केन्द्रीय विद्यालय संगठन

Kendriya Vidyalaya Sangathan

विज्ञान

SCIENCE

कक्षा/Class: **X**

2024-25

विद्यार्थी अध्ययन सामग्री

Student Support Material

संदेश

विद्यालयी शिक्षा में शैक्षिक उत्कृष्टता प्राप्त करना केन्द्रीय विद्यालय संगठन की सर्वोच्च वरीयता है। हमारे विद्यार्थी, शिक्षक एवं शैक्षिक नेतृत्व कर्ता निरंतर उन्नति हेतु प्रयासरत रहते हैं। राष्ट्रीय शिक्षा नीति 2020 के संदर्भ में योग्यता आधारित अधिगम एवं मूल्यांकन संबन्धित उद्देश्यों को प्राप्त करना तथा सीबीएसई के दिशा निर्देशों का पालन, वर्तमान में इस प्रयास को और भी चुनौतीपूर्ण बनाता है।

केन्द्रीय विद्यालय संगठन के पांचों **आंचलिक शिक्षा एवं प्रशिक्षण संस्थान** द्वारा संकलित यह 'विद्यार्थी सहायक सामाग्री' इसी दिशा में एक आवश्यक कदम है । यह सहायक सामग्री कक्षा 9 से 12 के विद्यार्थियों के लिए सभी महत्वपूर्ण विषयों पर तैयार की गयी है । केन्द्रीय विद्यालय संगठन की 'विद्यार्थी सहायक सामग्री' अपनी गुणवत्ता एवं परीक्षा संबंधी सामाग्री-संकलन की विशेषज्ञता के लिए जानी जाती है और अन्य शिक्षण संस्थान भी इसका उपयोग परीक्षा संबंधी पठन सामग्री की तरह करते रहे हैं । शुभ-आशा एवं विश्वास है कि यह सहायक सामग्री विद्यार्थियों की सहयोगी बनकर सतत मार्गदर्शन करते हुए उन्हें सफलता के लक्ष्य तक पहुंचाएगी ।

शुभाकांक्षा सहित ।

निधि पांडे
आयुक्त, केन्द्रीय विद्यालय संगठन

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PCLASS: 10 SCIENCE

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INDEX

CHAPTER – 1

CHEMICAL REACTIONS AND EQUATIONS

Content (reference: CBSE SYLLABUS – 2024)

❖ Chemical reactions: Chemical Equation, Balanced chemical equation (Method)

❖ Types of chemical reactions:

- Combination
- Decomposition
- Displacement (Single & Double)
- Exothermic-Endothermic Reaction.

❖ Reduction-Oxidation Reaction, Rancidity

❖ **Physical Change:** Change in physical properties.

- Melting (Solid to Liquid)
- Boiling (Liquid to Gaseous)
- Condensation (Gaseous to Liquid)
- No change occurs in the identity of the substance

❖ **Chemical Change:** Atoms in the reactants are rearranged to form one or more different substances.

- Old bonds are broken and new bonds are formed.
- Reactants lose their properties to form products of different properties.

  $4Fe(s) + 3O_2 \rightarrow 2Fe_2O_3$ (rust).

  Iron + Oxygen → Ferric oxide

❖ **Chemical changes may be observed in following ways:**

- CHANGE IN STATE: Magnesium ribbon burns with a dazzling white flame (reaction between magnesium and oxygen present in the air) and changes into a white powder of magnesium oxide.

  2Mg(s) + O2(g) → **2MgO(s)**

- CHANGE IN COLOR: Take lead nitrate solution in a test tube; add potassium iodide solution to this, and then we observed that lead (II) iodide and potassium nitrate is formed.
- EVOLUTION OF GAS: Take a few zinc granules in a conical flask, add dilute hydrochloric acid or sulphuric acid to this, and then we observed that hydrogen gas is evolved.
- TEMPERATURE INCREASE: Reaction between Quicklime and water.

❖ **Chemical equation:** The symbolic representation of a chemical reaction is called a chemical equation.

❖ **Features of a chemical equation:**

- The reactants are written on the left-hand side with a plus sign between them.

- The products are written on the right-hand side with a plus sign between them.
- An arrow separates the reactants from the products. The arrow head points towards the products and indicates the direction of the reaction.

❖ **Skeletal chemical equation:** A chemical equation which simply represents the symbols and formulas of reactants and products taking part in the reaction is known as skeletal chemical equation for a reaction.

Example: The skeletal equation of burning of magnesium in the air is as follows-

$Mg + O_2 \rightarrow MgO$

❖ **Balanced chemical equation:** A balanced equation is a chemical equation in which number of atoms of each element is equal on both sides of the equation i.e. number of atoms of an element on reactant side is equal to number of atoms of that element on the product side.

- **Step 1:** To balance a chemical equation, first draw boxes around each reactant and product and do not make any changes to it.

  $Fe + H_2O \rightarrow Fe_3O_4 + H_2$

- **Step 2:** List the number of atoms of each element present in the unbalanced equation.
- **Step 3:** We should always choose a compound with a maximum number of atoms in it, either on reactants side or products side.

  $Fe + H_2O \rightarrow Fe_3O_4 + H_2$

  (Here we select Fe_3O_4 which contains 4 oxygen atoms on the right-hand side. As we cannot make H_2O to H_2O_4 in order to increase oxygen atoms, so we make it to $4H_2O$.)

  $Fe + 4H_2O \rightarrow Fe_3O_4 + H_2$

- **Step 4:** Balance other atoms now like Fe and H.

  $Fe + 4H_2O \rightarrow Fe_3O_4 + H_2$

  L.H.S. - Atoms of H are 8

  R.H.S. - Atoms of H are 2

  (So multiply H_2 on R.H.S with 4, so we get)

  $Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

- **Step 5:** $Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

  Pick the last element Fe from the above partly balanced equation.

  L.H.S. - Fe are 1

  R.H.S. - Fe are 3

  (So multiply 3 on L.H.S)

  $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

- **Step 6:** Check the equation whether it is balanced or not by counting the number of atoms on L.H.S and R.H.S

  $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

This is the balanced equation.

- **Step 7:** Indicate the physical state of all the reactants and products by writing symbols in brackets as subscripts on the right corner below the formula.

$3Fe(s) + 4H_2O(l) \rightarrow Fe_3O_4(s) + 4H_2(g)$

❖ **Identification of types of reactions:**

✓ Combustion: $AB + O_2 \rightarrow$ Oxide of A & B.
✓ Combination: $A + B \rightarrow C$
✓ Decomposition: $AB \rightarrow A + B$
✓ Displacement: $A + BC\ (aq) \rightarrow AC\ (aq) + B$
✓ Double Displacement: $AB\ (aq) + CD\ (aq) \rightarrow AD\ (aq) + CB$

❖ **Definitions of reaction types with examples:**

1. Combination Reaction: Two or more reactant combines to form a single product. It may be classified into three types-

❖ **Element-Element Combination reaction**

$2Mg\ (s) + O_2\ (g) \rightarrow 2MgO$

Magnesium + Oxygen → Magnesium oxide (White ash)

❖ **Element-Compound Combination reaction**

$CO_2 + C \rightarrow 2CO$

Carbon dioxide + Carbon → Carbon monoxide

❖ **Compound-Compound Combination Reaction**

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$

(Quicklime) + Water → (Slakedlime)

2. Decomposition Reaction: Single compounds decompose or break down to give two or more simpler **substances. It may be classified into three types –**

❖ **Thermal** decomposition – In presence of thermal energy

$2FeSO_4$(Green crystal) $\xrightarrow{HEAT} Fe_2O_3\ (s) + SO_2\ (g) + SO_3(g)$

$CaCO_3(s) \xrightarrow{HEAT} CaO(s) + CO_2(g)$

(Limestone) (Quicklime) + (Carbon dioxide)

$2Pb(NO_3)_2(s) \xrightarrow{HEAT} 2PbO(s) + 4NO_2$(brown fumes) $+ O_2(g)$

(Lead nitrate) (Lead oxide) + (Nitrogen dioxide) + (Oxygen)

❖ **Electric decomposition** – In presence of electricity

$H_2O \xrightarrow{Electricity} 2H_2 + O_2$

The atomic mass percentage ration of Hydrogen and oxygen is 1:8. Whereas the atomic count ration is 2:1.

❖ **Photolytic decomposition**- In presence of light

$2AgCl \xrightarrow{Sunlight} 2Ag + Cl_2(g)$

White Silver

3. Displacement Reaction: A more reactive element [metal] displaces less reactive element [metal] from its aqueous salt solution

$Fe\ (s) + ZnSO_4\ (aq) \rightarrow FeSO_4\ (aq) + Zn\ (s)$

4. Double Displacement Reaction: Aqueous solution of two ionic compounds react by exchange of their ions is called double displacement Reaction.

$BaCl_2\ (aq) + Na_2SO_4\ (aq) \rightarrow BaSO_4\ (s) + 2\ NaCl(aq)$

$Pb(NO_3)_2 + 2\ KI\ (aq) \rightarrow PbI_2\ (\downarrow) + 2\ KNO_3\ (aq)$

5. Oxidation Reaction: In oxidation reaction, addition of oxygen or removal of hydrogen or loss of electron takes place.

$2Mg(s) + O_2\ (g) \rightarrow 2MgO\ (s)$

$2Cu + O_2 \rightarrow 2CuO$

6. Reduction Reaction: In reduction Reaction addition of hydrogen or removal of oxygen or gain of electron takes place.

$CuO(s) + H_2\ (g) \rightarrow Cu(s) + H_2O\ (l)$

7. Redox Reaction: Reaction involving both oxidation and reduction simultaneously

$CuO(s) + H_2 \rightarrow Cu(s) + H_2O(l)$

8. Exothermic Reaction: Reaction in which heat is evolved.

$C(s) + O_2\ (g) \rightarrow CO_2\ (g) + Heat$

9. Neutralisation Reaction: When an acid and a base react together to form salt and water.

$HCl\ (aq) + NaOH\ (aq) \rightarrow H_2O\ (l) + NaCl\ (aq)$

(acid) + (base) → (Water) + (Salt)

❖ **Law of Conservation of Mass:** In a chemical reaction matter is conserved.

Total no. of atoms on reactant side= Total no. of atoms on product side

Total mass of reactants = Total mass of products.

[While Balancing a Chemical Equation Formula of reactants and products should not be changed].

❖ **Rancidity:** Oxidation of oils or fats in a flood, resulting into a bad smell and taste.

- **Preventions:**

✓ Adding anti-oxidants.

✓ Replacing air by Nitrogen

✓ Refrigeration of food stuff

✓ Storing the food in air-tight containers (Vacuum Packing)

TYPES OF CHEMICAL REACTIONS

❖ **COMBINATION:** Addition of two elements or compounds to synthesis new compound
$C(s)+O_2(g) \rightarrow CO_2(g)$

❖ **DECOMPOSITION :** Decomposes to form two or more compounds.

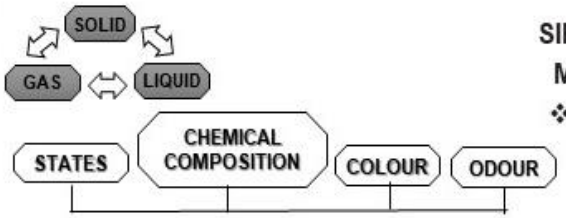
- Thermal decomposition reaction
  $CaCO_3 \rightarrow CaO + CO_2$
- Electrolytic decomposition reaction
  $2H_2O \rightarrow 2H_2 + O_2$
- Photo decomposition reaction
  $O_3 + hv \rightarrow O_2 + O$

❖ **Displacement:** Displaces a less active metal from its salt solution
$Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

❖ **Double displacement :** Exchange of ions or reactants
$Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

❖ **Oxidation:** Removal of Electron or Addition of O_2 Removal of H_2
$2Cu + O_2 \rightarrow heat \rightarrow 2CuO$

❖ **Reduction**: Addition of Electrons or Addition of H_2 Removal of O_2
$CuO + H_2 \rightarrow heat \rightarrow Cu+H_2O$



CHANGES OBSERVED AS

CHEMICAL REACTIONS & EQUATIONS

THERMOCHEMICALCHANGES

❖ **ENDOTHERMIC:** Energy absorbed

$2AgBr(s) \rightarrow Sunlight \rightarrow 2Ag(s)+Br2(g)$

❖ **EXOTHERMIC:** Energy released

$CH_4(g) + O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$+**HEAT**

❖ **RANCIDITY:** Fats and oils of food material are oxidised, they become rancid and their smell and taste change.

❖ **PREVENTIONS**

- **By adding antioxidants**
- **Use air tight containers**
- **Keeping them seal tight container**
- **Fill nitrogen gas in packed material**

SIMPLEST WAY TO WRITE WORD EQUATION

Magnesium + Oxygen → Magnesium oxide

❖ **Unbalanced equation (skeleton equation)**

Mg +O2 → MgO

BALANCED EQUATION

The Law of Conservation of Mass states that the mass of the reactants must balance the mass of the products. To balance a chemical equation, the atoms of both the elements and molecules on the reactant side (left side) and product side (right side) must be equal to each other. Method generally used to balance- Hit & Trial

Step I: To balance a chemical equation, first draw boxes around each formula.

Step II: List the number of atoms of different elements present in the unbalanced equation.

Step III: Identifying the Atoms in Each Element than start balancing with the compound that contains the maximum number of atoms in reactant or a product.

Step IV: Pick unbalanced elements on by one and multiply it with a whole number to equalize it on both side RHS=LHS.

Step V: Examine the equation and pick up the last element which is not balanced. You find that only one element is left to be balanced.

Step VI: Finally, to check the correctness of the balanced equation. Write physical state of elements written as gas (g), liquid (l) and solid (s)

Chapter – 2

ACIDS, BASES AND SALTS

Content: (reference: CBSE SYLLABUS – 2024)

- ❖ Their definitions in terms of furnishing of H+ and OH– ions
- ❖ General properties, examples and uses
- ❖ Neutralization
- ❖ Concept of pH scale (Definition relating to logarithm not required)
- ❖ Importance of pH in everyday life
- ❖ Preparation and uses of Sodium Hydroxide, Bleaching powder, Baking soda, Washing soda
- ❖ Plaster of Paris.

❖ **Properties of Acids:**

- Produce hydrogen ions [H+] in H_2O.
- Sour taste.
- Turn blue litmus red.
- Neutralize solutions carrying hydroxide ions.
- React with several metals releasing Hydrogen gas.
- React with carbonates releasing CO_2(g)
- Corrode metal surface quickly.

❖ **Types of Acid:**

1. Based on the origin and composition, acids are classified as:

a) **Organic acids:** Acids derived from living organisms like plants and animals.

Examples:

- ✓ Citric acid is present in citrus fruits
- ✓ Acetic acid present in vinegar
- ✓ Oxalic acid present in tomato
- ✓ Tartaric acid present in tamarind
- ✓ Lactic acid present in sour milk and curd

b) **Mineral acids:** They are also called inorganic acids. They are corrosive in nature.

Examples:

- ✓ Sulphuric acid (H_2SO_4)
- ✓ Hydrochloric acid (HCl)
- ✓ Nitric Acid (HNO_3)

2. On the basis of their strength, acids are classified as:

a) **Strong acids:** Completely dissociate into its ions in aqueous solutions.

Example: Nitric acid (HNO_3), Sulphuric acid (H_2SO_4), Hydrochloric acid (HCl).

b) **Weak acids:** Weak acids are those acids which do not completely dissociate into its ions in aqueous solutions.

Example: Carbonic acid (H_2CO_3), Acetic acid (CH_3COOH).

3. On the basis of their concentration, acids are classified as:

a) **Dilute acids:** Have a low concentration of acids in aqueous solutions.

b) **Concentrated acids:** Have a high concentration of acids in aqueous solutions.

❖ **Properties of Base:**

- Produce hydroxide ions [OH^-] in H_2O.
- Water soluble bases are called alkalise.
- Bitter Taste
- Turn Red Litmus blue.
- Neutralize solutions containing H+ ions.
- Have a slippery, 'soapy' feel.

1. On the basis of their strength, bases are classified as:

a) **Strong bases:** Strong bases are those bases which completely dissociate into its ions in aqueous solutions.

Example: Sodium hydroxide (NaOH)

Potassium hydroxide (KOH)

b) **Weak bases:** Weak bases are those bases which do not completely dissociate into its ions in aqueous solutions.

Example: Ammonium hydroxide (NH_4OH)

2. On the basis of their concentration, bases are classified as:

a) **Dilute bases:** Have a low concentration of alkali in aqueous solutions.

b) **Concentrated bases:** Have a high concentration of alkali in aqueous solutions.

❖ **Strength of Acid or Base Solutions:**

A scale for measuring hydrogen ion concentration in a solution, called pH scale has been developed. The p in pH stands for 'potenz' in German, meaning power.

- p = potential or Power
- H = Hydrogen
- pH = Anti log value of hydrogen ion concentration.

✓ pH = 7 (Neutral Solution $H_3O^+ = OH^{-)}$
✓ pH > 7 (Basic Solution $H_3O^+ < OH^{-)}$
✓ pH < 7 (Acidic Solution $H_3O^+ > OH^{-)}$

- Range of pH is from 1 to 14

❖ **pH Sensitivity of Plants & Animals:**

- Human body works in a narrow range of pH 7 to 7.8. Acidity can be lethal for plants and animals.
- pH of Digestive System: Stomach secretes HCl to kill bacteria in the food. The inner lining of stomach protects vital cells from this acidic pH.
- pH and tooth decay: Lower pH because of sour food and sweet food can cause tooth decay. The pH of mouth should always be more than 5.5.
- pH as self defence mechanism in plants & animals: Certain animals like bee and plants like nettle secrete highly acidic substance for self-defence.

❖ **Properties of salts:**

- Salts are formed by the combination of acid and base through neutralization reaction.
- The acidic and basic nature of salts depends on the acid and base combining in the neutralization reaction.
- The most common salt is sodium chloride or table salt which forms by the combination of sodium hydroxide (base) and hydrochloric acid.
- Other examples include Epsom salts ($MgSO_4$) used in bath salts, baking soda ($NaHCO_3$) used in cooking.
- The pH of salts solution depends on the strength of acids and base combined in neutralization reaction.

Acid	Base	Salt	Example
Strong	Strong	Neutral	$NaOH + HCl \rightarrow NaCl + H_2O$
Strong	Weak	Acidic	$HCl + NH_4OH \rightarrow NH_4Cl + H_2O$
Weak	Strong	Basic	$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$
Weak	Weak	Neutral	$CH_3COOH + NH_4OH \rightarrow CH_3COONH_4 + H_2O$

❖ **Indicators** – Indicators are substances which indicate the acidic or basic nature of the solution by their colour change.

The colour of some acid – base indicators in acidic and basic medium are given below:

S. No.	Indicators	Colour in acidic medium	Colour in basic medium
1.	Litmus Solution	Red	Blue
2.	Methyl Orange	Pink	Orange

3.	Phenolphthalein	Colourless	Pink
4.	Methyl Red	Yellow	Red

❖ **Chemical properties of acids:**

- Acids react **with active metals** to give hydrogen gas.
  $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
- Acids react **with metal carbonate and metal hydrogen carbonate** to give carbon dioxide.
  $NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$
- Acids react **with bases** to give salt and water. This reaction is called as **neutralization** reaction.
  $NaOH + HCl \rightarrow NaCl + H_2O$
- Acids react **with metals oxides** to give salt and water.
  $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

❖ **Addition of Acids or Bases to Water:** The process of dissolving an acid, especially nitric acid or sulphuric acid or a base in water is a **highly exothermic** one.

Note: Always add acid to water and never the other way! The acid must be added slowly to water with constant stirring. If one mixes the other way by adding water to a concentrated acid, the heat generated causes the mixture to splash out and cause burns.

❖ **Chemical properties of Bases:**

- Reaction with Metals - Certain reactive metals such as Zinc, Aluminium, and Tin react with alkali solutions on heating and hydrogen gas is evolved.

  $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

- Reaction with acids -Bases react with acids to form salt and water.

  $KOH + HCl \rightarrow KCl + H_2O$

- Reaction with Non-metallic oxides – These oxides are generally acidic in nature. They react with bases to form salt and water.

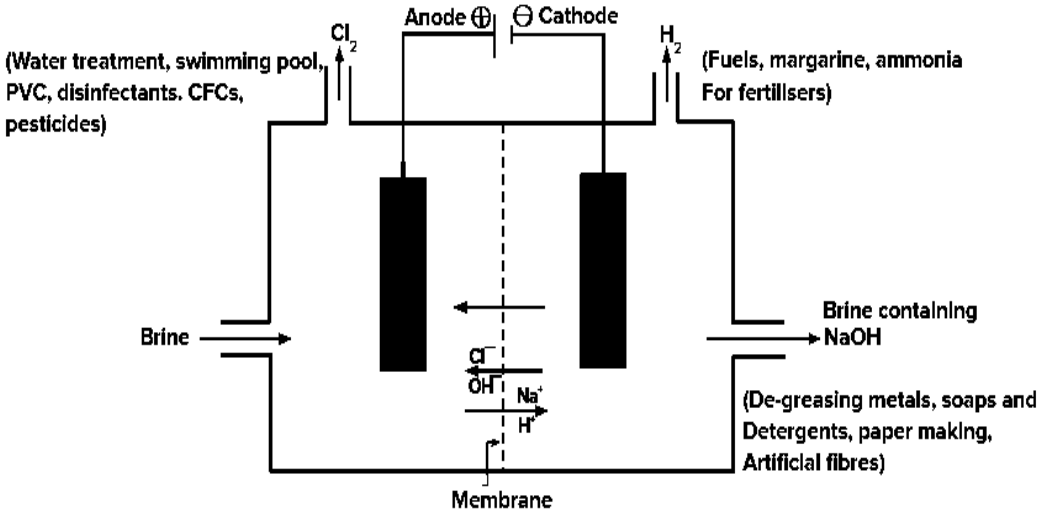
  $2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

❖ **Some Important Chemical Compounds:**

- **Common Salt (NaCl):** Sodium chloride is known as common salt. Its main source is sea water. It also exists in the form of rocks and is called rock salt. Common salt is an important component of our food. It is also used for preparing sodium hydroxide, baking soda, washing soda etc.

❖ **Chlor-Alkali process:** Electricity is passed through an aqueous solution of Sodium chloride (called brine). Sodium chloride decomposes to form sodium hydroxide. Chlorine gas is formed at the anode, and hydrogen gas at the cathode. Sodium hydroxide solution is formed near the cathode.

$2NaCl(aq) + 2\ H_2O\ (l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$



(Source: https://ncert.nic.in/textbook/pdf/jesc102.pdf)

a) Uses of Sodium hydroxide (NaOH) –

- It is used as a cleansing agent and in the manufacturing of washing soda.
- Sometimes, sodium hydroxide is also used as a reagent in the laboratories.
- It is used in the preparation of soda lime.
- It is used in the extraction of aluminium by purifying bauxite.

b) Uses of Hydrogen gas (H2) –

- Hydrogen with oxygen produces oxy-hydrogen flame which is used for cutting and welding.
- Hydrogen gas is used as a fuel.
- Hydrogen is used for hydrogenation of vegetable oil.
- Hydrogen gas is used extensively in the manufacture of ammonia gas, which is used to produce fertilizers.

c) Uses of Chlorine gas (Cl_2) –

- For bleaching
- For the preparation of insecticides
- For removing stains in the fabric
- For purification of water
- For the preparation of bleaching powder

❖ **Bleaching powder:** Molecular formula is $CaOCl_2$. Bleaching powder is produced by the action of chlorine on dry slaked lime.

Preparation: $Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

Uses:

- As disinfectant and germicide especially in the sterilization of drinking water.
- Manufacturing of chloroform.

- Bleaching of silk, cotton, linen, wool (fabric industry) and wood pulp (paper industry).
- As an oxidising agent in chemical industries

❖ **Baking Soda:** Baking soda is known as sodium bicarbonate. ($NaHCO_3$).
❖ **Baking Powder:** Baking powder is a mixture of Sodium bicarbonate ($NaHCO_3$) and tartaric acid ($NaHCO_3$)

Preparation: $NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$

Uses:

- Use to lighten the texture and to increase volume of various baked foods.
- Used instead of yeast for the end- products where the fermentation flavours would be undesirable.
- Used as antacid in acidity.

❖ **Washing soda:** Sodium carbonate ($Na_2CO_3.10H_2O$)

Preparation: It is two-step process

First step- sodium carbonate is obtained by heating baking soda.

$2NaHCO_3$ (heat) $\rightarrow Na_2CO_3 + H_2O + CO_2$

Second step- Washing soda is produced by recrystallisation of sodium carbonate

$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$

Uses:

- Used in glass, soap and paper industries.
- Used in the manufacture of sodium compounds such as borax.
- Used in domestic cleaning purposes.
- Used for removing permanent hardness of water.

❖ **Plaster of Paris:** Calcium sulphate hemihydrate $CaSO_4.½ H2O$

Preparation: By heating Gypsum at 373K.

$CaSO_4.2H_2O \xrightarrow{\text{(Heat at 373K)}} CaSO_4.\ ½\ H_2O + 1½\ H_2O$

Uses:

- Used in making casts and patterns for moulds and statues.
- Used as cement in ornamental casting and for making decorative materials.
- Used as a fire proofing material and for making chalks.
- Used in hospitals for immobilising the affected part in case of bone fracture or strain.

IMPORTANT KEY POINTS

- ✓ Acid is a compound which yields hydrogen ion (H+), when dissolved in water.
- ✓ Acid is sour to the taste and corrosive in nature. The pH value for acids is less than 7.
- ✓ Generally, all acids readily react with metal to release hydrogen gas. For example, metal zinc reacts with hydrochloric acid to form zinc chloride and hydrogen gas.
- ✓ Acid reacts with limestone ($CaCO_3$) to produce carbon dioxide. For example, hydrochloric acid reacts with limestone to produce carbonic acid and calcium chloride.
- ✓ Acid can be classified in organic and inorganic acids. Acetic acid (CH_3COOH) is the best example of organic acid, while acid produced from minerals are termed as inorganic acids like sulphuric acid (H_2SO4), hydrochloric acid (HCl).
- ✓ Acid converts the colour of blue litmus paper to red.
- ✓ Acids have a tendency to corrode metal surfaces quickly.
- ✓ Acids and bases conduct electricity because they produce ions in water. There is a flow of electric current through the solution by ions.
- ✓ Indicators are those chemical substances which behave differently in acidic and basic mediums and help in determining the chemical nature of the substance.
- ✓ Acid base indicators indicate the presence of an acid or a base by a change in their colour or smell.
- ✓ Indicators can be natural or synthetic.
- ✓ Olfactory indicators: These are those indicators whose odour changes in acidic or basic medium.

- Onion: Smell of onion diminishes in a base and remains as it is in an acid.
- Vanilla: The odour of vanilla essence disappears when it is added to a base. The odour of vanilla essence persists when it is added to an acid.
- Turmeric: In acids, the yellow colour of turmeric remains yellow. In bases, yellow colour of turmeric turns red.
- Red cabbage juice which is purple in colour changes to red in acidic medium.
- Litmus: Litmus is a natural indicator. Litmus solution is a purple dye which is extracted from lichen. Acids turn blue litmus red. Bases turn red litmus blue.

- ✓ Water is essential for acids and bases to change the colour of litmus paper.
- ✓ Remember that litmus paper will act as an indicator only if either the litmus paper is moist or the acid or base is in the form of aqueous solution. This is because acids and bases release H+ and OH- ions respectively in aqueous solutions.
- ✓ Phenolphthalein: Phenolphthalein remains colourless in acids but turn pink in bases.
- ✓ Methyl orange: Methyl orange turns pink in acids and becomes yellow in bases.
- ✓ Living organisms are pH sensitive. Human body works within a pH range of 7.0 to 7.8.
- ✓ Rain water with a pH less than 5.6 is called acid rain. This acid rain if it flows into river water makes the survival of aquatic life difficult.

- ✓ Plants also require a specific pH range of soil for their healthy growth.
- ✓ pH is also significant as it is used in self-defence by animals and plants. Bees use acids in their sting. To neutralise the effect a mild base like baking soda can be used.
- ✓ Water of crystallisation: It is the fixed number of water molecules present in one formula unit of a salt.
- ✓ Bases are compounds which yield hydroxide ion (OH-), when dissolved in water.
- ✓ Bases are bitter to taste and corrosive in nature. They feel slippery and soapy.
- ✓ Bases are good conductors of electricity and show pH value more than 7.
- ✓ Bases react with oils and grease to form soap molecules.
- ✓ Bases convert red litmus paper to blue in colour.
- ✓ Bases also have the tendency to corrode metal surfaces.
- ✓ A reaction between a base and a metal is similar as for acid to form salt and release hydrogen gas. But this reaction can only occur when a metal is strong enough to displace another metal from its parent constituent.

  $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$
- ✓ Phenolphthalein solution turns pink in colour in the basic solution. Bases turn methyl orange to yellow. Red cabbage juice which is purple in colour changes to yellow in basic medium.
- ✓ Strong bases: They are completely ionized in water to produce hydroxide ions.
- ✓ Weak bases: Partially ionized and equilibrium lies mostly towards the reactants side, Eg. Ammonia in water:

  $NH_3(aq) + H_2O(l) \rightarrow NH_4+ (aq) + OH-(aq)$
- ✓ A salt is defined as a compound formed by the complete or incomplete replacement of the hydrogen ion of an acid by a basic radical.
- ✓ A normal salt is formed by the complete replacement of the hydrogen ion of an acid by a basic radical whereas an acid salt is formed by the incomplete replacement of the hydrogen ion of an acid by a basic radical.

ACID BASE and SALTS

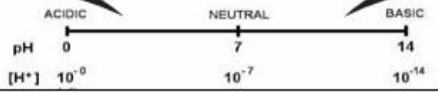
ACID

- Sour in taste
- Give H+ ions in aqueous solution
- Turns blue litmus red
- Aqueous solution conduct electricity
- Lewis acid is an **electron-pair acceptor**

BASE

- Bitter in taste
- Give OH^- ions in aqueous solution
- Turns Red litmus Blue
- Aqueous solution not conduct electricity
- A Lewis base is therefore **an electron-pair donor.**

PHYSICAL PROPERTIES



pH is defined as the negative logarithm of H+ ion concentration.

pH Scale: The values of the concentration of the hydrogen ion—which ordinarily ranges between about 1 and 10^{-14} gram-equivalents per liter—into numbers between 0 and 14. In pure water, which is neutral (neither acidic nor alkaline), the concentration of the hydrogen ion is 10^{-7} gram-equivalents per liter, which corresponds to a pH of 7. A solution with a pH less than 7 is considered acidic; a solution with a pH greater than 7 is considered basic, or alkaline.

CHEMICAL PROPERTIES OF ACID

- Reacts with metals to liberate **Hydrogen gas.**
  $2HCl + Zn \rightarrow ZnCl_2 + H_2$
- Reacts with metal carbonates/metal hydrogen carbonate to liberate **CO_2**
  $2HCl + Na_2CO_3 \rightarrow 2NaCl + CO_2 + H_2O$
  $HCl + NaHCO_3 \rightarrow NaCl + CO_2 + H_2O$
- React with Metallic Oxides with liberate Salt and Water
  $CuO + 2HCl \rightarrow CuCl2 + H2O$
- Reaction of a Non-metallic Oxide with Base
  $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

CHEMICAL PROPERTIES OF BASE

- Reacts with metals to liberate **Hydrogen gas.**
  $2NaOH + Zn \rightarrow NaZnO_2 + H_2$
- Reacts with metal carbonates/metal hydrogen carbonate to liberate CO2
  $2HCl + Na2CO_3 \rightarrow 2NaCl + CO_2 + H2O$
  $HCl + NaHCO_3 \rightarrow NaCl + CO_2 + H_2O$
- Neutralization : Acid and Base reacts to produce salt, It is kind of Double displacement reaction. $- NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$
- Electrolysis of Acid and Base gives Ions which makes solution Electro conductive.

A universal indicator is a mix of pH indicator solutions that are designed to determine the pH of solutions over a wide range of values.

❖ Natural color indicators:		
1. Turmeric	Yellow (In acid)	Red (In Base)
2. Litmus (obtained from lichen)	Red (In acid)	Blue (in Base)
❖ Olfactory indicators:		
1. Clove	Clove Smell (In acid)	No Smell (In Base)
2. Vanilla	Vanilla Smell (In acid)	No Smell (In Base)
3. Onion	Onion Smell (In acid)	No Smell (In Base)

Synthetic indicators: Methyl orange, phenolphthalein.

1. Red litmus	Remains red(In acid)	Turns blue(In base)
2. Blue litmus	Turns red (In acid)	Remains blue (In base)
3. Phenolphthalein	Colorless (In acid)	Pink (In base)
4. Methyl orange	Red (In acid)	Yellow (In base)

Litmus is a water-soluble mixture of different dyes extracted from lichens. It is absorbed onto filter paper to produce one of the oldest forms of pH indicator

Common Salt (NaCl)

$NaOH + HCl \rightarrow NaCl + H_2O$

1. By evaporation of sea water
2. From Earth as Mineral with Impurities.
3. Preservative in pickle and curing meat and fish.
4. Daily purpose in cooking
5. As Source of -

i. NaOH (caustic soda)
ii. Na_2CO_3 (washing soda)
iii. $NaHCO_3$ (baking soda)
iv. $CaOCl_2$ (Bleaching Powder)

Caustic Soda (NaOH)

$2NaCl\ (Brine) + 2H_2O \rightarrow 2NaOH\ (Caustic\ Soda) + Cl_2 + H_2$

*At anode(+ve): Cl_2 is produced
*At cathode(-ve): H_2 is produced
*Making soap, detergent and paper.
*De-greasing metals
*Refining oil and Making dyes and bleaches

Baking Soda ($NaHCO_3$)

$NaCl + NH_3 + H_2O + CO_2 \rightarrow NaHCO_3 + NH_4Cl$

*Used as antacid in medicine to remove acidity of the stomach
*Used in making baking powder (Basic soda + tartaric acid)

Washing Soda ($Na_2CO_3.10H_2O$)

- $NaCl + NH_3 + H_2O + CO_2 \rightarrow$ **$NaHCO_3$** $+ NH_4Cl$
- **Na_2CO_3** $+ 10\ H_2O \rightarrow Na_2CO_3.10H_2O$

$NaHCO_3.10H_2O \rightarrow$ **Na_2CO_3** $+ CO_2 + H_2O$

* Used in glass, soap and paper industries
* Manufacturing of sodium compounds such as Borax
* Cleaning agent for domestic purpose
* Remove permanent hardness of water

Bleaching Powder (CaOCl2)

$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

$CaOCl_2 + H_2SO_4 \rightarrow CaSO_4 + Cl_2 + H_2O$

Cl_2 produced by action of dilute acid acts as bleaching agent.

Uses of H2

1. Hydrogenation of oil to get vegetable ghee (margarine)
2. Make ammonia for fertilizers
3. In fuel for rockets.

Uses of Cl_2

1. In water treatment
2. Clean water in swimming pools
3. To make plastic, e.g. PVC
4. To make CFCs, Chloroform, dyes etc.

Uses of HCl

1. Cleaning steel
2. Preparation of chloride, e.g. NH_4Cl
3. In making medicines and cosmetics
4. In making plastics, PVC etc.

Plaster of Paris (P.O.P) ($CaSO_4.1/2\ H_2O$)

Gypsum, $CaSO_4.2H_2O$ (s) on heating at 100°C (373K) gives $CaSO_4.\frac{1}{2}\ H_2O$

$CaSO_4.1/2\ H_2O$ (P.O.P) $+ 1/2\ H_2O \rightarrow CaSO_4.2H_2O$

* P.O.P should be stored in moisture-proof container as moisture can cause slow setting of P.O.P by hydrating it.

Chapter – 3

METALS AND NON-METALS

CONTENT: (reference: CBSE SYLLABUS – 2024)

- ❖ Properties of metals and non-metals
- ❖ Reactivity Series
- ❖ Formation and properties of ionic compounds
- ❖ Basic metallurgic processes
- ❖ Corrosion and its prevention

Elements are classified broadly into two categories on the basis of their properties:

- Metals: Iron, Zinc, Copper, Aluminium etc.
- Non-metals: Chlorine, Nitrogen, Hydrogen, Oxygen, Sulphur etc.

Apart from metals and non-metals some elements show properties of both metals and non – metals, e.g. Silicon, Arsenic, Germanium. They are called **metalloids.**

❖ **Physical properties of Metals and Non-metals: -**

S. No.	Property	Metals	Non-Metals
1	Physical State	Metals are solid at room temperature. Except mercury and gallium.	Non-metals generally exist as solids and gases, except Bromine.
2	Melting and boiling points	Metals generally have high MP and BP except gallium and cesium.	Non-metals have low MP and BP except diamond and graphite.
4	Malleability and Ductility	Malleable and ductile.	Neither malleable nor ductile.
5	Electrical and thermal conductivity	Good conductors of heat and electricity.	Generally poor conductors of heat and electricity except graphite.
6	Lustre	Metals possess a shining lustre	Do not have lustre except iodine.
7	Sonorous sound	Give sonorous sound when struck.	Does not give sonorous sound.
8	Hardness	Generally hard except Na, K.	Solid non-metals are generally soft except diamond.

❖ **Chemical properties of Metals and Non-metals: -**

METAL	NON-METAL
REACTION WITH OXYGEN	
Metals form **basic oxides** Metal + Oxygen → Metal Oxide $4Na_{(s)} + O_{2(g)} \rightarrow 2Na_2O_{(s)}$ $4Al_{(s)} + 3O_{2(g)} \rightarrow 2Al_2O_{3(s)}$ • Zn and Al form **amphoteric oxides** (they show the properties of both acidic and basic oxides) • Most of the metal oxides are insoluble in water. • Some of them dissolve to form **Alkali** • $Na_2O_{(s)} + H_2O_{(l)} \rightarrow 2NaOH_{(aq)}$	Non-metals form **acidic oxides** Non-metal+Oxygen →Non-metal oxide $C + O_2 \rightarrow CO_2$ $S + O_2 \rightarrow SO_2$ • CO and H2O are neutral oxides (they are neither acidic nor basic in nature) • Non-metal oxides are soluble in water. • They dissolve in water to form acids. • $SO_2 + H_2O \rightarrow H_2SO_3$
REACTION WITH WATER	
Metals react with water to form metal oxides or metal hydroxide and H_2 gas is released. $2Na_{(s)}+2H_2O_{(l)} \rightarrow 2NaOH_{(s)}+H_{2(g)}+Heat$	Non-metals do not react with water, steam to evolve hydrogen gas.
REACTION WITH DILUTE ACIDS	
Metal + Acid → Metal salt + Hydrogen • With HCl $Mg(s)+2HCl(aq) \rightarrow MgCl_2(aq)+H_2(g)$ • With H_2SO_4 $2Na(s)+H_2SO_4 \rightarrow Na_2SO_4(aq)+H_2(g)$ • With HNO_3 Metal + HNO_3 → H_2 gas is not evolved. **Reason-** HNO_3 is strong oxidizing agent.	Non-metals do not react with acids to release H_2 gas
REACTION WITH SALT SOLUTIONS	
Metals react with salt solution and more reactive metal will displace a less reactive metal from its salt solution – **Single displacement reaction.** $CuSO_{4(aq)} + Zn_{(s)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$	When non-metals react with salt solution, more reactive non-metal will displace a less reactive non-metal from its salt solution. $2NaBr_{(aq)}+Cl_{2(g)} \rightarrow 2NaCl_{(aq)}+Br_{2(aq)}$

❖ **Reactivity Series:** Metals are arranged in a reactivity series based on their reactivity with water and acids. This series helps predict how metals will react with different substances. Reactivity decreases from top to bottom in the series (e.g., potassium is highly reactive, whereas gold is least reactive).

❖ **Ionic Compounds:**

- Metals tend to lose electrons to form cations (+).
- Non-metals gain electrons to form anions (-).
- Ionic compounds are formed through the transfer of electrons from metals to non-metals (e.g., NaCl)

❖ **Properties of ionic bonds:**

- **Physical nature:** solid and hard due to strong force of attraction. (generally brittle)
- **Melting point and boiling point:** have high M.P and B.P, as large amount of heat energy is required to break strong ionic attraction.
- **Solubility:** soluble in water and insoluble in kerosene and petrol.
- **Conduction of electricity:** ionic compounds in solid state do not conduct electricity. (Reason—Ions cannot move due to rigid solid structure.)

Note: Ionic compounds conduct electricity in molten state. (Reason-- Ions can move freely since the electrostatic forces of attraction between the oppositely charged ions are overcome due to heat.)

❖ **Occurrence of metals: -**

Metals occur in Earth's crust, Sea-water.

❖ **Minerals:** Elements or compounds occurring naturally in the earth's crust are called Minerals.

❖ **Ores:** Minerals that contain a very high percentage of a particular metal and these metals can be extracted economically on a large scale.

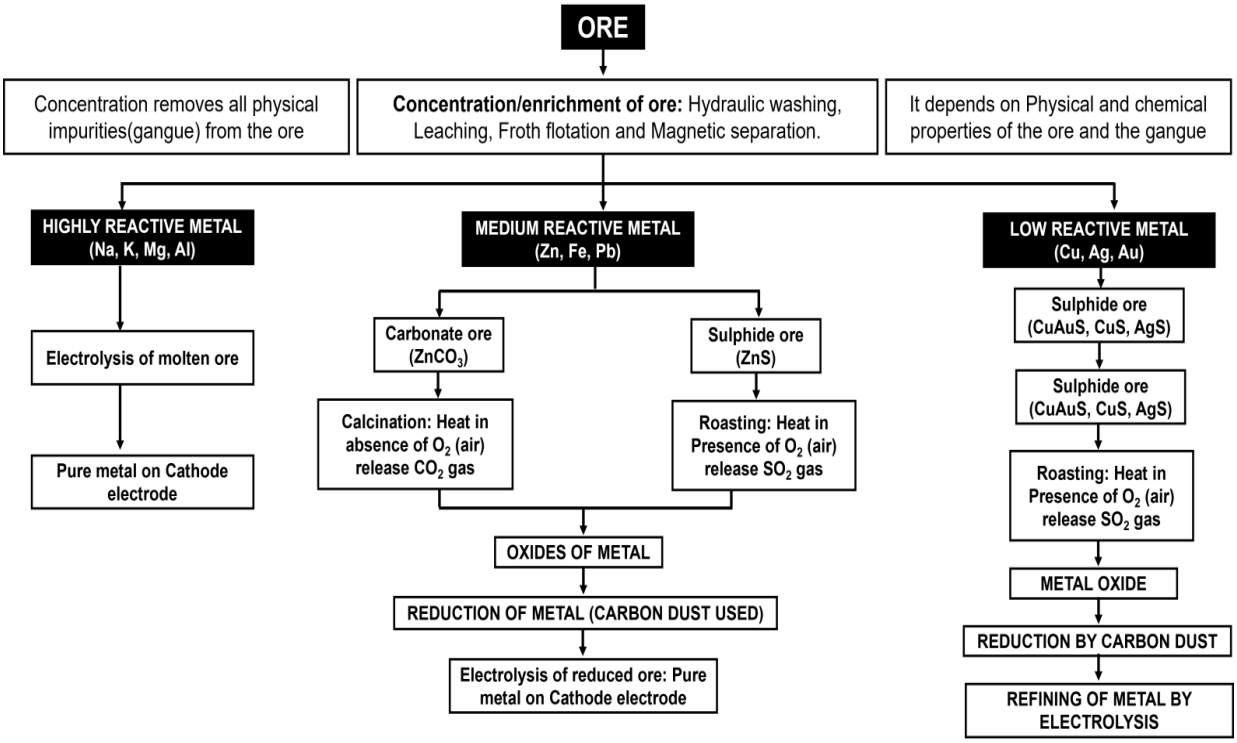
Example:

- Bauxite ore → Aluminium
- Haematite ore → Iron
- Magnetite ore → Iron
- Limestone → Calcium
- Gypsum → Calcium
- Bauxite → Aluminium
- Calamine → Zinc

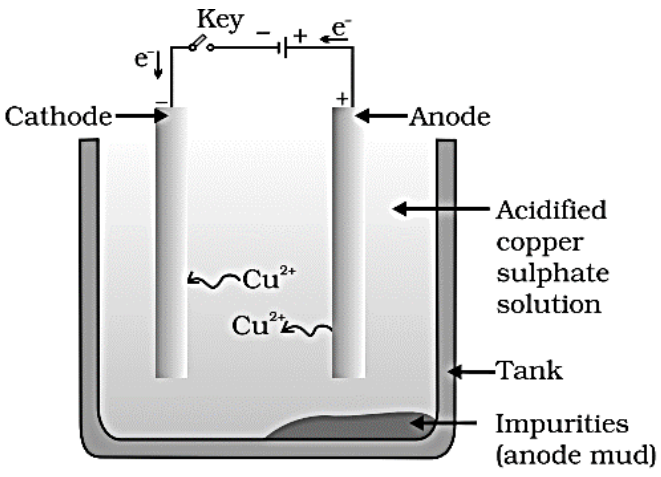
❖ **ORE PROCESSING: METAL PURIFICATION**

CALCINATION	ROASTING
• It is applicable for carbonate ores.	• It is applicable for sulphide ores.

• Heating of ores in absence of oxygen. • CO_2 gas is released and Metal oxide is obtained. $ZnCO_2(s) \xrightarrow{HEAT} ZnO(s) + CO_2(g)$	• Heating of ores in presence of oxygen. • SO_2 gas is released and Metal oxide is obtained. $2ZnS(s)+3O_2(g) \xrightarrow{HEAT} 3ZnO(s)+SO_2(g)$



❖ **Electrolysis:** This is the final process to find purest form of metal. In a jar/container electrolysis performed here impure metal(anode) and a strip of pure metal (cathode) are used as electrodes. They are dipped in an electrolytic bath which contains the soluble salt of the same metal. As electricity is passed through the solution, the less basic metal moves towards the anode mud leaving the more basic metal in the solution. For example, copper is purified using this method.



❖ **Corrosion**: Corrosion is oxidation of metals. Example of corrosion are as follows

- Blacking of silver (Silver sulphide)

  $4Ag + 2H_2S + O_2 \rightarrow 2Ag_2S + 2H_2O$
- Green layer on copper (Copper carbonate)
  $2Cu+O_2+CO2+H_2O \rightarrow CuCO_3.Cu(OH)_2$
- brown flaky substance on iron
  $4Fe + 3O_2 + 6H_2O \rightarrow 4Fe(OH)_3$
  $2Fe(OH) \rightarrow Fe_2O_3.3H_2O$

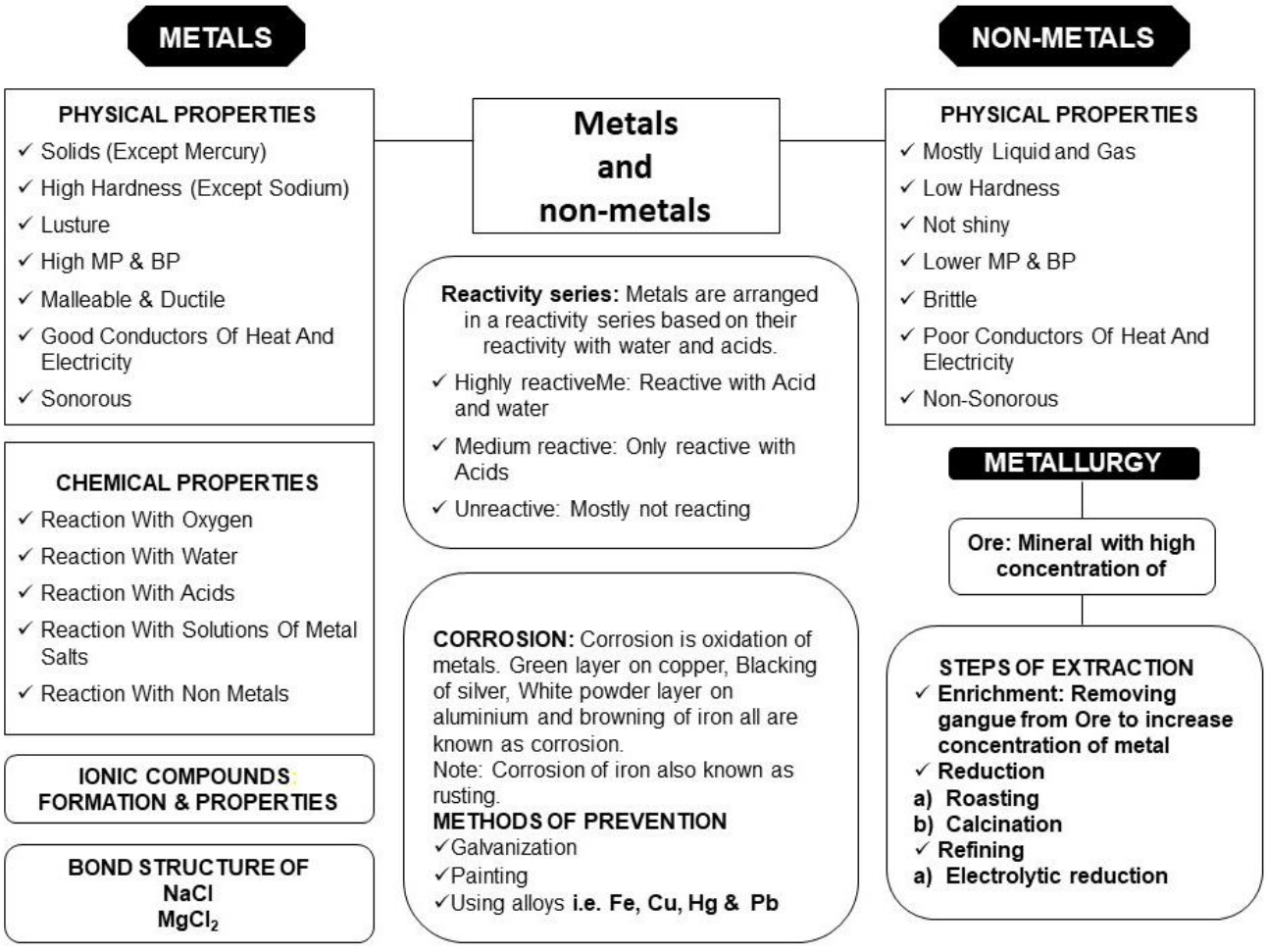
Note: Corrosion of iron also known as Rusting.

- **Prevention methods:**

✓ Galvanization

✓ Painting

✓ Using alloys (Metals are combined to form alloys to enhance properties) (e.g., brass is an alloy of copper and zinc).



Chapter – 4

CARBON AND ITS COMPOUNDS

CONTENT: (reference: CBSE SYLLABUS – 2024)

- ❖ Covalent Bonding in Carbon compounds
- ❖ Versatile nature of Carbon
- ❖ Homologous series
- ❖ Nomenclature of carbon compounds functional groups
  (Halogens, Alcohol, Ketone, Aldehyde, Alkenes and Alkynes)
- ❖ Difference between saturated and unsaturated hydrocarbons
- ❖ Chemical properties of carbon compounds
  (Combustion, Oxidation, Addition and Substitution)
- ❖ Ethanol and Ethanoic acid (only properties and uses)
- ❖ Soaps and detergents

❖ **CARBON:** Study of carbon known as organic chemistry. It is a ubiquitous atom like it is the seventeenth most abundant element found on The Earth. It may be found in both free as well as in the combined state i.e. coal, graphite, diamond as pure form and as metal carbonates, hydrocarbons, and carbon dioxide gas in the combined state. The atomic number of carbons is 6 and the atomic mass is 12.01 $gmol^{-1}$. Carbon is a member of the 14th group. It combines with other elements such as dihydrogen, dioxygen, chlorine, and sulphur and provides amazing arrays of materials that can vary from most living and non-living part of universe.

❖ **Bonding in Carbon –** Carbon valence count is 4, so it involves sharing of electrons between bonding atoms known as COVALENT BOND.

❖ **Characteristics of covalent compounds:**

- These are weaker than ionic bonds.
- These are insoluble in water and soluble in benzene, kerosene and petrol etc.
- These compounds are poor conductors of electricity.
- These have low melting and boiling points.

❖ **Allotropy in Carbon:** The property due to which an element exists in two or more forms, which differ in their physical and some of the chemical properties is known as “Allotropy” and the various forms are called “Allotropes”.

Carbon exists in two allotropic forms

- **Crystalline:** The crystalline forms are diamond and graphite
- **Amorphous:** The amorphous forms are coal, charcoal, lamp black etc.
- Fullerenes form another class of carbon allotropes. The first one to be identified was **C-60**, which has carbon atoms arranged in the shape of a football.

❖ **Unique Nature of Carbon:** Following reason that carbon has unique nature:

- **Catenation:** The property of elements to form long chains or rings by self-linkage of their own atoms through covalent bonds is called catenation. (Carbon atom forming bonds with carbon atoms)
- **Tetravalency:** The ability to form four bonds with four other atoms of carbon or atoms of some other mono-valent element.

❖ **Types of organic compound: There are two types of organic compound**

- **Saturated Carbon Compounds:** The valencies of all the carbon atoms are satisfied by single covalent bonds between them.
- **Unsaturated Carbon Compounds:** At least one double or triple bond between the carbon atoms is present.
- **Straight chain compounds: (Aliphatic compounds)** the compounds which contain a straight chain of carbon atoms e.g. normal butane (C_4H_{10}), normal pentane (C_5H_{12}) etc.
- **Cyclic compounds**: (Aromatic compound) the compounds are called closed chain or ring compounds e.g. cyclohexane (C_6H_{12}), cyclopentane (C_5H_{10}) etc.
- **Branched chain compounds:** Those compounds which have branched structure. e.g. isobutane (C_4H_{10}), isopentane (C_5H_{12}), neopentane (C_5H_{12}) etc.

❖ **IMPORTANT DEFINITIONS:**

- **Hydrocarbons:** All those compounds which contain just carbon and hydrogen are called hydrocarbons.
- **Isomers:** Chemical compounds that have the same chemical formula but different chemical structure (arrangement of atoms in the molecule) are called isomers and this phenomenon is called Isomerism.
- **Functional Group:** The atom or group of atoms which replaces hydrogen atom/ atoms and determines the properties of a compound is known **as a functional** group. e.g. —OH (alcohol), —CHO (aldehyde),

  >C=C< (alkene), — C≡C — (alkyne) etc.

- **Homologous Series:** A series of compounds in which the same functional group substitutes hydrogen in a carbon chain is called a homologous series. Consecutive members of the series differ by a —CH_2 unit and 14 amu mass.

  CH_4 and C_2H_6 - These are differ by a -CH_2 -unit

  C_2H_6 and C_3H_8 - These are differ by a -CH_2 unit

❖ **Nomenclature:** A set of rules were developed for naming organic compounds based on their structures. The IUPAC name of organic compounds consists of three parts.

Prefix – Root Word – Suffix

- Root word indicates the number of carbon atoms present in the longest chain. It includes count of carbon in Latin language is as follows

Number of Carbons	Name
1	**meth**ane
2	**eth**ane
3	**prop**ane
4	**but**ane
5	**pent**ane
6	**hex**ane
7	**hept**ane
8	**oct**ane
9	**non**ane
10	**dec**ane

- In case a functional group is present, it is indicated in the name of the compound with either as a prefix or as a suffix.

Functional group	Prefix	Suffix
carboxylic acids	none	-oic acid
aldehydes	none	-al
ketones	none	-one
alchols	hydroxy-	-ol
fluorine	fluoro-	None
chlorine	chloro-	None
bromine	bromo-	None
iodine	iodo-	None

- While adding the suffix to the root word the terminal “e” of the carbon chain is removed.
- If the carbon chain is unsaturated then the final ‘ane’ in the name of the carbon chain is substituted by “ene or yne” for double and triple bonds respectively.

❖ **Chemical Properties of Carbon Compounds:**

- **Combustion:** Carbon compounds undergo combustion reaction to produce CO_2 and H_2O with the evolution of heat and light.

  $CH_4+2O_2 \rightarrow CO_2 + 2H_2O$ + heat and light

- **Oxidation:** The substances which are used for oxidation are known as oxidising agents. e.g. alkaline KMnO4, acidified $K_2Cr_2O_7$.
- Addition reaction: Unsaturated hydrocarbons (alkenes and alkynes) undergo addition reaction in presence of catalysts such as palladium or nickel to give saturated hydrocarbons. e.g. hydrogenation of vegetable oils using a nickel catalyst.
- Substitution reaction: Saturated hydrocarbons give substitution reaction e.g. Chlorination reaction - methane in presence of sunlight undergo substitution reaction as one type of atom or a group of atoms takes the place of another.

❖ **Some Important Carbon Compounds**

ETHANOL C_2H_5OH:

Properties of ethanol is as follows –

- **Physical Properties of Ethanol**

✓ Ethanol is colourless.

✓ It is liquid at room temperature.

✓ Ethanol mixes with water quite well.

✓ Ethanol is a combustible material. It produces CO_2, water vapour, heat and light when it is burnt in the presence of oxygen.

✓ Ethanol, when oxidised with monatomic oxygen, gives ethanoic acid.

- **Chemical properties of Ethanol**

▪ **Dehydration**: Intramolecular dehydration: Ethanol, when heated with excess conc. H_2SO_4 at 443K undergoes intramolecular dehydration (i.e. removal of water from a molecule of ethanol) to give ethene (unsaturated hydrocarbon).

$CH_3CH_2OH \xrightarrow{\text{hot conc.}H_2SO_4} CH_2{=}CH_2{+}H_2O$

▪ **Reaction with sodium:** Ethanol reacts with sodium metal to form sodium ethoxide and hydrogen gas.

$2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2\uparrow$

▪ **Oxidation:** Ethanol is oxidized to ethanoic acid with alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$. During this reaction, the orange colour of $K_2Cr_2O_7$ changes to green. Therefore, this reaction can be used for the identification of alcohols.

$CH_3CH_2OH_2 \xrightarrow{\text{Alkaline KMnO4/ Acidified K2Cr2O7+Heat}} CH_3COOH$

▪ **Esterification:** Ethanol reacts with Ethanoic acid in the presence of conc. H_2SO_4 to form ethyl ethanoate and water. The compound formed by the reaction of an alcohol with carboxylic acid is known as an ester (a fruity smelling compound used as perfumes) and the reaction is called esterification.

$C_2H_5OH + CH_3COOH \xrightarrow{\text{conc.H2SO4}} CH_3COOC_2H_5 + H_2O$

Ethanoic Acid (Acetic Acid) CH_3COOH:

- **Physical Properties of Ethanol:**

✓ Ethanoic acid, commercially known as acetic acid belongs to a group of acids called carboxylic acid.

- ✓ 5-8% solution of acetic acid in water is called **vinegar** and is used widely as a preservative in pickles.
- ✓ The melting point of pure ethanoic acid is 290 K and hence it often freezes during winter in cold climates.
- ✓ This gave rise to its name **glacial acetic acid**.

- **Chemical properties:**
- **Reaction with a base:**

$2CH_3COOH + 2NaOH \rightarrow 2CH_3COONa + H_2O$

- **Reaction with carbonates and bicarbonates:**

a. $2CH_3COOH + Na2CO_3 \rightarrow 2CH_3COONa + CO_2 + H_2O$

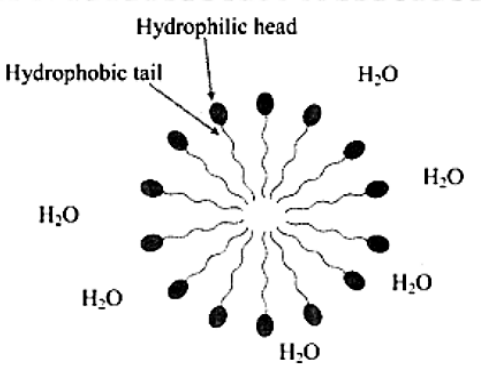
b. $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2$

- **Reaction with alcohol:** (Esterification) Esters are most commonly formed by reaction of an acid and an alcohol. Esters react with a base to give back the alcohol and sodium salt of carboxylic acid (Saponification)

$CH_3COOC_2H_5 \xrightarrow{NaOH} C_2H_5OH + CH_3COONa$

❖ **Soaps and Detergents:** Hardness of water needs the use of detergent

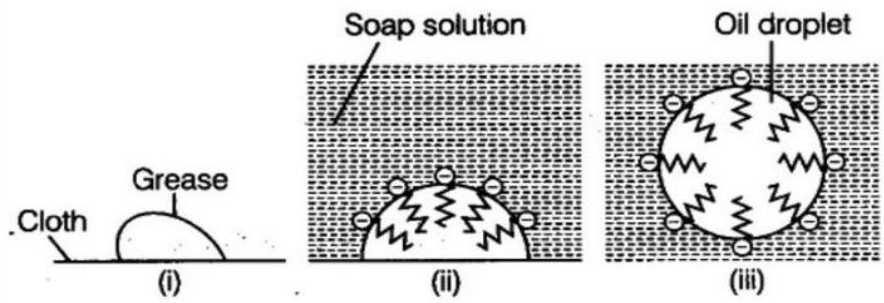
- **Soaps:** Soaps are sodium or potassium salts of long chain acid carboxylic acids.
- **Detergent:** Detergents are sodium salts of sulphonic acids or ammonium salts with chlorides or bromides ions
- **Scum:** an insoluble substance (scum) remains after washing with water. This is caused by the reaction of soap with the calcium and magnesium salts, which cause the hardness of water.



Soap micelle in water

(Source: https://ncert.nic.in/textbook/pdf/jesc104.pdf)

❖ **The mechanism of the cleaning action of soaps:** The dirt present on clothes is organic in nature and insoluble in water. Therefore, it cannot be removed by only washing with water. When soap is dissolved in water, its hydrophobic ends attach themselves to the dirt and remove it from the cloth. Then, the molecules of soap arrange themselves in micelle formation and trap the dirt at the centre of the cluster. These micelles remain suspended in the water. Hence, the dust particles are easily rinsed away by water.



(i) Grease or oil on surface of cloth.

(ii) Stearate ions arranged around the grease or oil droplet.

(iii) Grease or oil droplet surrounded by stearate ions (ionic micelle formed)

CARBON COMPOUNDS

NOMENCLATURE: A set of rules were developed for naming organic compounds based on their structures. The IUPAC name of organic compounds consists of three parts.

Number of Carbons	Name
1	**meth**ane
2	**eth**ane
3	**prop**ane
4	**but**ane
5	**pent**ane
6	**hex**ane
7	**hept**ane
8	**oct**ane
9	**non**ane
10	**dec**ane
11	**undec**ane
12	**dodec**ane

- Alkane- All single bond
- Alkene- At least one double bond
- Alkyne- At least one triple bond

Chain-Aliphatic
Ring: Cyclo/Aromatic
Branch: Iso

Functional groups

Functional group	Prefix	Suffix
carboxylic acids	none	-oic acid
aldehydes	none	-al
ketones	none	-one
alchols	hydroxy-	-ol
fluorine	fluoro-	none
chlorine	chloro-	none
bromine	bromo-	none
iodine	iodo-	none

- ✓ **Common name:** Carbon
- ✓ **Atomic Number: 6**
- ✓ **Atomic weight: 12.01**
- ✓ **Isomers: C12, C13, C14**
- ✓ **Valency: 4**
- ✓ **Bond: Covalent Bond**
- ✓ **Allotypes: Diamond, Graphite, Fullerene**

VERSATILE NATURE OF CARBON

- ✓ **Catenation**
- ✓ **Long Branch Chain Compound formation**
- ✓ **Four Covalent bond formation**
- ✓ **Wide range of bonding**
- ▪ **Single covalent bond: C-C, H-H**
- ▪ **Double Covalent bond: C=C, O=O**
- ▪ **Triple Covalent bond: C≡C, N≡N**

Homologous series:
A series of compounds with same functional group substitutes hydrogen in a carbon chain is called a homologous series.

Physical and Chemical Properties

- **ETHANOL**
- **ETHANOIC ACID**

Saturated & unsaturated hydrocarbons: Electron dot structure, Branches, chain, & rings, nomenclature

Soaps & detergents

- ❖ **Structure**
- ❖ **Advantage of detergent and Soap**
- ❖ **Cleansing process of soap**

- ✓ **Combustion**
- ✓ **oxidation**
- ✓ **Addition**
- ✓ **Substitution**

ESTERIFICATION

$$C_2H_5OH + CH_3COOH \xrightarrow{conc.H_2SO_4} CH_3COOC_2H_5 + H_2O$$

CHAPTER 5

LIFE PROCESSES

CONTENTS *(reference: CBSE SYLLABUS – 2024)*

❖ Life processes: 'Living Being'
❖ Basic concept of

- Nutrition
- Respiration
- Transport in plants and animals
- Excretion in plants and animals

❖ LIFE PROCESSES

- All physiological processes required by an organism to survive.
- In unicellular organisms, all these processes are carried out by a single cell, where as in multicellular organism life processes occur in various specialized body parts.

❖ **NUTRITION:** The process, by which an organism takes food and utilizes it, is called nutrition. Nutrition is obtained through nutrients-Carbohydrates, fats, proteins, minerals and vitamins

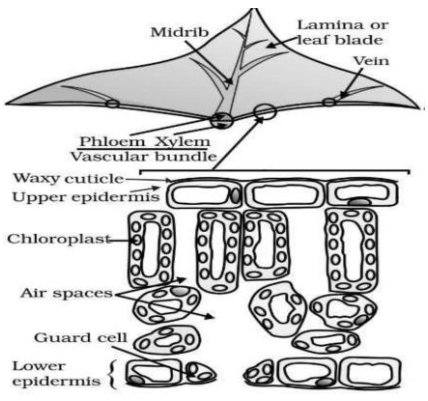
❖ NUTRITION IN PLANTS: AUTOTROPHIC NUTRITION

- Organisms prepare its own food by a process called photosynthesis. Green plants and blue-green algae make their food by photosynthesis.
- Photosynthesis is a photochemical reaction.
- Photosynthesis is an oxidation- reduction reaction in which carbon dioxide is reduced to sugar and water is oxidized.
- Chloroplast is the site of photosynthesis in leaves.
- Stoma helps in exchange of gases.
- Raw materials for photosynthesis- CO2 and H2O.
- Essential requirements- chlorophyll and sunlight
- Products - Glucose and O2.

Equation of photosynthesis

$$6CO_2 + 12H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} \underset{\text{(Glucose)}}{C_6H_{12}O_6} + 6O_2 + 6H_2O$$

(Source- https://ncert.nic.in/textbook.php?jesc1=5-13)



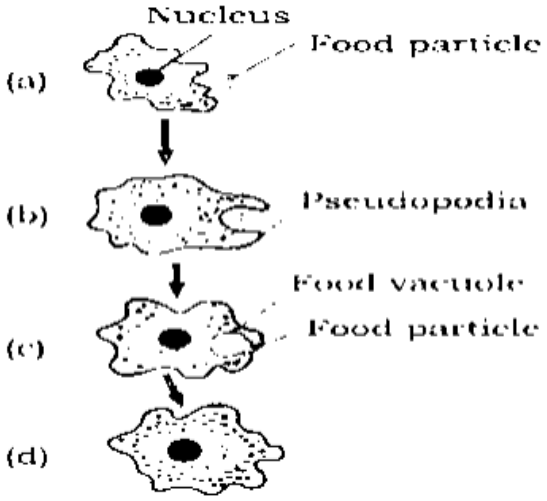
Cross-section of a leaf

❖ **Events occur during photosynthesis**

- Absorption of light energy by chlorophyll.
- Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.
- Reduction of carbon dioxide to carbohydrates.

❖ **NUTRITION IN ANIMALS: HETEROTROPHIC NUTRITION**

- Nutrition is obtained by the organism from other living organism (parasite) e.g. or dead and decaying objects (saprophyte) e.g. Fungi like bread moulds, yeast and mushrooms or by taking in the entire food inside the body (holozoic).
- **Nutrition in amoeba:** Amoeba captures food with the help of pseudopodia, forms a food vacuole with the food particle within it. Inside the food vacuole digestion take place and the digested material, is then diffused into the cytoplasm. The undigested material is moved to the surface of the cell and thrown out.
- **Nutrition in Paramecium:** Paramecium is another unicellular organism; the cell has a definite shape and food is taken in at a specific spot. Food is moved to this spot by the movement of cilia present on the entire body surface.



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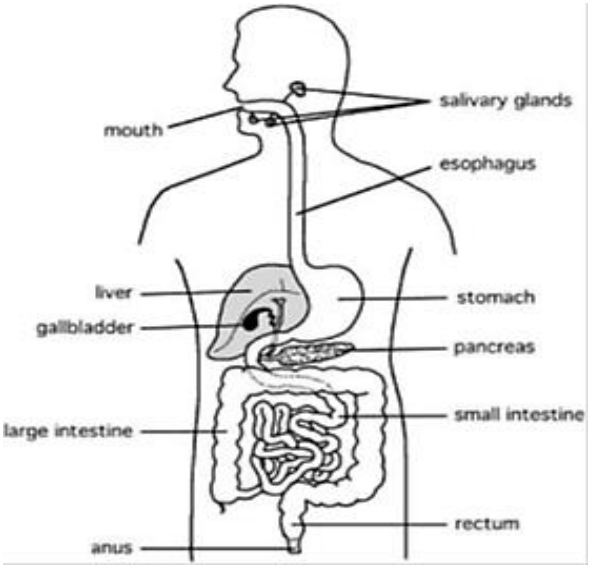
❖ **NUTRITION IN HUMAN BEING: Human has digestive system for nutrition. It also known as alimentary canal.**

- Alimentary canal - Alimentary canal is a tubular structure from mouth to anus. Three glands function along with different parts of alimentary canal.

Buccal cavity & salivary glands	• Food is crushed and mixed with saliva with the help of teeth and tongue. • Saliva present in the salivary glands contains salivary amylase, an enzyme that break down starch (digestion starts in the mouth).
Oesophagus	• Peristaltic movement (Rhythmic movement muscles in oesophagus) pushing the food towards stomach.

Stomach	• A large sac like structure. • Gastric gland present in the wall of stomach secretes HCl, pepsin, mucus. • HCl kill the germs in food and make the food acidic medium, which is essential for pepsin to digest proteins in the food. • Mucus protects the inner lining of alimentary canal by HCl.
Small Intestine	• It is the longest and coiled tube and it receives secretions of liver and pancreas through a common duct. • It is site for complete digestion of food and converts carbohydrates to glucose, proteins to amino acids and fats to fatty acid and glycerol. • Villi on the inner walls of small intestine have small finger like projections that increase the surface area for absorption of digested food.
Liver	• Produce bile juice and store it in the gall bladder. Bile juice • make the medium alkaline for enzymes of the pancreatic juice Break • the fat molecules into smaller parts (emulsification)
Pancreas	• Pancreatic juice has enzymes- Trypsin to digest protein and Lipase digest lipid.
Large intestine	• Unabsorbed food enters into large intestine for further absorption • of water. The undigested food is removed from body via anus.

(Source- https://crispindia.net/assets/files/study/Class%2010_Bio_Structured%20LP%20Book.pdf)

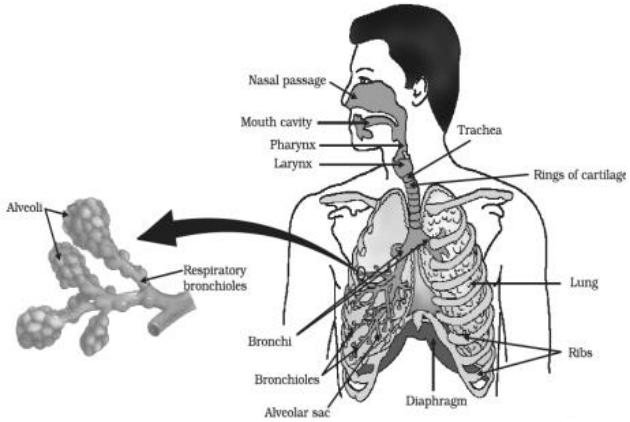


❖ RESPIRATION

1. Aerobic respiration	occurs in presence of oxygen	Cytoplasm and Mitochondria	• Glucose is broken down into pyruvate in cytoplasm of cell • In presence of oxygen pyruvate enters into mitochondria and completely oxidized there to produce CO2 and energy (ATP).
2. Anaerobic respiration	occurs in absence of oxygen	Cytoplasm	• In absence of oxygen pyruvate partially decomposes and form • Lactic acid in tired muscle cells
3. Anaerobic respiration (fermentation)	Occur in few microorganisms like Yeast	Cytoplasm	• In absence of oxygen pyruvate partially decomposes and form ethanol in yeast.

❖ Human respiratory system:

- Consists of nostrils, nasal passage, pharynx, larynx, trachea, bronchi, bronchioles, alveoli, diaphragm and ribcage.
- When we breathe in air through nostrils, from nostril air passes through the pharynx, larynx, trachea, bronchi, bronchioles and finally alveoli.
- When we breathe in air ribs are lifted with the flattening of the diaphragm, thereby the chest cavity increases and the air is sucked into the alveoli.
- Exchange of gases takes place at alveoli by diffusion. The blood brings carbon dioxide from the rest of the body to go into the alveoli and the oxygen in the alveolar air is taken up by blood to be transported to all the cells in the body.
- During the breathing cycle, when air is taken in and let out, the lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and for the carbon dioxide to be released.
- An iron containing haemoglobin (present in RBC) is the respiratory pigment that takes up oxygen from the air in the lungs and carries it to tissues which are deficient in oxygen as it has a very high affinity for oxygen. Carbon dioxide is more soluble in water than oxygen is and hence is mostly transported in the dissolved form in our blood.



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❖ RESPIRATION IN PLANTS

- They have stomata (present in leaves) and lenticels (present in stems) which are involved in the exchange of gases by diffusion.
- At night, CO2 elimination is the major exchange activity going on.
- During the day, CO2 generated during respiration is used up for photosynthesis; hence oxygen release is the major event at this time.

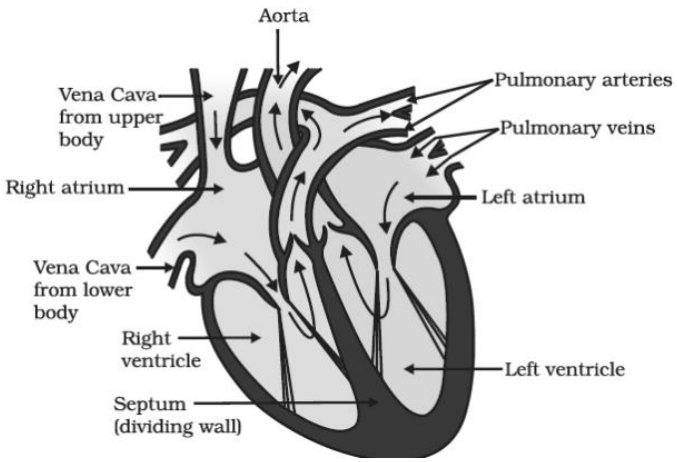
❖ TRANSPORTATION IN HUMAN BEING:

IMPORTANT TERMS

• Blood	• A type of connective tissue consists of RBC, WBC, Platelets and plasma.
• Plasma	• Fluid portion of blood
• Systole	• Contraction of heart chambers
• Diastole chambers	• Relaxation of heart
• Double circulation	• Blood goes through the heart twice
• Arteries	• Thick walled. elastic, Carry blood away from heart to various organs
• Veins	• Thin walled, carry blood from different organs to the heart
• Platelets	• Helps in blood clotting during injury.
• Lymph / Tissue fluid	• Fluid in intercellular space in the tissues. They carry digested and absorbed fat.
• Sphygmomanometer	• Measures blood pressure

❖ HUMAN HEART:

- Human heart is four chambered – two atria and two ventricles. Amphibians have three chambered heart, Fish – two chambered heart. The septum separates separation of the right side and the left side of the heart is useful to keep oxygenated and deoxygenated blood from mixing. Birds and mammals hat have high energy needs to maintain their body temperature constant. Amphibians or many reptiles have three-chambered hearts, and tolerate some mixing of the oxygenated and de-oxygenated blood streams as they do not use energy for this purpose, the body temperature depends on the temperature in the environment. Fishes, have only two chambers to their hearts, blood goes only once through the heart in the fish during one cycle of passage through the body.
- Right atrium and right ventricle contain deoxygenated blood while left atrium and left ventricle contains oxygenated blood.
- Oxygenated blood from lungs enters in left atrium via pulmonary veins. When the left atrium contracts the blood enters to left ventricle.
- The blood goes outside to different parts of body via aorta when left ventricle contracts.
- From different part of body deoxygenated blood is carried out by vena cava to the right atrium. When right atrium contracts the blood enters into right ventricle.
- The deoxygenated blood goes to the lungs through pulmonary arteries when right ventricle contracts.



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❖ TRANSPORTATION IN PLANTS

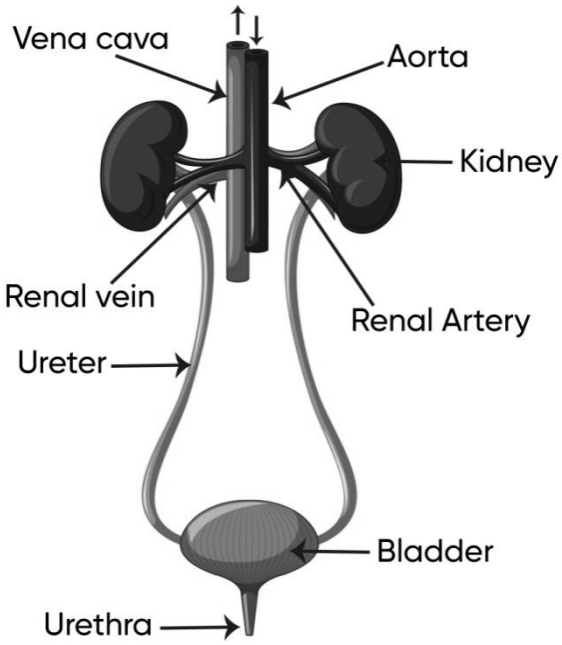
• Stomata	• Gaseous exchange, Transpiration
• Xylem	• Xylem tissue- vessels and tracheids. • Transport water and mineral from root to aerial part (unidirectional)
• Phloem	• Transport food from the leaves to other part (multidirectional).

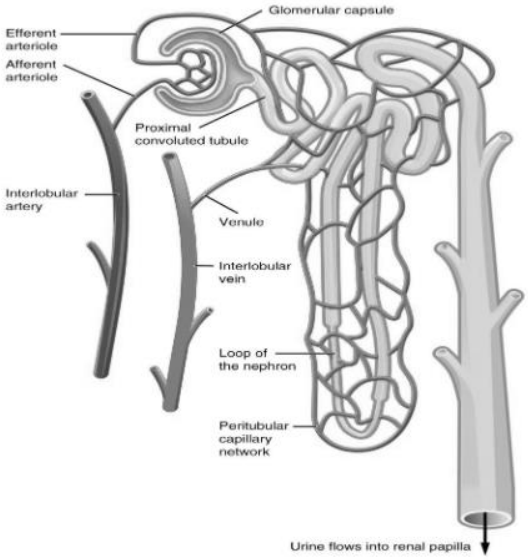
❖ EXCRETION IN PLANTS:

- Stomata remove O2 in photosynthesis, CO2 in respiration and water vapour in transpiration.
- Some waste products are removed as resin, gums, latex etc. They get stored in leaves, bark etc and fall off upon shedding.

❖ EXCRETION IN HUMAN BEING

- Basic filtration unit in kidneys are tuft of thin walled capillaries called glomerulus in cup like structure called Bowman's capsule where ultrafiltration takes place and filtered urine is collected here.
- There is reabsorption of glucose, amino acids, salts and water in tubules of nephrons. The final urine gets collected in the collecting duct where amount of water to be excreted is decided. The concentrated urine enters the urinary bladder via ureter and finally passes outside the body through urethra.





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(credit: https://crispindia.net/assets/files/study/Class%2010_Bio_Structured%20LP%20Book.pdf)

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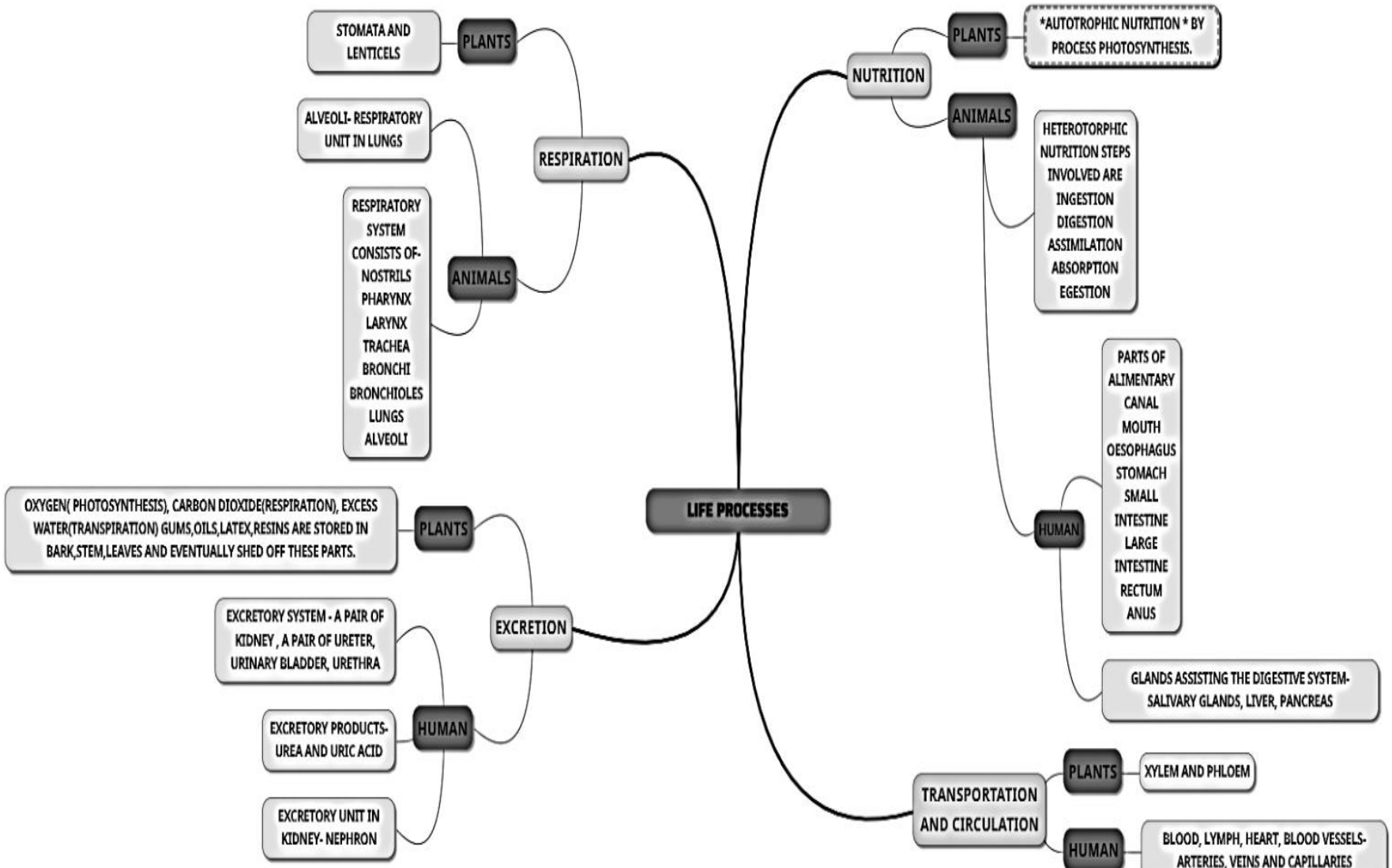

LIFE PROCESSES
RESPIRATION
PLANTS
STOMATA AND LENTICELS
ANIMALS
ALVEOLI- RESPIRATORY UNIT IN LUNGS
RESPIRATORY SYSTEM CONSISTS OF-
NOSTRILS
PHARYNX
LARYNX
TRACHEA
BRONCHI
BRONCHIOLES
LUNGS
ALVEOLI
EXCRETION
PLANTS
OXYGEN(PHOTOSYNTHESIS), CARBON DIOXIDE(RESPIRATION), EXCESS WATER(TRANSPIRATION) GUMS,OILS,LATEX,RESINS ARE STORED IN BARK,STEM,LEAVES AND EVENTUALLY SHED OFF THESE PARTS.
HUMAN
EXCRETORY SYSTEM - A PAIR OF KIDNEY , A PAIR OF URETER, URINARY BLADDER, URETHRA
EXCRETORY PRODUCTS- UREA AND URIC ACID
EXCRETORY UNIT IN KIDNEY- NEPHRON
NUTRITION
PLANTS
*AUTOTROPHIC NUTRITION * BY PROCESS PHOTOSYNTHESIS.
ANIMALS
HETEROTORPHIC NUTRITION STEPS INVOLVED ARE
INGESTION
DIGESTION
ASSIMILATION
ABSORPTION
EGESTION
HUMAN
PARTS OF ALIMENTARY CANAL
MOUTH
OESOPHAGUS
STOMACH
SMALL INTESTINE
LARGE INTESTINE
RECTUM
ANUS
GLANDS ASSISTING THE DIGESTIVE SYSTEM- SALIVARY GLANDS, LIVER, PANCREAS
TRANSPORTATION AND CIRCULATION
PLANTS
XYLEM AND PHLOEM
HUMAN
BLOOD, LYMPH, HEART, BLOOD VESSELS- ARTERIES, VEINS AND CAPILLARIES

CHAPTER 6

CONTROL AND COORDINATION

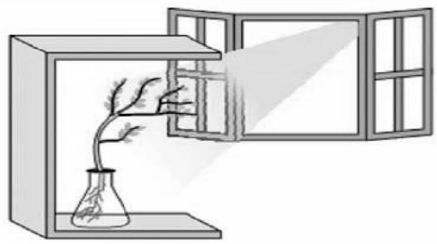
CONTENTS (reference: CBSE SYLLABUS – 2024)

- **Tropic movements in plants**
- **Introduction of plant hormones**
- **Control and co-ordination in animals: Nervous system; Voluntary, involuntary and reflex action**
- **Chemical co-ordination: animal hormones.**
- **Movements are shown by organisms in response to stimuli.**

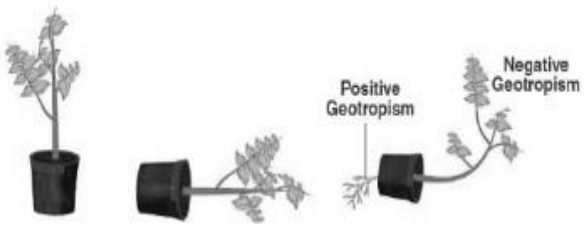
- **Types of tropic movements** In plants movements are growth dependent and growth independent. They are also under the control phytohormones.

• Phototropism	Light is the stimulus	Towards – positive phototropism	Away from the light- negative phototropism
• Geotropism	Earth is the stimulus	Towards – positive geotropism	Away from the light- negative geotropism
• Hydrotropism	Water is the stimulus	Towards – positive hydrotropism	Away from the light- negative hydrotropism
• Chemotropism	Chemicals are the stimulus	Towards – positive chemotropism	Away from the light- negative chemotropism

PHOTOTROPISM



GEOTROPISM



- **CHEMICAL COORDINATION IN PLANTS – Plant hormones / Phytohormones/ Plant growth regulators**

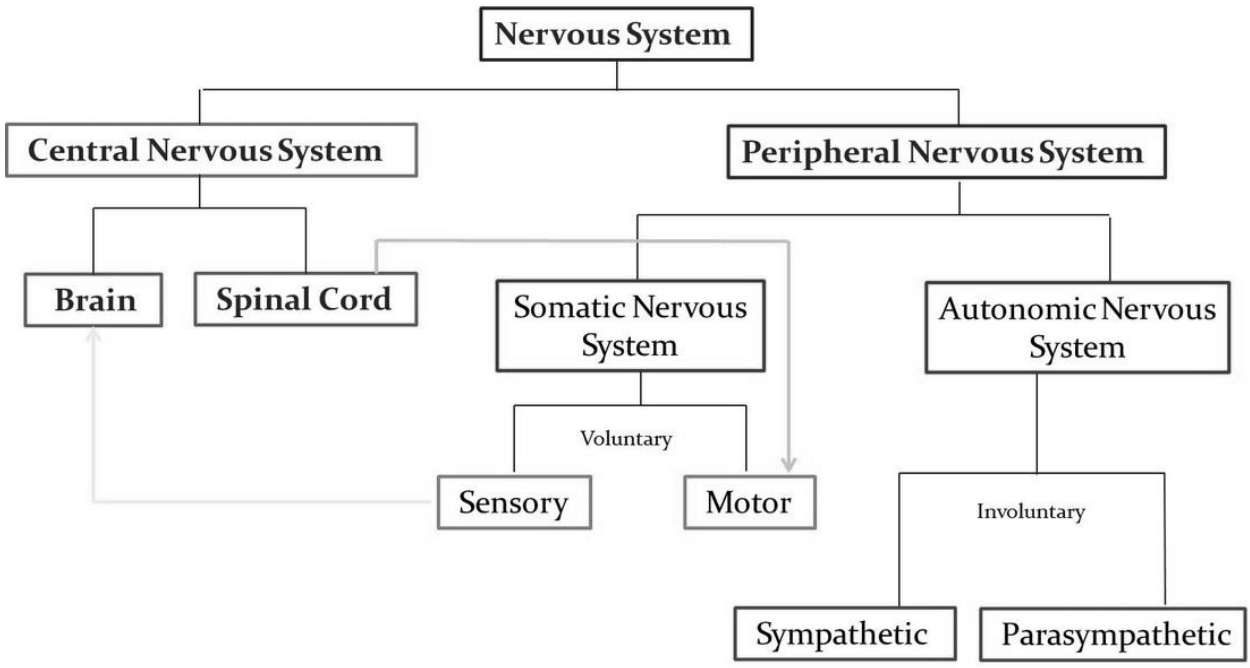
- They are the chemical compounds regulating plant growth and development.
- These are synthesized in less quantity in one part of plant body and transported to other part where they perform specific physiological processes.
- Different phytohormones and their **functioning** in plants are

PLANT HORMONE	ACTION
a) Auxin	• Growth promoter • Stem elongation • Root growth • Apical dormancy • Photo tropism
b) Gibberellins	• Growth promoter • Growth of Stem • Cell elongation
c) Cytokinin	• Growth promoter • Shoot and branch growth • Cell division
d) Abscisic acid	• Growth inhibitor • Wilting of leaves
e) Ethylene	• Growth inhibitor • Ripening of fruits

❖ **CONTROL AND CO-ORDINATION IN ANIMALS:** In man the responses are coordinated and controlled by the nervous, muscular and endocrine systems.

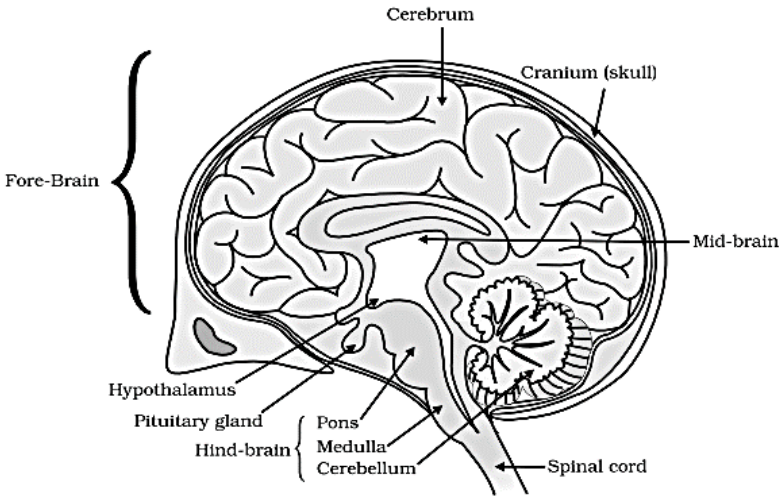
❖ **HUMAN NERVOUS SYSTEM:** One of the most complex organ systems to ever evolve, the human nervous system consists of two parts, namely:

- Central Nervous System (consists of the brain and spinal cord)
- Peripheral Nervous System (includes all the nerves of the body)



❖ **CENTRAL NERVOUS SYSTEM (CNS)** is often called the central processing unit of the body. It consists of the brain and the spinal cord. The brain and spinal cord constitute the central nervous system. They receive information from all parts of the body and integrate it.

- Brain: The brain is one of the important, largest and central organs of the human nervous system. It is the control unit of the nervous system, which helps us in discovering new things, remembering and understanding, making decisions, and a lot more.
- The brain is protected by cranium (bony box). Inside the box, the brain is contained in a fluid-filled balloon which provides further shock absorption. The vertebral column or backbone which protects the spinal cord. The brain and spinal cord both are cushioned by 3 layers of membranes (called meninges) and cerebrospinal fluid, which provides frontal, lateral and dorsal protection. The human brain is composed of following major parts-



a) **Forebrain**: The anterior part of the brain consists of Cerebrum, Hypothalamus and Thalamus.

Function: Cerebrum a part of the largest part of the fore brain and is responsible for reasoning, memory, visual processing, emotions, speech, recognition of auditory and taste stimuli, etc. It initiates voluntary actions.

b) **Midbrain**: The smaller and central part of the brainstem consists of Tectum and Tegmentum.

Function: Mid brain is the centre for visual and auditory reflexes. Many involuntary actions are controlled by coordination of mid brain and hind brain.

c) **Hindbrain**: The central region of the brain composed of Cerebellum, Medulla and Pons.

Function: Cerebellum is responsible for precision of voluntary actions and maintaining the posture and balance of the body. Pons relays signals from the hindbrain to the forebrain. It also takes care of the functions like sleep, respiration, facial sensation etc.

Note:

✓ Medulla Oblongata controls all involuntary movements like vomiting, sneezing, yawning, heartbeat, breathing, blood pressure, etc and continues as the spinal cord.

✓ The brain and spinal cord constitute the central nervous system. They receive information from all parts of the body and integrate it. The communication

between the central nervous system and the other parts of the body is facilitated by the peripheral nervous system consisting of cranial nerves (12 pairs) arising from the brain and spinal nerves (31 pairs) arising from the spinal cord.

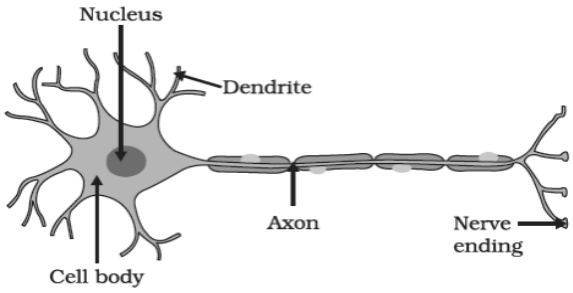
❖ **PERIPHERAL NERVOUS SYSTEM (PNS)** is the lateral part of the nervous system that develops from the central nervous system which connects different parts of the body with the CNS. We carry out both voluntary and involuntary actions with the help of peripheral nerves. PNS includes two types of nerve fibers:

- Afferent nerve fibers – These are responsible for transmitting messages from tissues and organs to the CNS.
- Efferent nerve-fibers – These are responsible for conveying messages from CNS to the corresponding peripheral organ.

❖ **Classification of the peripheral nervous system:**

- Somatic neural system (SNS): It is the neural system that controls the voluntary actions in the body by transmitting impulses from CNS to skeletal muscle cells. It consists of the somatic nerves.
- Autonomic neural system (ANS): The autonomic neural system is involved in involuntary actions like regulation of physiological functions (digestion, respiration, salivation, etc.). It is a self-regulating system which conveys the impulses from the CNS to the smooth muscles and involuntary organs (heart, bladder and pupil).

❖ **NEURON:** Nerve cell or neuron is the structural and functional unit of the nervous system in man. Each neuron is having: dendrites, cyton/cell body, axon and nerve ending.



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- Dendrites acquire information
- Information travels through axon as an electrical impulse
- At nerve ending this electrical impulse converts into a chemical signal for onward transmission.

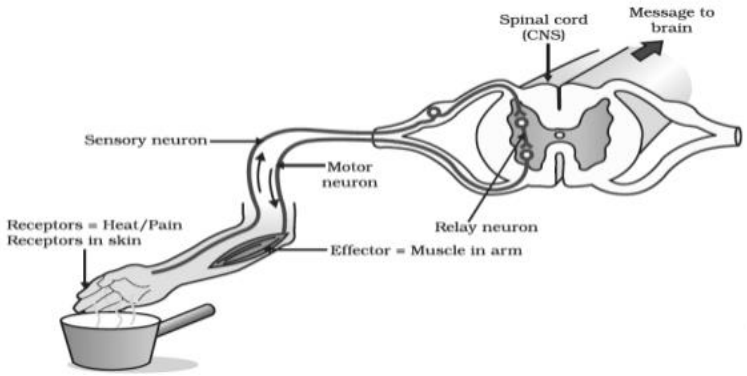
Note: How nervous impulse travels in the body?

- The stimuli is detected the specialised tips of some nerve cells usually called receptors usually located in our sense organs, such as the inner ear, the nose, the tongue, and so on. (gustatory receptors will detect taste while olfactory receptors will detect smell)
- This information, acquired at the end of the dendritic tip of a nerve cell sets off a chemical reaction creating an electrical impulse.

- This impulse travels from the dendrite to the cell body, and then along the axon to its end.
- At the end of the axon, the electrical impulse sets off the release of some chemicals. These chemicals cross the gap, or synapse, and start a similar electrical impulse in a dendrite of the next neuron. This is a general scheme of how nervous impulses travel in the body.
- Similar synapse finally allows delivery of such impulses from neurons other cells, such as muscles cells or gland

❖ **REFLEX ACTION:** A spontaneous sudden, involuntary reaction of the body as a response to stimuli from the surroundings.

❖ **REFLEX ARC:** Reflex arc is the path followed by an electrical impulse during a reflex action.



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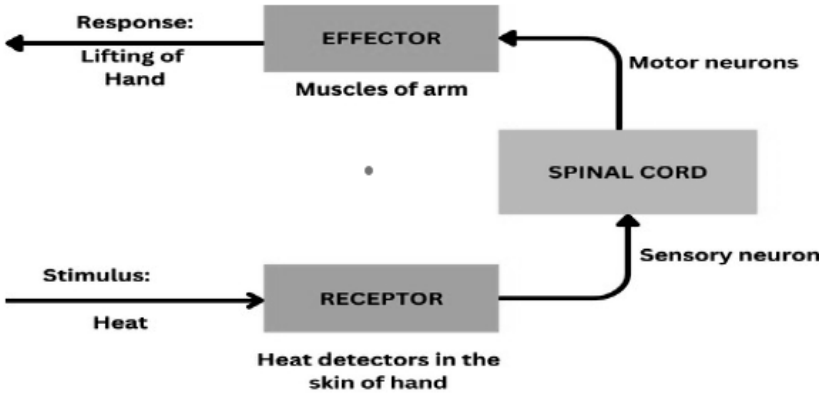

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❖ **HORMONE IN ANIMALS:** "Hormones are chemicals synthesized and produced by the specialized glands to control and regulate the activity of certain cells and organs. The specialized secretary glands are known as endocrine glands."

To regulate various functions, different types of hormones are produced in the body. They are classified as follows:

- Peptide Hormones: Peptide hormones are composed of amino acids and are soluble in water. Example: Insulin.

- Steroid Hormones: steroid hormones are fat-soluble and are able to pass through a cell membrane. Example: Sex hormones such as testosterone, estrogens and progesterone.

GLANDs	LOCATION	HORMONE	ROLEs	REMARKs
Pituitary	Located at the base of the brain.	Growth hormone	Regulate growth and development	• Also called **Master gland** as it controls the secretions of all the other endocrine glands. • Under-secretion causes Dwarfism. • Over-secretion causes Gigantism in children.
Thyroid	Thyroxin	located in the throat	Regulates carbohydrates, proteins and fats metabolism in the body.	• Iodine is required to synthesize thyroxin in the body. • Under-secretion of thyroxin leads to goitre.
Pancreas	Insulin	behind the stomach in the abdomen.	Regulate blood sugar level	• It is a dual gland that is works as both endocrines as well an exocrine gland. • Under secretion of insulin leads to diabetes.
Adrenal	adrenaline	Occurs in pairs one on above each kidney.	Stress hormone (enable the body to prepare in the stressed situation) Increasing, breathing rate.	• Adrenaline helps in flight and fights response so it is also called flight and flight hormone.
Testes	testosterone	Outside the abdominal cavity in male.	Take care of male secondary sexual characters.	• They are dual glands that are work as both endocrines as well exocrine glands.
Ovary	oestrogen	On either	Take care of	• They are dual glands that

		side of uterus in the lower abdomen.	female secondary sexual characters.	are work as both endocrines as well exocrine glands.

❖ **Movements are shown by ants in response to stimuli**

TROPIC MOVEMENTS	NASTIC MOVEMENTS
Growth dependent movement in the response to stimuli.	Growth independent movement in the response to stimuli.
Directional movement	Non-directional movement
Depends on the direction of the stimulus	Does not depends on the direction of the stimulus
Cell division is the reason for action	Change in the turgor pressure is the reason for action
Slow (Time taking)	Immediate (Real time response)
• Geotropism: Roots growing towards earth in response to water. • Phototropism: Shoot turns towards light • Chemotropism: Growth of pollen tube towards ovule.	• Thigmotropism: Drooping of leaves of 'Touch me not plant' on just touching it. • Internal response: Opening and closing of stomata.

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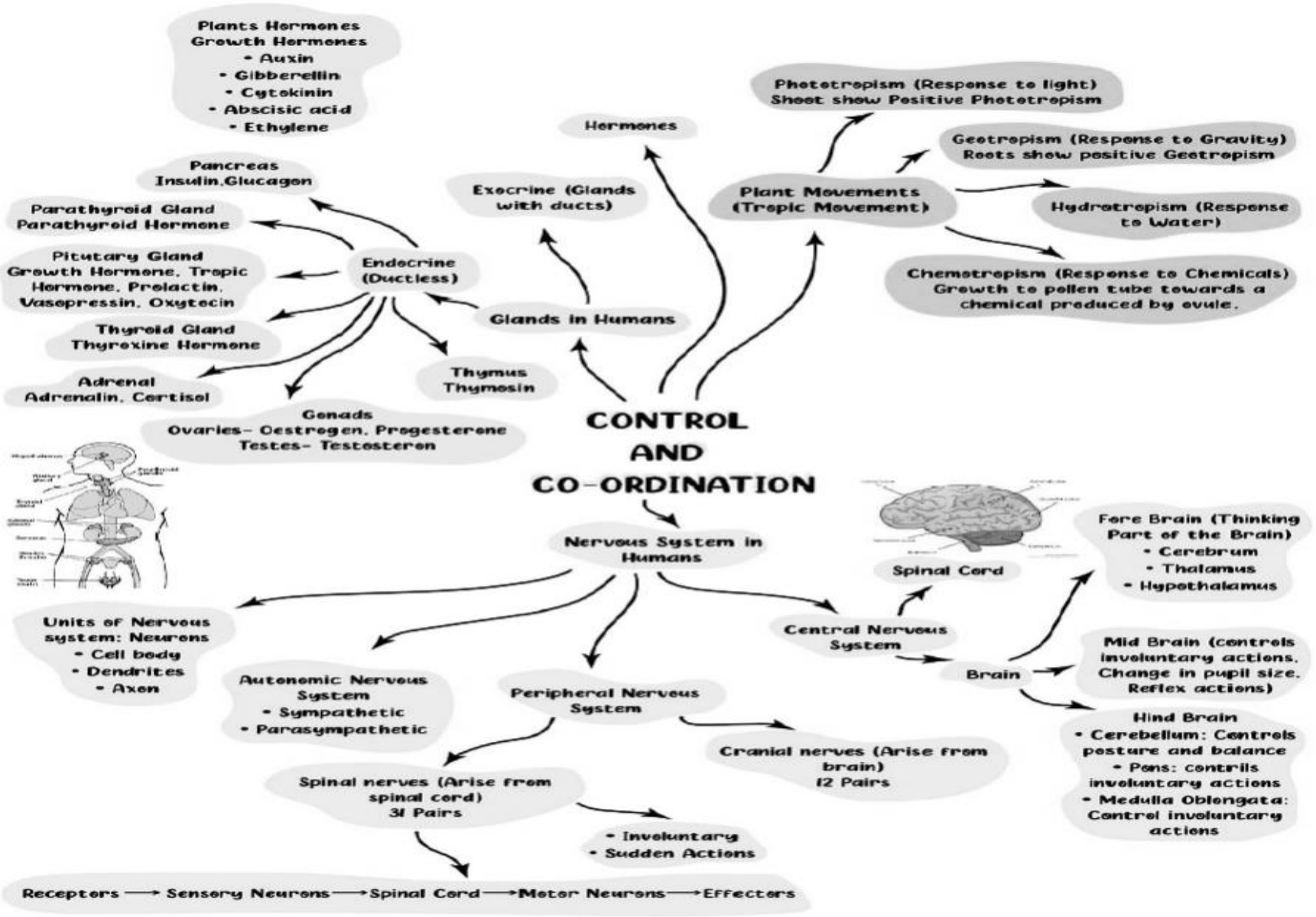
CONTROL AND CO-ORDINATION
Plants Hormones
Growth Hormones
• Auxin
• Gibberellin
• Cytokinin
• Abscisic acid
• Ethylene
Hormones
Exocrine (Glands with ducts)
Glands in Humans
Endocrine (Ductless)
Pancreas
Insulin,Glucagon
Parathyroid Gland
Parathyroid Hormone
Pituitary Gland
Growth Hormone, Tropic Hormone, Prolactin, Vasopressin, Oxytocin
Thyroid Gland
Thyroxine Hormone
Adrenal
Adrenalin, Cortisol
Thymus
Thymosin
Genads
Ovaries- Oestrogen, Progesterone
Testes- Testosteron
Plant Movements (Tropic Movement)
Phototropism (Response to light)
Shoot show Positive Phototropism
Geotropism (Response to Gravity)
Roots show positive Geotropism
Hydrotropism (Response to Water)
Chemotropism (Response to Chemicals)
Growth to pollen tube towards a chemical produced by ovule.
Nervous System in Humans
Units of Nervous system: Neurons
• Cell body
• Dendrites
• Axon
Autonomic Nervous System
• Sympathetic
• Parasympathetic
Peripheral Nervous System
Spinal nerves (Arise from spinal cord)
31 Pairs
• Involuntary
• Sudden Actions
Cranial nerves (Arise from brain)
12 Pairs
Receptors → Sensory Neurons → Spinal Cord → Motor Neurons → Effecters
Central Nervous System
Spinal Cord
Brain
Fore Brain (Thinking Part of the Brain)
• Cerebrum
• Thalamus
• Hypothalamus
Mid Brain (controls involuntary actions. Change in pupil size. Reflex actions)
Hind Brain
• Cerebellum: Controls posture and balance
• Pons: contrils involuntary actions
• Medulla Oblengata: Control involuntary actions

CHAPTER 7

HOW DO ORGANISMS REPRODUCE?

CONTENTS *(reference: CBSE SYLLABUS – 2024*)

- ❖ **Reproduction in animals and plants (asexual and sexual)**
- ❖ **Reproductive health - need and methods of family planning.**
- ❖ **Safe sex v/s HIV-AIDS.**
- ❖ **Child bearing and women's health.**

Reproduction: The production of new individuals of the same kind from the existing organisms is known as reproduction.

- Reproduction is necessary for continuation of same species.
- Reproduction helps in transferring genetic material from first generation to the next one and introducing variations in the population for better chances of survival.

✓ Variations: The differences of new individual from the parent give rise to variations in a species. Variations help the individuals to tolerate adverse changes in the environment for their survival.

✓ The DNA is the information source for making proteins in the nucleus of a cell. Any change in the information, different proteins will be made leading to altered body designs. Therefore, a basic event in reproduction is the creation of a DNA copy where cells use chemical reactions to build copies of their DNA.

- There are two modes of reproduction:

a) Asexual reproduction

b) Sexual reproduction

ASEXUAL REPRODUCTION	SEXUAL REPRODUCTION
Involves only one parent	Often involves two parents
Gametes are not produced.	Gametes are produced.
No fertilization takes place.	Male and female gametes fuse to form zygote. Thus fertilization takes place.
It involves mitosis	It involves meiosis

❖ **Asexual reproduction**: It is a mode of reproduction in which a new offspring is produced by a single parent. The new individuals produced are genetically and physically identical to each other so basically they are the clones of their parents.

- There are different types of asexual reproduction:

✓ Binary Fission

- ✓ Budding
- ✓ Fragmentation
- ✓ Vegetative Propagation
- ✓ Sporogenesis

- **Fission:** The word “fission” means “to divide”. If the parent cell divides into multiple progeny cells. The cell division patterns vary in different organisms, i.e., some are directional while others are non-directional. Fission can be two types based on the progeny counts-

- **Binary Fission:** When one parent cell split into two identical halves and form new individuals. In *leishmania* the binary fission occurs in a definite orientation. In amoeba it is non-definite orientation.

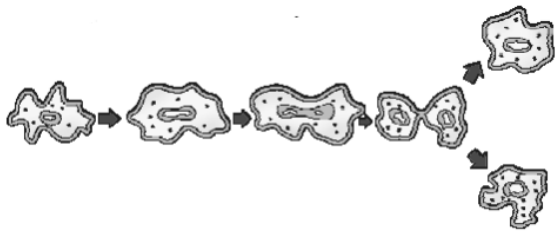

Figure 7.1(a) Binary fission in Amoeba

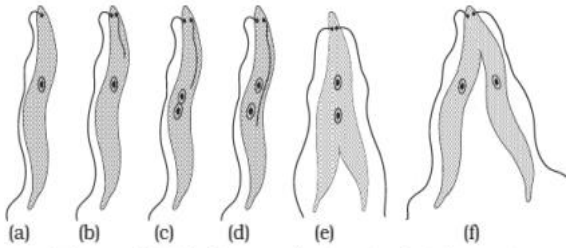

Figure 7.1(b) Binary fission in Leishmania

- **Multiple fission:** When one parent cell divides and splits internally to form a

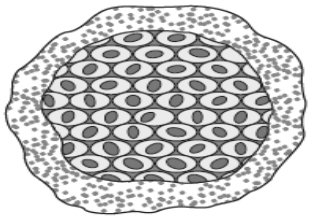

Figure 7.2
Multiple fission in Plasmodium

number of daughter cells, it is called multiple fission.

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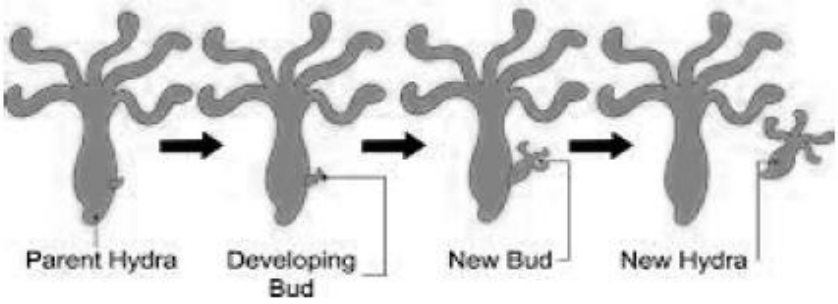
- **Budding:** Budding is the process of producing an individual through the buds that develop on the parent body. Hydra is an organism that reproduces by budding. The bud derives nutrition and shelter from the parent organism and detaches once it is fully grown.

- In Hydra, a bud develops as an outgrowth due to repeated cell division at one specific site, which further develops into tiny individuals and when fully mature, detach from the parent body and become new independent individuals.



- Bud may remain attached to the parent as seen in the yeast.

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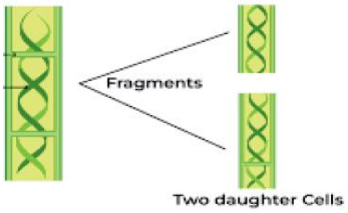
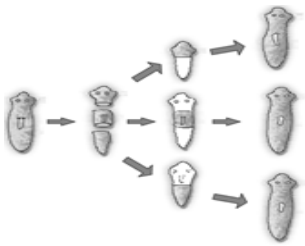
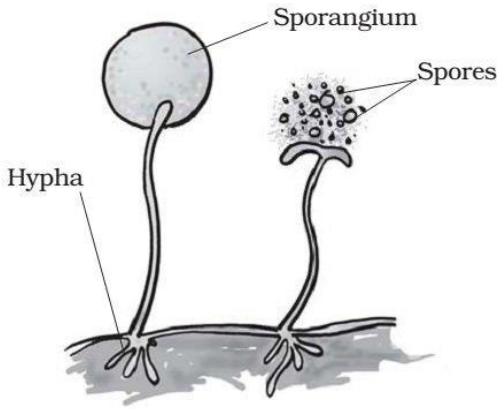
- **Regeneration and Fragmentation:**

REGENERATION	FRAGMENTATION
Type of asexual reproduction that takes place in multicellular organisms with simple body organisation.	Type of asexual reproduction that takes place in fully differentiated multicellular organisms with complex body organisation
An organism breaks into fragments and each fragment develops into new individual.	An organism if breaks into pieces by chance, and each piece may or may not develop into new individual.
Fragmentation is not carried out by specialised cells.	Regeneration is carried out by specialised cells (regenerative cells).
Example: Spirogyra	Example: Planaria, Hydra etc
 (Source: https://crispindia.net/assets/files/study/Class%209_Eng_Structured%20LP%20Book.pdf)	 (Source-https://ncert.nic.in/textbook.php?jesc1=7-13)

Spore formation: Spore formation is evolutionary developed mode of asexual reproduction. In unfavourable conditions, the organism develops sac-like structures called sporangium that contain spores. When the conditions turn into favourable, the sporangium burst opens and spores are released that germinate to give rise to new organisms.

- Fungus like Rhizopus (bread mould), Bacteria and non-flowering plants reproduce by this method. These organisms produce many microscopic reproductive units called spores in blob (sporangium). The spores are covered by thick walls that

protect them until favourable conditions appear for growth. Under favourable condition, they germinate to form new progeny organism.



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- **Vegetative propagation:** In plants occurs through their vegetative parts such as leaves, roots, stems, and buds. This is called vegetative propagation. For example, potato tubers, runners/stolon, onion bulbs, etc. This property of vegetative propagation is used in methods such as layering or grafting to grow many plants like sugarcane, roses, or grapes for agricultural purposes (artificial).

Advantage of vegetative propagation-

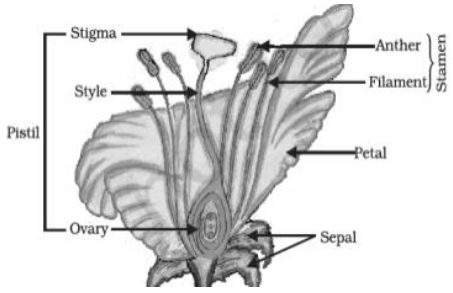
✓ Easy propagation flower production variety like Rose, Jasmine, Banana and Orange, which have lost the capacity to produce seeds.

✓ All plants produced are genetically similar enough to the parent plant.

✓ Tissue Culture **is used to** develop new plants from a cell or tissue in a nutrient medium under aseptic conditions.

❖ SEXUAL REPRODUCTION IN FLOWERING PLANTS

- The reproductive parts of angiosperms are located in the flower.
- Non-Essential parts of Flowers are sepals and petals.
- Sepals (calyx) protect the inner parts of the flower and petals(corolla) aid in attracting pollinating agents.
- Essential/ reproductive parts present in the flower are- stamen (androecium) and pistil (gynoecium). Stamen produce pollen grains bearing male gametes and pistil produce ovule/ egg cell.



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- The flower may be unisexual (papaya, watermelon) when it contains either stamens or pistil or bisexual (Hibiscus, mustard) when it contains both stamens and pistil.

❖ **POLLINATION:** The process of transfer of pollen grains from an anther to the stigma of the flower is called pollination. Pollination can be

- **Self-pollination:** The transfer of pollen grains from the anther to the stigma of the same flower or another flower of the same plant
- **Cross-pollination:** The transfer of pollen grains from the anther to the stigma of another flower or another flower of a different plant of the same species.

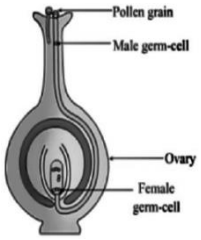
Note: Pollination generally takes place with the help of some agents like insects, birds, wind and water.

❖ **FERTILIZATION:**

- Pollination is followed by fertilization.
- Pollen grains land on the stigma of the ovary.
- Pollen tubes having male gametes grow and travel through the style and reach the ovary. Ovule has female gametes.
- Pollen tube releases 2 male gametes inside the ovule, one of which fuses with female germ cell and forms a zygote which grows into the baby plant i.e. embryo. Other gamete fuse with 2 polar nuclei to form endosperm.

❖ **POST FERTILIZATION CHANGES:**

- The ovule develops a tough coat and changes into the seed.
- The ovary grows rapidly and ripens to form a fruit.
- Zygote divides several times and forms an embryo inside the ovule.
    - Petals, sepals, stamens, style and stigma shrivel and fall off(Source-



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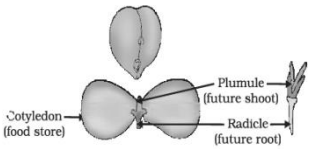

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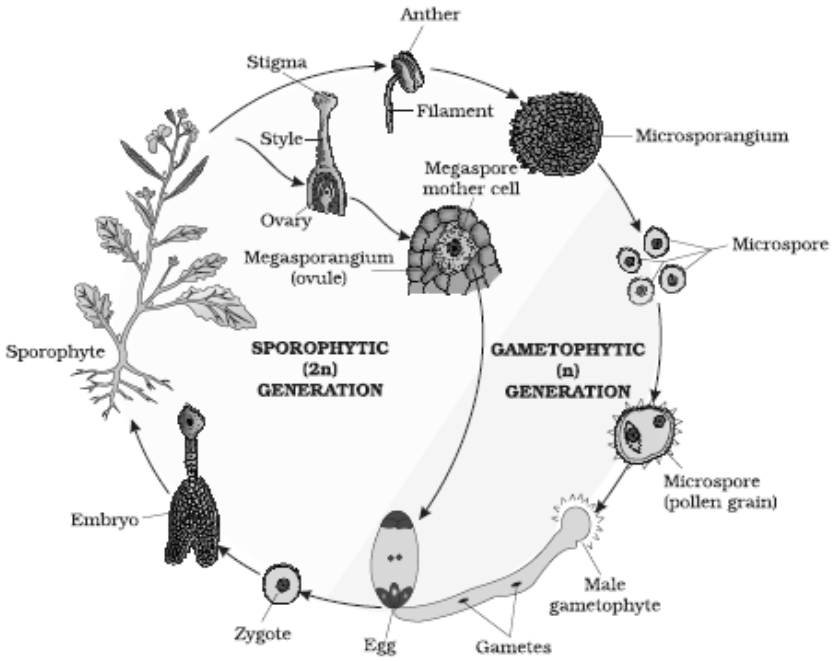
❖ **SEED AND ITS PARTS:**

- Cotyledons store food for the growing embryo.
- Embryo has two parts:

a) Plumule: develops into shoot

b) Radicle develops into root.

- The process of development of a new plantlet from the embryo is called germination.



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❖ **REPRODUCTION IN HUMAN BEING:** Human beings become reproductively active from the onset of puberty. Puberty is associated with changes secondary sexual characters Human has two gender with distinguish character to support –

○ **Male Reproductive System:**

- Male reproductive system consists of one pair of testes, sperm ducts or vas deferens, urethra, a system of glands-Seminal vesicles and prostate gland.
- The formation of germ-cells or sperms takes place in the testes located outside the abdominal cavity in scrotum because sperm formation requires a lower temperature than the normal body temperature.
- Testes secrete testosterone hormone which brings about changes in appearance seen in boys at the time of puberty in addition to the formation of sperms. The sperms formed are travel through the vas deferens. Vas deferens tube opens into a common tube called urethra.

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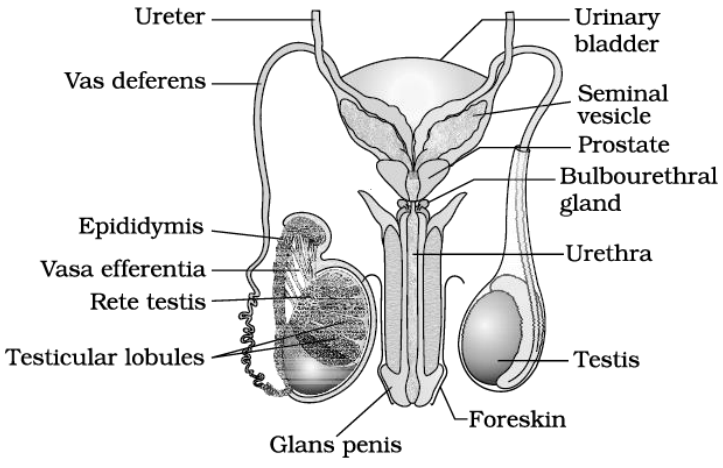
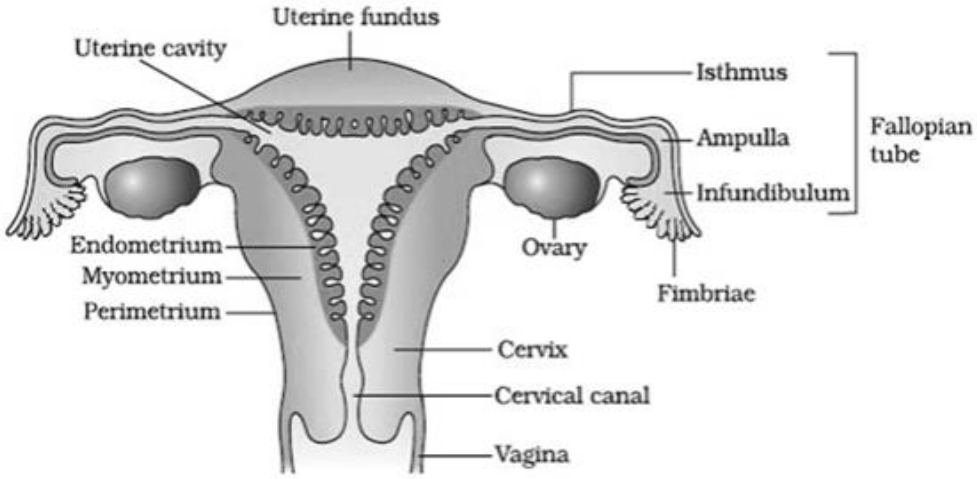


- It runs through a muscular organ called Penis.
- The urethra thus forms a common passage for both the sperms and urine glands like the prostate and the seminal vesicles add their secretions so that the sperms are now in a fluid which makes their transport easier and this fluid also provides nutrition.

- **Female Reproductive System:** It consists of ovaries, fallopian tube/oviduct, uterus, and vagina. A pair of ovaries is located in the abdominal cavity near the kidney. Ovaries produce female gamete (ovum or egg) and secrete female hormones estrogen. The egg is carried from the ovary to womb/uterus through a thin oviduct or fallopian tube. The two oviducts unite into an elastic bag like structure known as the uterus. Uterus opens into the vagina.
- **Sexual Cycle in female:** On the onset of puberty, only one egg is produced alternately from ovary after a period of 28 days. If fertilization takes place, then the fertilized egg (zygote) gets implanted in the lining of uterus which later forms embryo.
- Zygote divides repeatedly to from embryo which gets embedded in the uterine wall, this is called implantation**.** Embryo gets nutrition from the mother's blood with the help of special tissue called placenta.
- The uterus prepares itself every month to receive the fertilized egg. If the egg is not fertilized, the thick spongy uterine its lining slowly breaks down and comes out through the vagina as blood and mucus. This cycle takes place every month and is called as menstruation and it usually lasts for about 2-5 days.



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❖ **SEXUAL TRANSMITTED DISEASES (STD's):** The diseases can be transmitted from person to person due to a sexual act are called sexually transmitted diseases. These can be bacterial infections- gonorrhoea and syphilis viral infections - warts and HIV-AIDS. Here the best policy is 'Prevention is better than cure':

- Avoid unprotected sex
- Avoid sexual contacts with multiple partners
- Consult a qualified doctor for diagnosis and treatment.

❖ **Birth Control methods:** To control size of the growing population and prevent unwanted pregnancies, birth control methods are used. Prevention of pregnancy in women is called contraception.

- Birth control methods can be broadly categorised as:

✓ **Barrier methods**- In this method, physical devices such as condoms (for males) and diaphragm (for females) are used. These prevent meeting of sperm and egg by acting as a mechanical barrier and also protecting sexually transmitted diseases.

✓ **Chemical methods- oral pills** contain chemicals which stop the ovaries from releasing egg. These pills lead to side effects due to hormonal imbalance.

✓ **Intra-uterine contraceptive methods (IUCD)-** Copper-T used to prevent pregnancy, is inserted inside the uterus preventing the implantation of fertilized egg in uterus. They can cause side effects due to irritation of the uterus.

✓ **Surgical methods-** In this method a surgery operated of certain parts of the reproductive system is the surgical method of birth control. It can be performed on both males and females. They are as follows:

a) Vasectomy: A small portion of the vas deferens is cleaved, and the ends are tied in the males during vasectomy. It prevents the flow of sperm from the testis to the semen.

b) Tubectomy: A small part of the female fallopian tube is removed, and ends are tied with a nylon thread during tubectomy. It prevents the transport of the egg (released from the ovary) into the uterus.

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CHAPTER 8

HEREDITY

CONTENTS *(reference: CBSE SYLLABUS – 2024*)

- **Heredity**
- **Mendel's contribution- Laws for inheritance of traits**
- **Sex determination**

- **HEREDITY-** The transfer of characters (resemblances as well as differences) from one generation to next generation is called heredity.
- **VARIATION-** Several characteristics may differ in the individuals of the same species. These differences are termed variation. The cause can be due to small Iinaccuracies in DNA copying, mutation, influence of some environmental factors etc. Sexually reproducing organisms show great variations among themselves. A long-term accumulation of variation leads to evolution.
- **GREGOR JOHANN MENDEL'S CONTRIBUTION**

- Gregor Johann Mendel's known as father of genetics, discovered that individual traits are inherited as factors. These factors later came to be known as genes.
- Mendel proposed the principles of inheritance known as Mendel's Law.

a) The Law of Dominance

b) The Law of Segregation and

c) The Law of Independent Assortment.

- **Mendel chose the Garden Pea,** *Pisum sativum***, for his experiment since it had the following advantages.**

- Well defined contrast characters
- Bisexual flower
- Easy hybridization
- Easy to cultivate and relatively short life cycle
- Predominant self-fertilization.

- **Gene- A** gene is a functional unit of heredity made of DNA.
- **Allele-** Each gene may exist in alternative forms known as alleles.
- Each parent(diploid) has two alleles for a trait- they may be:

- Homozygous – indicating they possess two identical alleles for a trait.

a) Homozygous dominant (TT).

b) Homozygous recessive (tt)

- Heterozygous- Genotype possess one of each allele for a particular trait (Tt).

❖ GENOTYPE & PHENOTYPE

- **Genotype –** is defined as the genetic constitution of an individual for any particular character or trait.
- **Phenotype –** is defined as physical appearance of an individual for any particular Trait. An individual's phenotype depends on his/her genotype.

❖ **Dominant and Recessive Traits:** The traits that express themselves in an organism in homozygous or heterozygous condition are said to be dominant. For example: tall trait in pea plants tends to express more than the short trait. Therefore, the tall trait of the plant is said to be dominant over the short trait. Thus, the genotype can be written as TT; Tt.

❖ The trait that cannot be expressed in the presence of a dominant allele but can be expressed only in an organism when present in homozygous condition is said to be as recessive. For example: short trait in pea plants tends to express only in the absence of the taller allele when and the genotype can be written as tt (homozygous).

❖ ACQUIRED AND INHERITED TRAITS

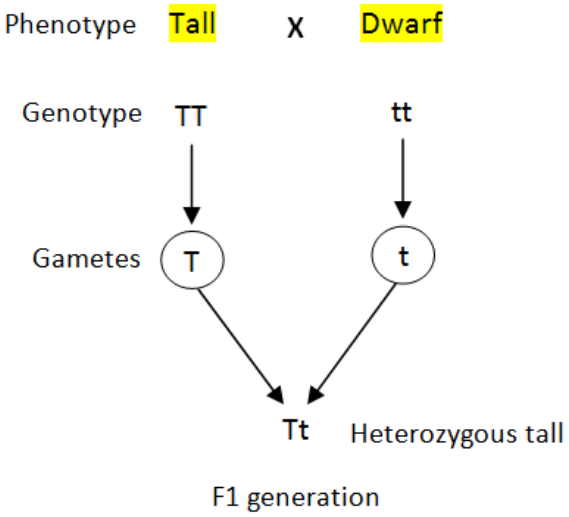
ACQUIRED TRAITS	INHERITED TRAITS
Traits acquired during one's life time.	Traits inherited from ancestors.
They do not pass on from one generation to another.	They pass on from one generation to another.
These traits are not present in the genetic makeup.	These traits are present in the genetic makeup.
Change in DNA will not bring about any change in such traits.	Change in DNA will bring about any change in such traits.

❖ How do these Traits get expressed?

- A section of DNA that provides information for one protein is called the gene for that protein.
- For example: for tallness of a plant, growth hormone is triggered. The amount of the plant hormone made will depend on the efficiency of the process for making it. If the concerned enzyme works more efficiently, then lot of hormone will be made, and the plant will be tall.
- If the gene for that enzyme has an alteration that makes the enzyme less efficient, the amount of hormone will be less, and the plant will be short. Thus, genes control characteristics, or traits.

❖ MONOHYBRID CROSS

- The concept of monohybrid cross relates to the law of dominance and segregation given by Mendel.
- When only one trait is considered in a cross between two organisms, it is referred to as a monohybrid cross.
- For example, when we consider plant height as a trait and cross a tall plant (TT) with a dwarf plant (tt), the resulting F2 generation yields a ratio of 3 tall plants to 1 short plant, demonstrating a monohybrid ratio of 3:1.



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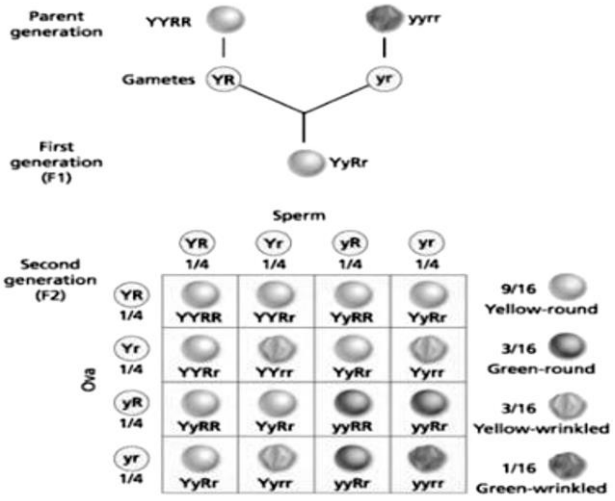
❖ DIHYBRID CROSS

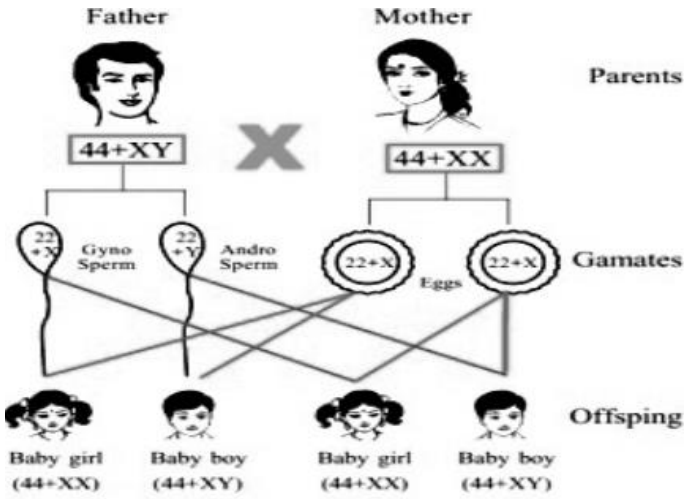
- When two characters are considered while crossing two organisms, then such a cross is called as a dihybrid cross.
- For example, when a plant with round and green pea (RRyy) is crossed with a plant with wrinkled and yellow (rrYY) pea, in F1 generation all are heterozygous round and green peas.
- On crossing the same, then in F2 generation, we get four combinations of characters in the ratio of 9:3:3:1 as round and yellow, round and green, wrinkled and yellow, wrinkled and green.
- Thus, the dihybrid ratio is 9:3:3:1.

(Source- https://crispindia.net/assets/files/study/Class%2010_Bio_Structured%20LP%20Book.pdf)



❖ **SEX DETERMINATION:** Some organisms rely entirely on environment factors for determination of sex in them. In animals like a few reptiles, the temperature at which fertilised eggs are kept determines whether the animals developing in the eggs will be male or female. In other animals, like snails, individuals can change sex, indicating that sex in these is not genetically determined.

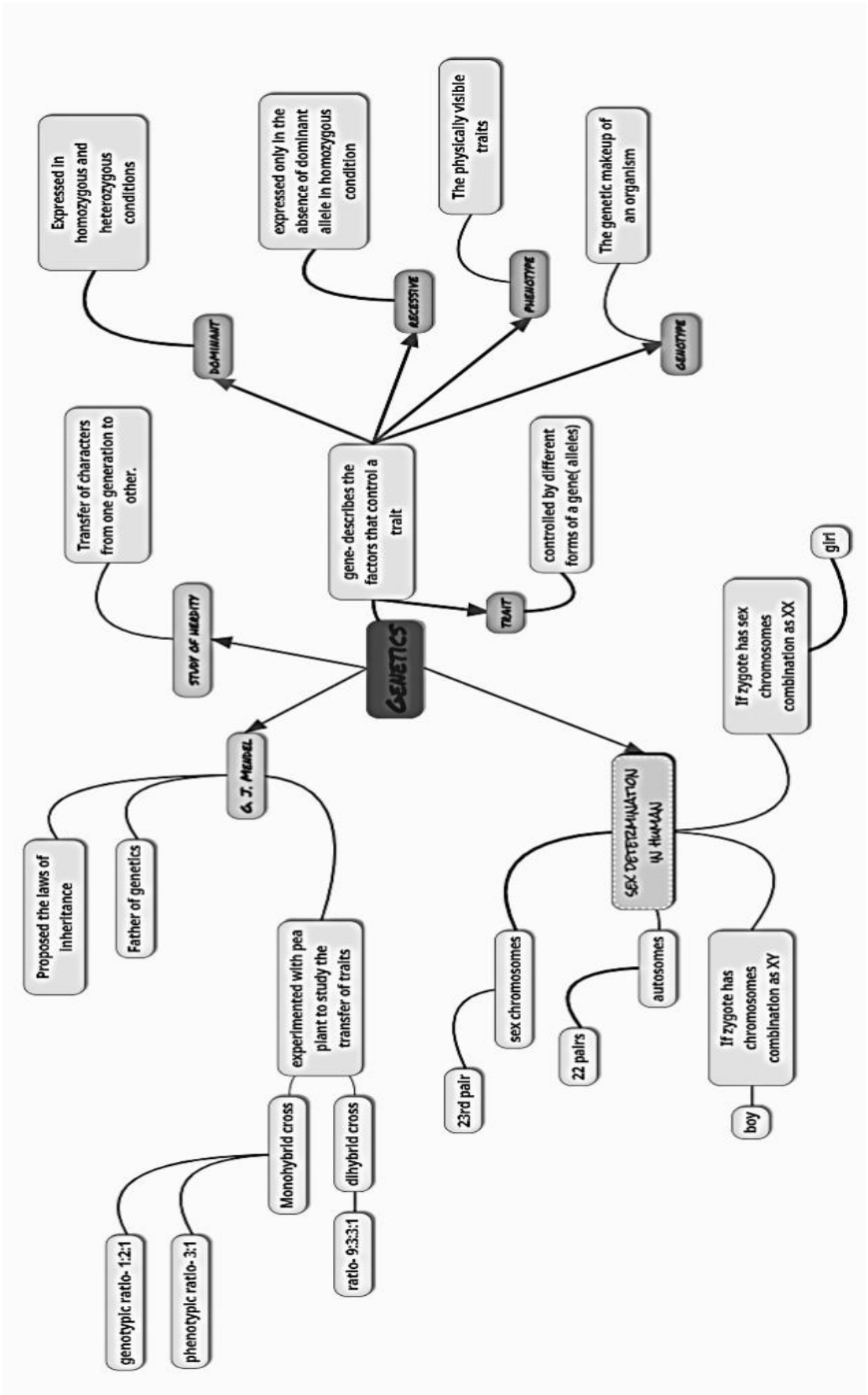
- Sex determination in human: In human beings, the sex of the individual is genetically determined.
- Each cell of human being contains 23 pairs (46 numbers) of chromosomes, out of which 22 pairs are called autosomes, and are similar in both males and females and are responsible for the various characteristics of an individual.
- The last pair that is 23rd pair that determine the sex of the individual are called sex chromosomes and are of two types X and Y.
- All children will inherit an X chromosome from their mother, despite whether they are a boy or girl.
- A child who inherits an X chromosome from her father will be a girl, and one who inherits a Y chromosome from him will be a boy.



(Source- https://crispindia.net/assets/files/study/Class%2010_Bio_Structured%20LP%20Book.pdf)

❖ **REFERENCES**

- https://ncert.nic.in/textbook.php?jesc1=8-13
- https://docs.google.com/document/d/1x4PG4fqTinTBhaxdLsgk2D-9utxTUns6/edit
- https://crispindia.net/assets/files/study/Class%2010_Bio_Structured%20LP%20Book.pdf
- https://cbseacademic.nic.in/web_material/CurriculumMain25/Sec/Science_Sec_2024-25.pdf
- https://docs.google.com/document/d/1jScSw-YP2yawS_HvPjYEkswhRww7H_qj/edit


GENETICS
STUDY OF HEREDITY
Transfer of characters from one generation to other.
G. J. MENDEL
Proposed the laws of Inheritance
Father of genetics
experimented with pea plant to study the transfer of traits
Monohybrid cross
genotypic ratio- 1:2:1
phenotypic ratio- 3:1
dihybrid cross
ratio- 9:3:3:1
TRAIT
controlled by different forms of a gene(alleles)
gene- describes the factors that control a trait
DOMINANT
Expressed in homozygous and heterozygous conditions
RECESSIVE
expressed only in the absence of dominant allele in homozygous condition
PHENOTYPE
The physically visible traits
GENOTYPE
The genetic makeup of an organism
SEX DETERMINATION IN HUMAN
If zygote has sex chromosomes combination as XX
girl
If zygote has chromosomes combination as XY
boy
sex chromosomes
23rd pair
autosomes
22 pairs

CHAPTER - 9

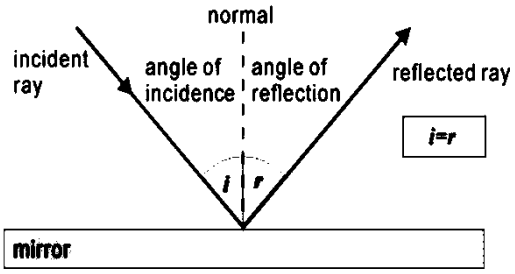
LIGHT - REFLECTION AND REFRACTION

CONTENTS *(reference: CBSE SYLLABUS – 2024*)

- ❖ Reflection of light by curved surfaces; Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required), magnification.
- ❖ Refraction; Laws of refraction, refractive index.
- ❖ Refraction of light by spherical lens; Image formed by spherical lenses; Lens formula (Derivation not required); Magnification. Power of a lens.

- ❖ **LIGHT: The form of energy which gives vision through our eyes. This has phenomenon like – Reflection and Refraction.**
- ❖ **Reflection of Light:** The phenomenon of bouncing back of light into the same medium by the smooth surface is called reflection. Highly polished (smooth) surfaces such as a mirror reflect most of the light falling on it.

- **Incident light:** Light which falls on the surface is called incident light.
- **Reflected light:** Light which goes back after reflection is called reflected light.
- **The angle of incidence:** The angle between the incident ray and the normal.
- **An angle of reflection:** The angle between the reflected ray and the normal.



- ❖ **Laws of reflection:** There are two laws of reflection:

a) The incident ray, the reflected ray and the normal at the point of incidence, all lie in the same plane.
b) Angle of incidence is always equal to the angle of reflection i.e. $\angle i = \angle r$

- ❖ **Image:** If light rays coming from a point and after reflection or refraction meet at another point or seems to meet at another point, then second point is called image of the first point. There are two types of image, *i.e.*-

a) **Real image:** When the rays of light, after reflection from a mirror, actually meet at a point, the image formed by these rays is said to be real. Real images can be obtained on a screen.
b) **Virtual image:** When the rays of light, after reflection from a mirror, appear to meet at a point, then the image formed by these rays is said to be virtual. Virtual images can't be obtained on a screen.

- ❖ **Mirror:** The shiny/polished surface which can reflect the light is a mirror. Mirror is of two types:

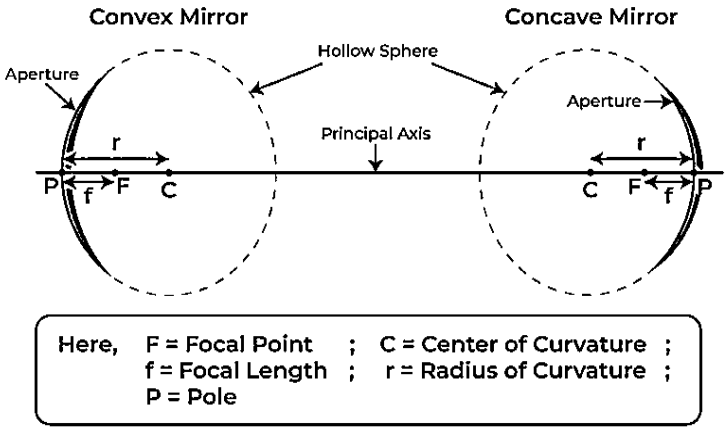
1. **Plane Mirror:** If the reflecting surface is a plane then the mirror is plane.
2. **Spherical Mirror:** If the reflecting surface is part of the hollow sphere then the

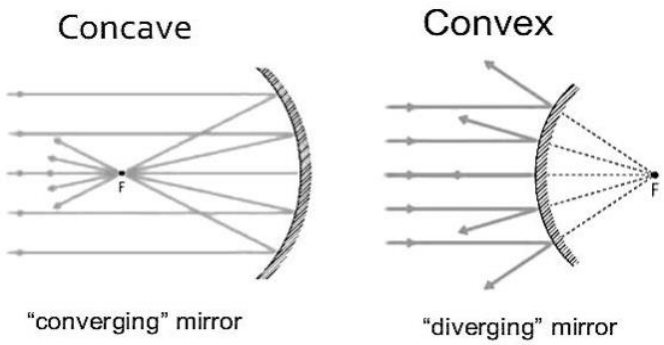
mirror is a spherical mirror.

The spherical mirror is of two types:

a. Convex mirror: In this mirror reflecting surface is curved outwards (convex). It diverges the light so it is also called a diverging mirror.
b. Concave mirror: In this mirror reflecting surface is curved inwards (concave). It converges the light so it is also called converging mirror.

❖ **Pole (Vertex):** The central point of a mirror is called its pole.
❖ **Centre of curvature:** The centre of the sphere of which the mirror is a part is called the centre of curvature. It is denoted by C.

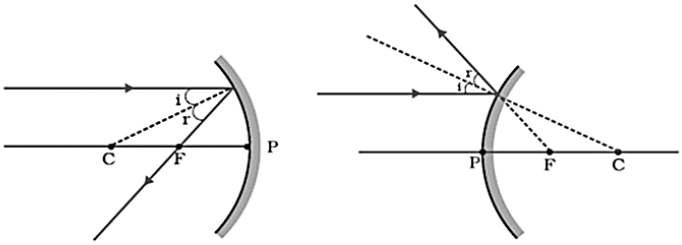




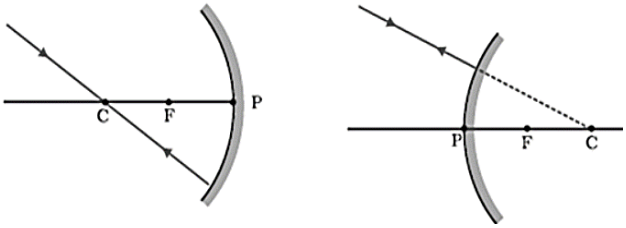
❖ **Radius of curvature:** The radius of the sphere of which the mirror is a part is called the radius of curvature. It is denoted by R.
❖ **Principal axis:** The straight line passing through the pole and the centre of curvature is called the principal axis.
❖ **Principal focus:** It is a point on the principal axis at which the rays parallel to the principal axis meet after reflection or seem to come from it. For a concave mirror, the focus lies in front of the mirror and for a convex mirror, it lies behind the mirror. In short, a concave mirror has a real focus while a convex mirror has a virtual focus.
❖ **Focal plane:** A plane, drawn perpendicular to the principal axis and passing through the principal focus.
❖ **Focal length:** The distance between the pole and the focus is called the focal length. It is represented by f. The focal length is half the radius of curvature. f=R/2
❖ **Reflection by Spherical mirror:** A ray of light which is parallel to the principal axis of a spherical mirror, after reflection converges or diverges from focus.

❖ RULE OF REFLECTION IN CURVED MIRROR

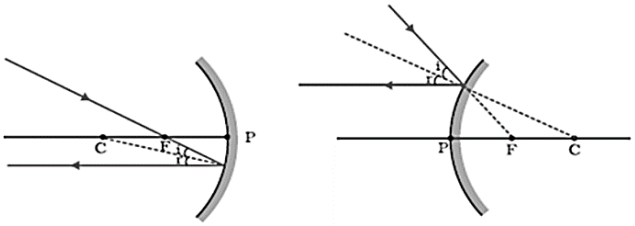
- A ray of light which is parallel to the principal axis of a spherical mirror, after reflection converges or diverges from focus.



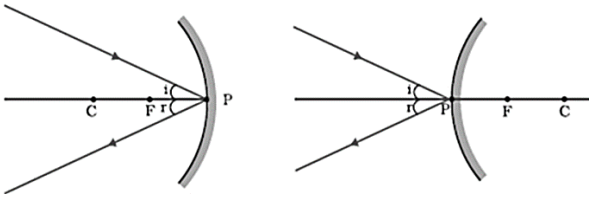
- A ray of light passing through or appearing from the center of curvature of spherical mirror is reflected back along the same path.



- A ray of light passing through or appearing from the focus of spherical mirror becomes parallel to the principal axis.



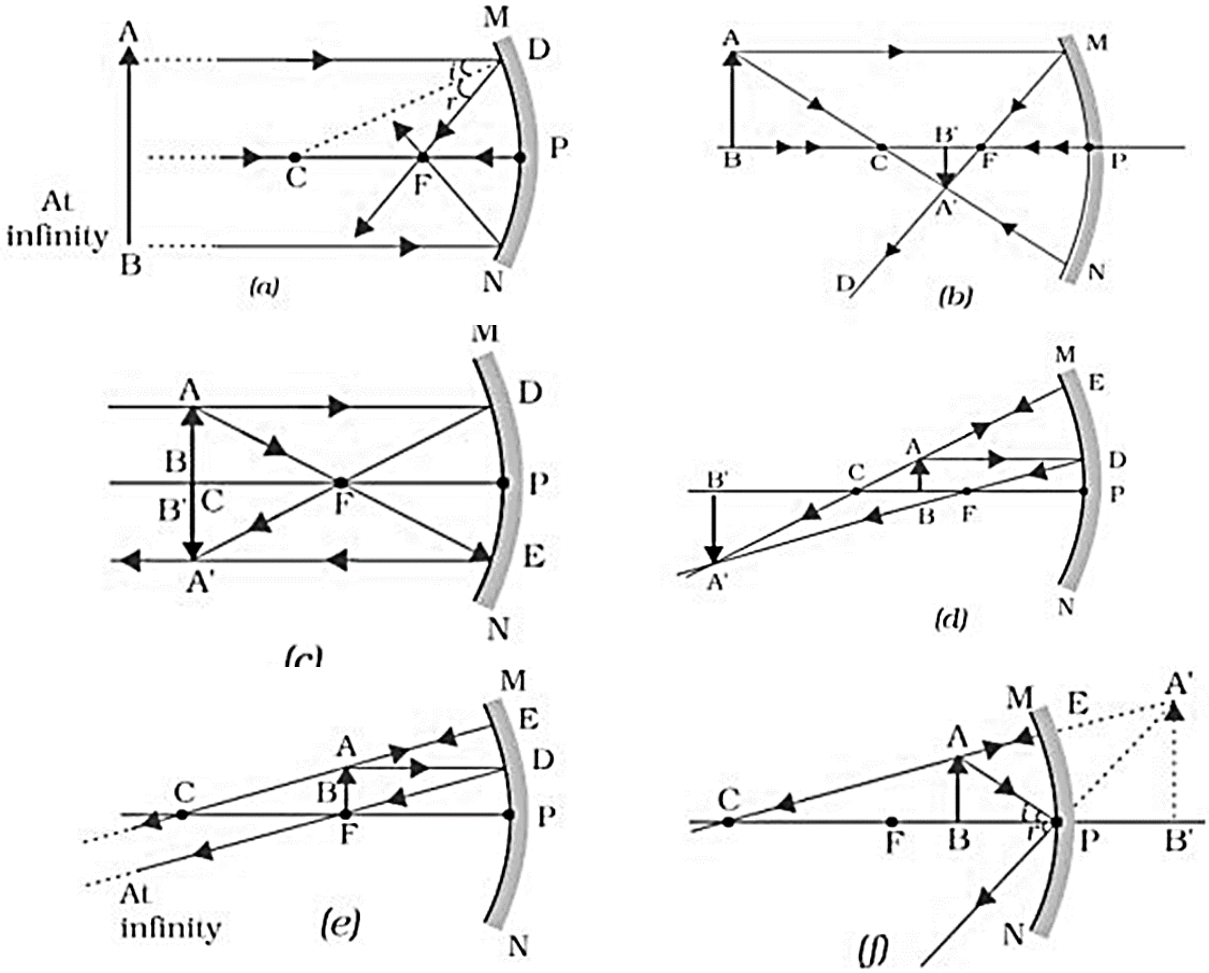
- A ray of light which is incident at the pole of a spherical mirror is reflected back making same angle with principal axis.



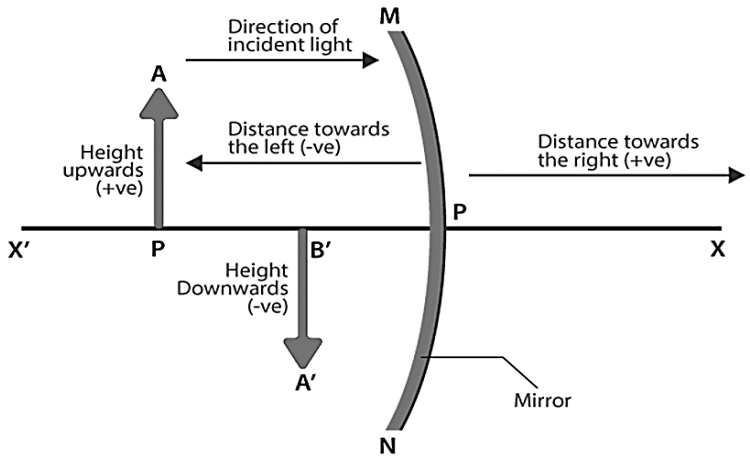
❖ IMAGE FORMATION OF CONCAVE MIRROR

Object position	Image position	Size of image	Nature of image
At infinity	Focus (F)	Point sized	Real
Beyond C	Between F and C	Small	Real and inverted
At C	At C	Same as that of the object	Real and inverted
Between C and F	Behind C	Enlarged	Real and inverted
At F	At infinity	Highly enlarged	Real and inverted
Between F and P	Behind mirror	Enlarged	Virtual and erect

❖ IMAGE FORMATION OF CONCAVE MIRROR



❖ SIGN CONVENTIONS OF SPHERICAL MIRROR



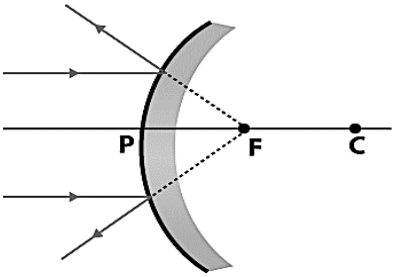
All the distances are measured from the pole of the mirror as the origin.

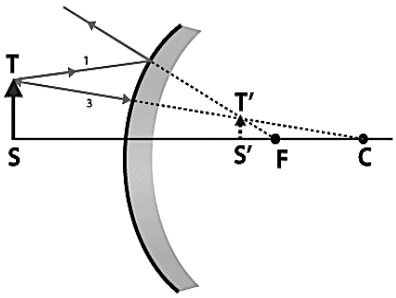
- Distances measured in the direction of incident rays are taken as positive.
- Distances measured opposite to the direction of incident rays are taken as negative.

- Distances measured upward and perpendicular to the principal axis are taken as positive.
- Distances measured downward and perpendicular to the principal axis are taken as negative.

❖ **IMAGE FORMATION OF CONVEX MIRROR**

POSITION OF OBJECT	POSITION OF IMAGE	SIZE OF IMAGE	NATURE OF IMAGE
At Infinity	At the focus F, behind the mirror	Highly diminished	Virtual and Erect
Between Infinity and the Pole	Between P and F, behind the mirror	Diminished	Virtual and Erect





USES OF CONCAVE MIRROR	USES OF CONVEX MIRROR
• Shaving mirrors • Head light of vehicles • Ophthalmoscope • Astronomical telescopes • Headlights • Solar furnaces	• Rear-view mirrors of all the vehicles. • Security purposes in school, hotel, and hospital galleries. • In ATM to view the behind person • Telescopes • Sunglasses • Street light

❖ **Magnification by Mirrors**

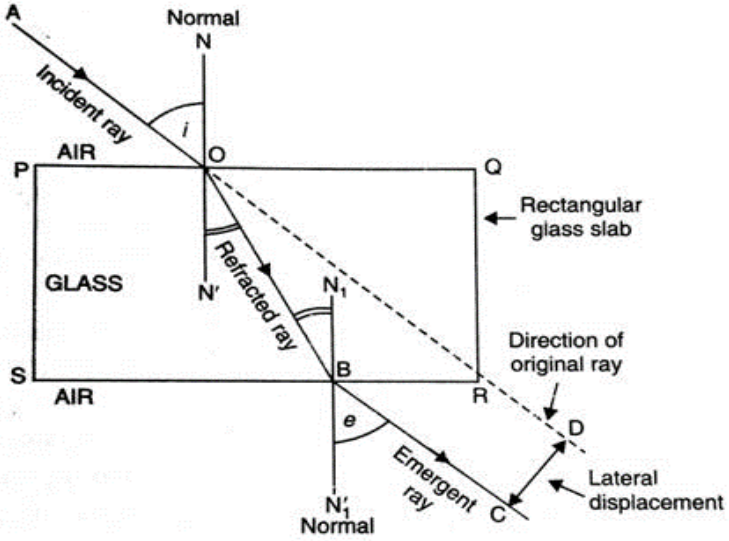
- Increase/decrease in the image size produced by spherical mirrors with respect to the object size is known as magnification.
- It is the ratio of the height of the image to the height of the object.
- It is denoted as m.

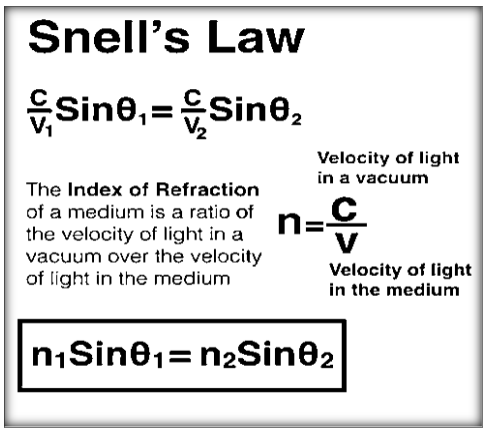
$$m = \frac{-h_2}{h_1} = \frac{-v}{-u} \Rightarrow \frac{h_2}{h_1} = -\frac{v}{u}$$

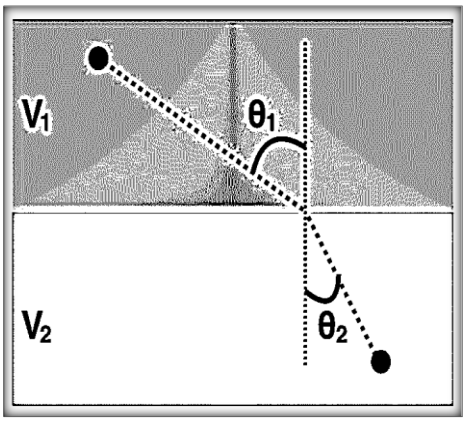
$$m = -\frac{v}{u} = \frac{f}{f-u} = \frac{f-v}{f} = \frac{h_2}{h_1}$$

❖ Refraction through a Rectangular Glass Slab

Light emerges from the glass slab in direction parallel with that in which it enters the glass slab. Perpendicular distance between incident ray and emergent ray coming out of glass slab is called lateral displacement.







❖ REFRACTIVE INDEX

Absolute refractive index is the ratio of speed of light in vacuum or air to speed of light in the medium. (n = c/v)

- **Relative refractive index**

✓ **n_{21} = Speed of light in medium-1 / Speed of light in medium-2**
(Refractive index of medium-2 wrt medium 1 is known as refractive index of medium
✓ **n_{12} = Speed of light in medium 2 / Speed of light in medium 1**
(Refractive index of medium 1 wrt medium 2 is known as refractive index of medium 1)

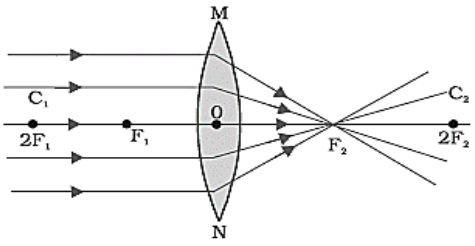
- When light goes from rarer medium to denser medium than refracted ray bend toward normal.
- When light goes from denser medium to rarer medium than refracted ray bend away from the normal.

- Refractive index depends on nature of material of medium, density of medium, colour or wavelength of light.

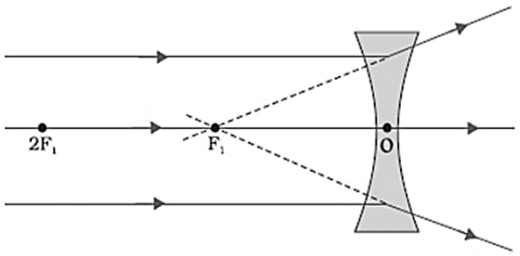
S.No.	Material medium	Refractive Index
1	Diamond	2.42
2	Sapphire	1.77
3	Ruby	1.71
4	Dense flint glass	1.65
5	Carbon di sulphide	1.63
6	Rock Salt	1.54
7	Canada balsam	1.53
8	Benzene	1.50
9	Crown glass	1.52
10	Turpentine oil	1.47
11	Fused quartz	1.46
12	Kerosene	1.44
13	Water	1.33
14	Ice	1.31
15	Air	1.0003

❖ REFRACTION BY SPHERICAL LENSES

i. Convex lens: Lens which converge the light after the refraction is known as converging lens.
ii. Concave lens: Lens which diverge the light after refraction is known as diverging lens.

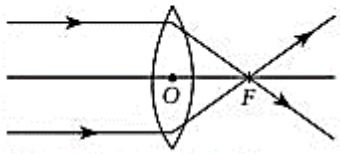
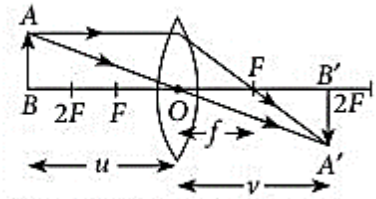


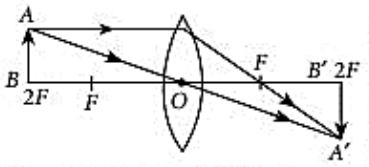
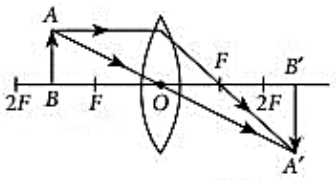
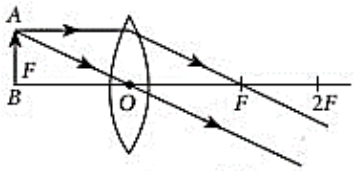
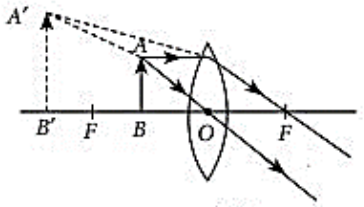
(a) Converging action of convex lens



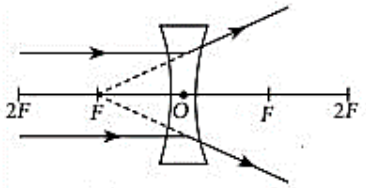
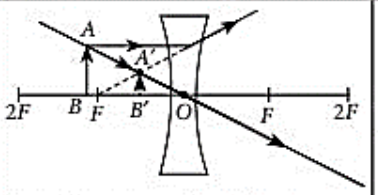
(b) Diverging action of concave lens

❖ IMAGE FORMATION OF CONVEX LENS

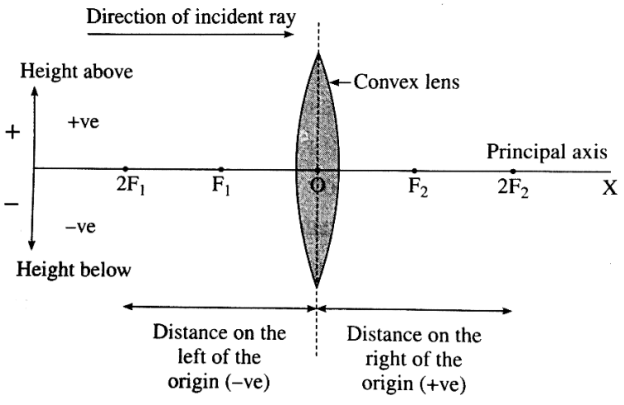
Convex lens				
	Ray diagram	**Position of object**	**Position of image**	**Nature of image**
(a)	 u = –ve, v = +ve and f = +ve	At infinity	At F	Real, inverted and highly diminished
(b)	 u = –ve, v = +ve and f = +ve	Between infinity and $2F$	Between F and $2F$	Real, inverted and diminished

(c)	 u = –ve, v = +ve and f = +ve	At 2F	At 2F	Real, inverted and same sized
(d)	 u = –ve, v = +ve and f = +ve	Between F and 2F	Beyond 2F	Real, inverted and enlarged
(e)	 u = –ve, v = +ve and f = +ve	At F	At infinity	Real, inverted and enlarged
(f)	 u = –ve, v = –ve and f = +ve	Between F and O	On the same side of the lens	Virtual, erect and enlarged

❖ IMAGE FORMATION OF CONCAVE LENS

	Ray diagram	Position of object	Position of image	Nature of image
(a)	 u = –ve, v = –ve and f = –ve	At infinity	At F	Virtual, erect and highly diminished
(b)	 u = –ve, v = –ve and f = –ve	Between infinity and O	Between F and O	Virtual, erect and diminished

❖ SIGN OF DATA WITH LENS



USES OF CONCAVE LENS	USES OF CONVEX LENS
• Concave lens used in peepholes/spy holes. • These are also used in flashlights. • They are also used in terrestrial telescopes, binoculars. • These are used on spectacles to correct the vision.	• Used in making microscope • These are used on spectacles to correct the vision. • These are used in the camera to focus on a single object. • Convex lenses are used widely in the camera, focusing on an image and magnifying it. • These are used as a magnifying glass. • Convex lenses are used widely in the overhead projectors.

❖ **Magnification by Lens**

- Increase in the image size produced by spherical lens with respect to the object size is known as magnification.
- It is the ratio of the height of the image to the height of the object.
- It is denoted as m.

$$\text{Magnification} \quad m = \frac{Height\ of\ image}{Height\ of\ Object}$$

$$m = \frac{v}{u}$$

$$\text{Lens Formula:} \quad \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

- POWER OF LENS: - The ability of lens to converse or diverge light rays is called power of lens. It depends on focal length of lens.

  P = 1/f, the SI unit of power of lens is dioptre (D).

OBJECT	IMAGE	TYPE
AT INFINTY	FOCUS	REAL
BEYOND C	BETWEEN C-F	REAL
AT C	AT C	REAL
BETWEEN C-F	BETWEEN F-C	REAL
AT F	AT INFINITY	REAL
BETWEEN N-C	BEHIND THE MIRROR	VIRTUAL

USES: Reflector of Torches, Headlights and projector lens, Solar devices

CONCAVE MIRROR

MIRROR

$$\frac{-h_2}{h_1} = \frac{-v}{-u} \Rightarrow \frac{h_2}{h_1} = -\frac{v}{u} \qquad m = -\frac{v}{u}$$

$$m = -\frac{v}{u} = \frac{f}{f-u} = \frac{f-v}{f} = \frac{h_2}{h_1}$$

Convex mirror always produce virtual images.

USES: Vehicle rear mirror, Securities Camera

CONVEX MIRROR

PLAIN MIRROR: Produces virtual images of same size at same distance

SPHERICAL MIRROR

MIRROR **REFLECTION**

MAGNIFICATION

LENS

From the lens formula, $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

Multiplying throughout by v,

$\frac{v}{u} + \frac{v}{v} = \frac{v}{f}$, but $m = \frac{v}{u}$

$m + 1 = \frac{v}{f}$

$v = fm + f$

OBJECT	IMAGE	TYPE
AT INFINTY	AT F2	REAL
BEYOND 2F1	BETWEEN F2-2F2	REAL
AT 2F1	AT 2F2	REAL
BETWEEN 2F1-F1	BETWEEN 2F2-INFINITY	REAL
AT F1	AT F2	REAL
BETWEEN N-C	BEHIND THE MIRROR	VIRTUAL

Concave lens always produce virtual images.

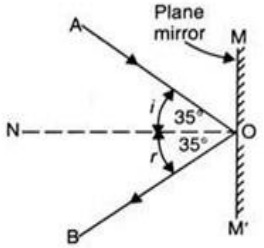
USES: Vehicle rear mirror, Securities Camera

USES: Microscope, Telescope, Magnifying glass, Spectrometer, Spectacles

CONCAVE/DIVERGING LENS **CONVEX/CONVERGING LENS**

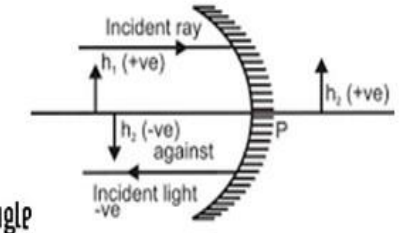
LIGHT : ENERGY GIVES VISIBILITY

REFRACTION **LENS**



The light undergoing the **TOTAL INTERNAL REFLECTION** also follows the ordinary laws of reflection

LAW OF REFLECTION



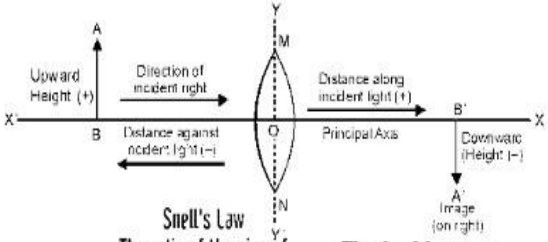
The angle of incidence is equal to the angle of reflection $\angle i = \angle r$

The incident ray, the normal and the reflected ray, all lie on the same plane

Power is measured in Diopters (D)

$$P = \frac{1}{f \text{ (in metres)}}$$

LAW OF REFRACTION

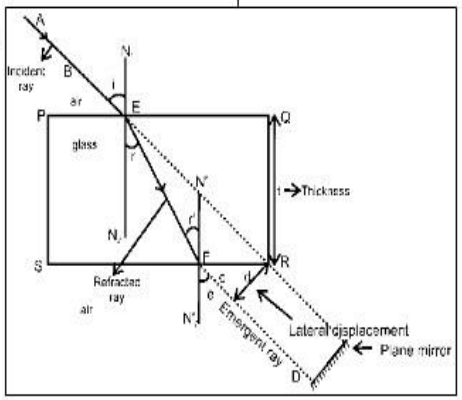


Snell's Law
The ratio of the sine of angle of incidence to the sine of angle of refraction is always constant

$$n = \frac{\sin i}{\sin r}$$

The incident ray, the normal and the refracted ray at the point of incidence all lie in the same plane for the two given transparent mediam

Refractive index of plane mirror



Chapter- 10

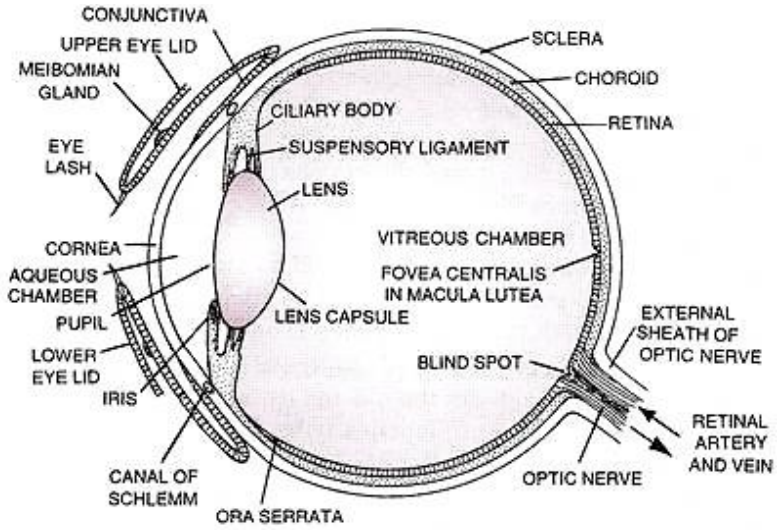
HUMAN EYE AND COLOURFUL WORLD

CONTENTS *(reference: CBSE SYLLABUS – 2024*)

- ❖ Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses.
- ❖ Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life. (Excluding color of the sun at sunrise and sunset).

The Human Eye: It is a natural optical organ which is used to see the objects by human. It is like a camera which has a lens and screen system.

NAME	DETAILS	RESULT
Retina	It is a light sensitive screen inside the eye on which an image is formed. It contains rods and cones.	Captures the light rays focused by the lens and send electric signals to the brain.
Cornea	It is a thin membrane which covers the eye trail.	It acts like a lens which refracts the light entering the eye.
Aqueous humour	It is fluid which fills the space between cornea and eye lens	Medium for light travel from cornea to retina
Eye lens	It is a convex lens made of transparent and flexible jelly like material.	It's can be adjusted with the help of ciliary muscles to focus light on retina
Pupil	It is a hole in the middle of iris through which light enters the eye. It appears black because light falling on it goes into the eye and does not come back.	Opens and closes in order to regulate and control the amount of light.
Ciliary muscles	These are the muscles which are attached to eye lens.	Modify the shape of eye lens which leads to the variation in focal length
Iris	Covered part of pupil	Controls light level similar to the aperture of a camera
Optical nerve	Nerves between Retina black spot and Brain	Transmit the image to the brain in the form of electrical signals



❖ The pupil of an eye provides a variable aperture, whose size is controlled by iris.

(a) When the light is bright: Iris contracts the pupil, so that less light enters the eye.

(b) When the light is dim: Iris expands the pupil, so that more light enters the eye. Pupil opens completely when iris is relaxed.

❖ Color Blindness: A person having defective cone cells is not able to distinguish between the different colors (red and green spectrum). This defect is known as Color Blindness.

Defects of Vision:

❖ **Myopia (Short-sightedness):** It is a kind of defect in the human eye due to which a person can see nearby objects clearly but he cannot see the distant objects clearly.

Causes of Myopia

(i) Excessive curvature of the eye lens.

(ii) Elongation of eyeball.

❖ **Hypermetropia (Long-sightedness):** It is a kind of defect in the human eye due to which, a person can see distant objects properly but cannot see the nearby objects clearly.

Causes of Hypermetropia

(i) Decrease in the power of eye lens i.e., increase in focal length of eye lens.

(ii) Shortening of eyeball.

❖ **Presbyopia:** It is a kind of defect in human eye which occurs due to ageing.

Causes of Presbyopia

(i) Decrease in flexibility of eye lens. Gradual weakening of ciliary muscles.

(ii) In this, a person may suffer from both myopia and hypermetropia.

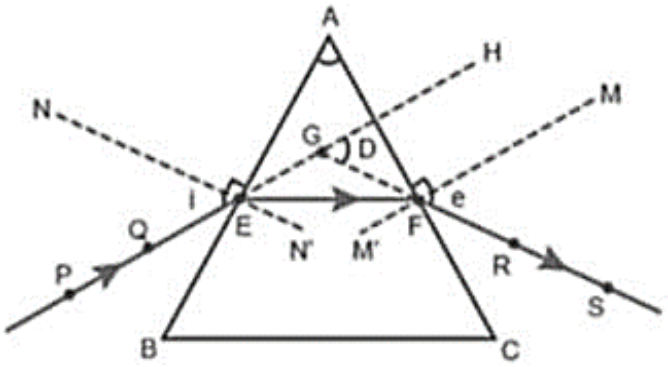
❖ **Astigmatism:** It is a kind of defect in human eye due to which a person cannot see (focus) simultaneously horizontal and vertical lines both.

❖ **Cataract:** Due to the membrane growth over eye lens, the eye lens becomes

hazy or even opaque. This leads to a decrease or loss of vision. This problem is called a cataract. It can be corrected only by surgery.

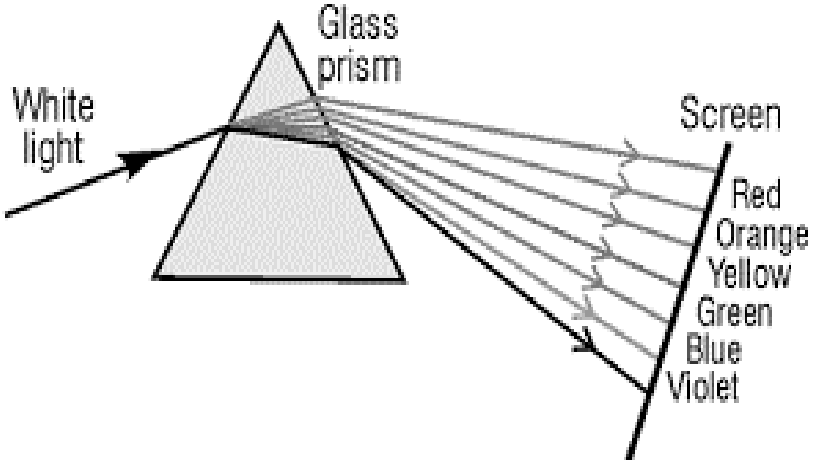
Prism: A prism is a transparent refracting medium bounded by two plane surfaces, inclined to each other at a certain angle. It has one triangular base and three rectangular lateral surfaces.

- **Refraction of light through a prism:** When a ray of light is incident on a rectangular glass slab, after refracting through the slab, it gets displaced laterally. As a result, the emergent ray comes out parallel to the incident ray. Unlike a rectangular slab, the side of a glass prism is inclined at an angle called the angle of prism.
- **Angle of Prism:** Angle between two lateral faces is called angle of prism.
- **Angle of Deviation:** The angle between the incident ray and emergent ray.



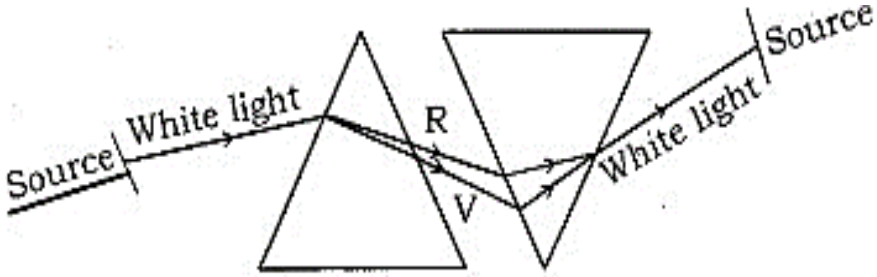
PE - Incident ray
EF - Refracted ray
FS - Emergent ray
A - Angle of the prism
∠i - Angle of incidence
∠r - Angle of refraction
∠e - Angle of emergence
∠D - Angle of deviation

Dispersion of white light by a glass prism: The phenomenon of splitting of white light into its seven constituent colors when it passes through a glass prism is called dispersion of white light. The spectrum sequence VIBGYOR. The different component colors of light bends at a different angle with respect to the incident angle. The violet light wavelength is minimum, frequency is maximum so bends the least while the red wavelength is maximum and frequency is minimum so bends the most.



- **Monochromatic light:** Light consisting of single color or wavelength is called monochromatic light, example; sodium light.
- **Polychromatic light:** Light consisting of more than two colors or wavelengths is called polychromatic light, example; white light.

Recombination of white light: Newton found that when an inverted prism is placed in the path of dispersed light then after passing through the prism, they recombine to form white light.

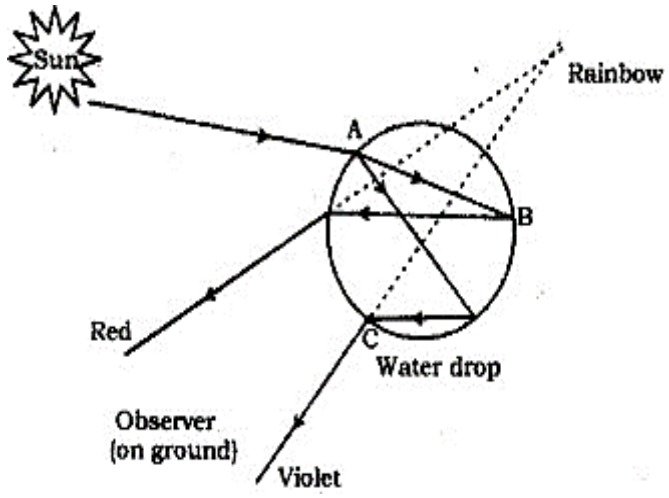


Dispersion is caused by prism P_1

- **Rainbow:** It is the spectrum of sunlight in nature due to complete internal reflection. The water droplets act like small prism. They refract and disperse the incident sunlight, then reflect it internally, and finally refract it again when it comes out of the raindrop. Due to the dispersion of light and internal reflection, different colors reach the observer 's eye.

- ✓ The formation of rainbow involves a series of physical phenomena refraction, dispersion and internal reflection.
- ✓ Rainbow is always formed in a direction opposite to that of the sun, i.e. sun is always behind the observer.
- ✓ Red color appears on top and violet at the bottom of rainbow.

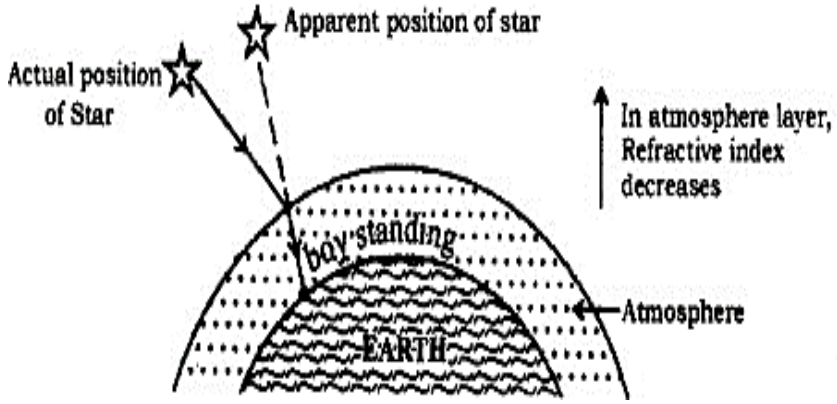
Atmospheric Refraction: The refraction of light caused by the Earth's atmosphere (having air layers of varying optical densities) is called Atmospheric Refraction.



Appearance of Star Position:

Reason: Atmospheric refraction of star light.

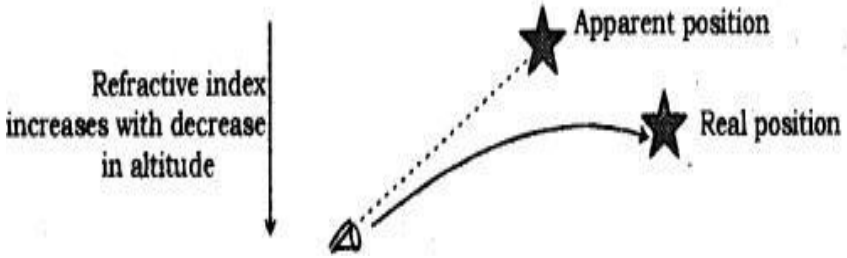
The temperature and density of different layer of atmosphere creates different medium. Starlight enters the Earth's atmosphere, it undergoes refraction continuously, due to changing refractive index *i.e.,* from Rarer to denser. It bends towards the normal. Due to this, the apparent position of the star is different from actual position. The star appears higher than its actual position.



Twinkling of Star:

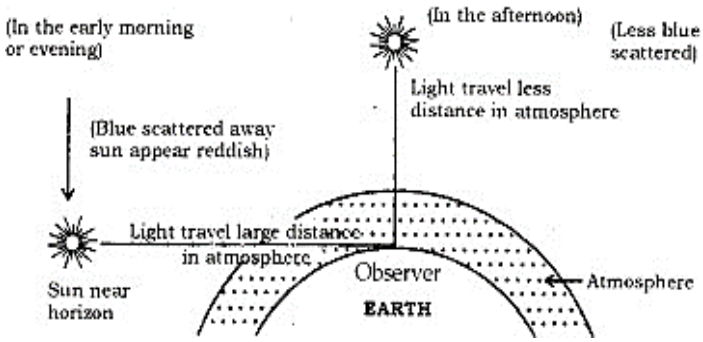
Reason: Atmospheric refraction.

Physical condition of earth's atmosphere is not stationary so the beam of starlight keeps deviating from its path, the apparent position of star keeps on changing. The amount of light enters our eyes fluctuate sometimes bright and sometime dim results into twinkling effect of stars.



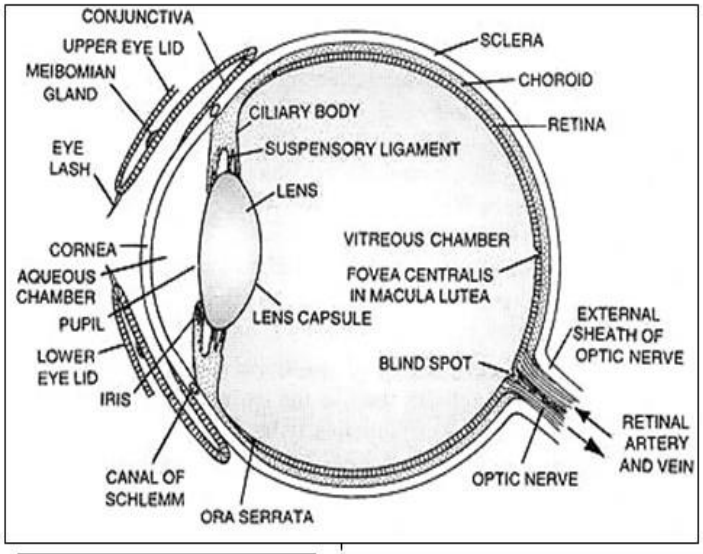
- **Scattering of light:** According to Rayleigh's Law of Scattering, the amount of scattered light $1/\lambda^4$ (λ = wavelength). Scattering of light decreases with increase in wavelength.
- **Blue color of the sky:** The sunlight that reaches the earth atmosphere is scattered in all directions by the gases and dust particles. Sky appears blue; this is because the size of the particles in the atmosphere is smaller than the wavelength of visible light, so they scatter the light of shorter wavelength (blue end of spectrum). The blue colour is scattered more and hence the sky appears blue.
- **Red Danger Signal:** The danger signal or sign is made of red colour because red colour scatters the most when strikes the small particle of fog and smoke because it has the maximum wavelength (visible spectrum). Hence, from large distance also, we can see the red colour clearly.

- **At noon sun appears white:** At noon, the sun is overhead and sunlight would travel shorter distance relatively through the atmosphere. Hence, at noon, the sun appears white as only little of the blue and violet colours are scattered.

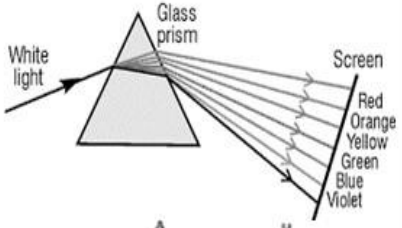


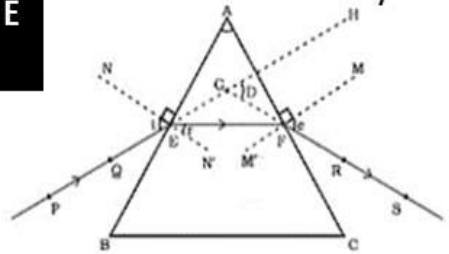
HUMAN EYE AND COLORFUL WORLD

STRUCTURE



PRISM





PE – Incident ray
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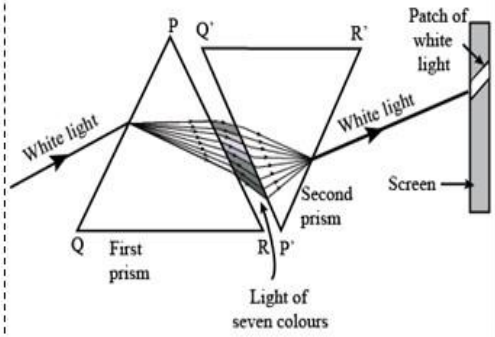
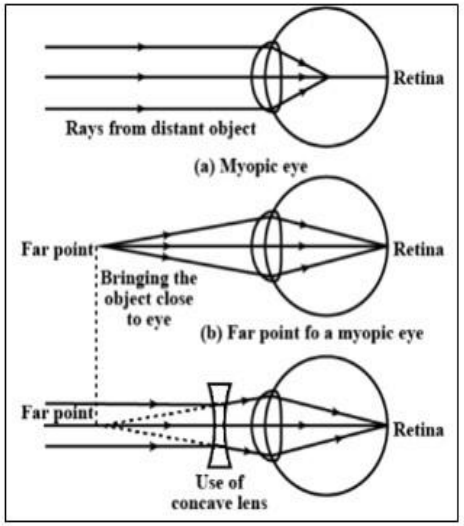
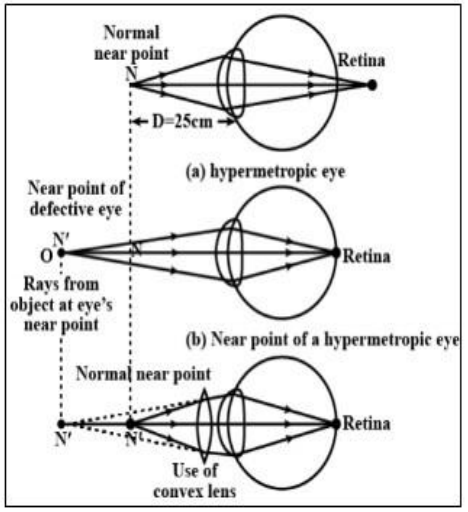


DEFECTS OF VISION

MYOPIA

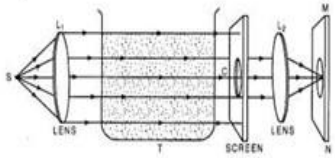


HYPERMETROPIA



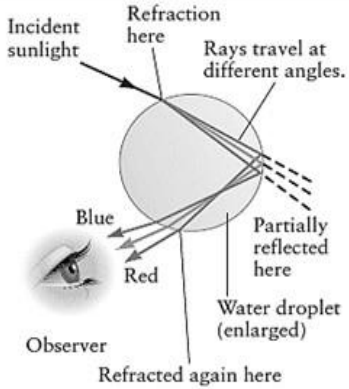
Presbyopia is a common defect of vision at old age.

SCATTERING OF LIGHT



- Tyndall Effect
- the color of the clear Sky is Blue
- Color of the Sun at Sunrise and Sunset is orange-red

ATMOSPHERIC REFRACTION



- Twinkling of stars
- Advance sunrise and delayed sunset

Chapter-11

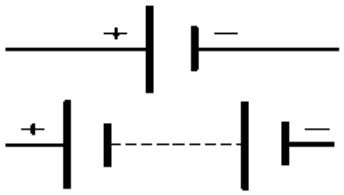
ELECTRICITY

CONTENTS *(reference: CBSE SYLLABUS – 2024*)

- ❖ Electric current, potential difference and electric current. Ohm's law; Resistance, Resistivity,
- ❖ Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life.
- ❖ Heating effect of electric current and its applications in daily life. Electric power, Interrelation between P, V, I and R.

❖ **Important Definitions-**

- **Electric Current:** The rate of flow of charge is called electric current.



- **Potential:** The work done require to bring a unit positive charge from infinity to a particular point is called potential of that point
- **Potential Difference:** The work done require to bring a unit positive charge from one point to another is called potential between those points.
- **Battery:** The device which offer potential difference.
- **Resistance:** The hindrance or obstacle offered by a conductor in the path of electric current is called resistance.
- **Resistor: It is** a device that provides resistance in a circuit is resistor.
- **Resistivity:** The ability of material to offer resistance (resist the path of electric current) is called resistivity.
- **Electric power:** The rate of doing work or consuming electrical energy is called electric power.
- **Voltmeter:** The device that is used to measure potential difference between two points.
- **Ammeters:** the device used to measure electric current in a circuit.
- **Circuit:** The path taken by electric current. It is always a closed loop
- **Circuit diagram:** The symbolic representation of a circuit.
- **Heating effect of electric current:** When electric current is supplied to a purely resistive conductor, the energy of electric current is dissipated entirely in the form of heat and as a result, resistor gets heated. The heating of resistor because of dissipation of electrical energy is commonly known as Heating Effect of Electric Current.
- **Galvanometer:** It is a device to detect current in an electric circuit.
- **Conductors and Insulators:** A substance which offers comparatively less opposition to the flow of current is known as conductors. Substances which offer larger opposition to the flow of electric current are insulators.

❖ **Electric Potential and Potential Difference:** The electric potential at a point is defined as work done in bringing a unit positive charge from infinity to that point. The potential difference between two points is defined as the difference in electric potentials between the two given points. It is denoted by the symbol 'V'.

- **Equation: V=W/Q**
- **SI Unit** of charge is **Volt(V)**
  - 1 Volt is the potential difference between two points when 1 Joule of work done is required to move a charge of one coulomb across them.
  - A Voltmeter is used to measure potential difference.

❖ **Conductors and Insulators**

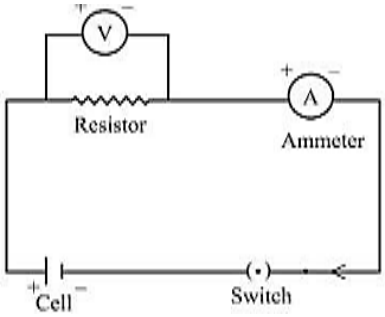
- A cell is a source of potential difference, which is created inside it due to internal chemical reactions.
- A combination of cells is called a battery.

❖ **Electric Current**

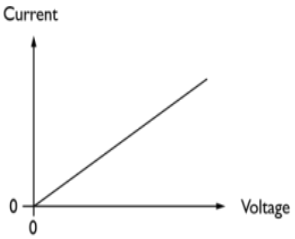
- The rate of flow of electric charge is called electric current,
- Electric current is denoted by 'I'
- I = Q / t
- The direction of flow of electric current is from positive terminal to negative terminal, i.e., opposite to the direction of flow of electrons.
- SI Unit of electric current is Ampere(A).
- 1 Ampere is the current constituted by the flow of 1C charge in 1s.
- An Ammeter is used to measure electric current.

❖ **Electric circuit and circuit diagram**

- A closed-loop path which a current take is called an electric circuit.
- Representation of an electric circuit through symbols is called a circuit diagram.



Ohm's law: If the physical condition remains same, the current flowing through a conductor is directly proportional to the applied potential difference between the two ends of the conductor and vice a versa. For the current I flowing through a conductor having potential difference V across its ends, we have:



  - $V \propto I$
  - $V = IR$
- Here R is the constant of proportionality and known as the resistance of the conductor.
- Value of resistance does not change on changing electric current or potential difference.

❖ **Resistance:** Resistance is a measure of the opposition offered to the current flow in an electric circuit. SI unit of resistance is ohm (Ω)

❖ **Factors affecting Resistance**

- Resistance is: directly proportional to the length of the conductor.

  $R \propto l$

- Inversely proportional to the cross-sectional area of the conductor.

  $R \propto 1/A$

- Combining the two we have

  $R \propto l/A$

  $R = \rho\, l/A$

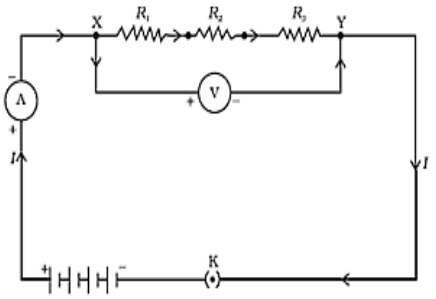
Here ρ is the constant of proportionality and known as resistivity.

❖ **Resistivity-**The electrical resistance offered by a substance of unit length and unit cross-sectional area is called **resistivity.**

- **SI Unit** of resistivity is **ohm meter (Ωm)**
- **Factors affects resistivity:** Resistivity depends on
  - Temperature
  - Material of the conductor

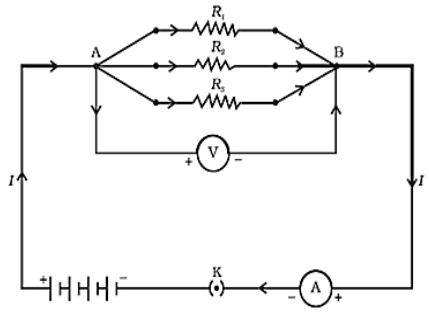
❖ **Combination of Resistors-**

- **Resistors in series:** Two resistors are said to be combined in series if they carry the same current. In this circuit the following applies.
  - $I_1 = I_2 = I_3 = I$
  - $Vs = V_1 + V_2 + V_3$
  - Using ohm's law V=IR
  - $IRs = IR_1 + IR_2 + IR_3$
  - $IRs = I\,(R_1 + R_2 + R_3)$
  - So, $Rs = R_1 + R_2 + R_3$



So, the resultant resistance of the combination of the resistors in the series is the sum of all resistance.

- **Resistors in parallel:** Two resistors are said to be combined in parallel if the same potential difference is applied to them. In this circuit,
  - $I = I_1 + I_2 + I_3$
  - Using OHM's law V=IR => I=V/R
  - $V/Rp = V/R_1 + V/R_2 + V/R_3$
  - $V/Rp = V(1/R_1 + 1/R_2 + 1/R_3)$
  - $1/Rp = 1/R_1 + 1/R_2 + 1/R_3$



❖ **Heating Effect of Electric Current:** When current passes through a conductor, it produces heat. This phenomenon is called heating effect of electric current. The amount of heat produced can be given by Joules law. By definition

- Power P = work done W/time t
- P=W/t
- P=H/t (work done = energy and heat is a form of energy)
- H=PX t
- H=VIt (P=W/t = VQ/t =VI)
- $H=I^2Rt$ (V=IR)

❖ **Joule's Law:**

- Heat (H) ∝ square of the current (I).
- H ∝ Resistance of the given circuit.
- H ∝ Time (t) for which current flows through the conductor.
- So, H=I2Rt

When a potential difference is established, it causes electrons to move, i.e., flow of current.

❖ **Electric Power:** The rate of doing work or rate of consumption of electrical energy is called Electric Power.

If W is work done in time t, then P=W/t.

- P= VQ/t (V=W/Q => W=VQ)
- P =VI (Q/t= I)
- P= I^2R (V=IR)
- P= V^2/R (I=V/R)
- S.I unit of power is Watt (W).

One watt of power is consumed when 1 A of current flows at a potential difference of 1 V.

❖ **Electrical Energy**

- SI unit of energy is Joule(J)
- The commercial unit of electrical energy is a kilowatt-hour (kWh).
- 1kWh = 3,600,000J = 3.6×106 J

- **One kilowatt-hour** is defined as the amount of energy consumed when 1kW of power is used for 1 hour.

ELECTRICITY

Electric Circuit: A closed and continuous path through which electric current flows.
Battery, Bulb, Switch, fuse, connecting wire, Ammeter, Voltmeter

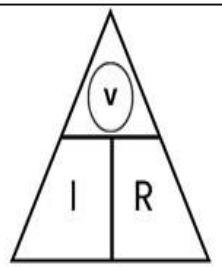
ELECTRIC CURRENT IS A FLOW OF CHARGED PARTICLES, SUCH AS ELECTRONS OR IONS, MOVING THROUGH AN ELECTRICAL CONDUCTOR OR SPACE.
SI UNIT – AMPERE (A)
A = 1 C/1s . (1 mA = 10^{-3} A)
Measured by AMETER

The physical property of matter that causes it to experience a force when placed
SI UNIT – COULOMB (C)
Charge of 6 × 10^{18} electrons

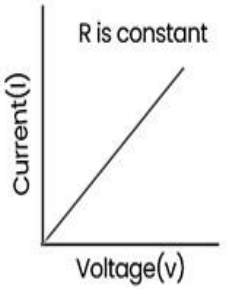
Potential Difference is work done per unit charge in moving a unit positive charge between two points.
V = W/Q (1V = 1J/C)
SI unit - volt
1KV = 10^3 V 1mV = 10^{-3}V
Measured by VOLTMETER

Ohm's Law: Ohm's law states current through a conductor is proportional to voltage across it and inversely proportional to resistance.
V α I or V = RI
The constant of proportionality,
R, is called Resistance and has units of ohms (Ω).

I = V/R
V = IR
R = V/I



V = I × R

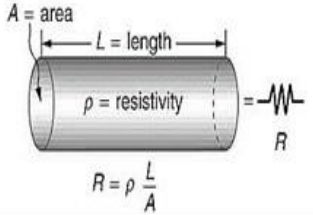


Resistance : Property of a conductor due to which it opposes the flow of current through it.
R=V/I or 1Ω=1V/A
SI UNIT – Ohm Ω
1kΩ =10^3Ω
1mΩ =10^{-3}Ω

Factors Affecting Resistance
- **Length of the conductor**
- **Area of cross-section**
- **Nature of material**
- **Effect of temperature**

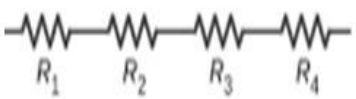
$$R = \frac{\rho L}{A}$$
ρ = resistivity
L = length
A = cross sectional area

Resistivity is the Resistance of the flow of current from one end to the other in a material.

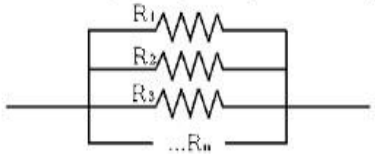


TOTAL RESISTANCE OF ELECTRIC CIRCUIT

SERIES CIRCUIT
Two or more resistors are said to be connected in series when the same amount of current flows through all the resistors.
$R_{total} = R_1 + R_2 + ... + R_n$



PARALLEL CIRCUIT
Two or more resistors are said to be connected in parallel when the voltage is the same across all the resistors. $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + ... + \frac{1}{R_n}$



Joule's law of Heating Effect
The heat produced is directly proportional to the square of Electric current(I), Resistance(R) and Time(t).
H = Vit H = I^2 Rt

Electric power (P) is rate at work is done or energy is transformed into an EC.
SI UNIT - Watt or Joule/Second
P = VI **P = I^2R** **P = V^2/ R**
1 Unit =1 kWh = 3.6 × 106 joule (J)

CHAPTER – 12

MAGNETIC EFFECTS OF ELECTRIC CURRENT

CONTENT *(reference: CBSE SYLLABUS – 2024*)

- ❖ Magnetic effects of current: Magnetic field, field lines
- ❖ field due to a current carrying conductor,
- ❖ field due to current carrying coil or solenoid;
- ❖ Force on current carrying conductor, Fleming's Left-Hand Rule,
- ❖ Direct current. Alternating current: frequency of AC.
- ❖ Advantage of AC over DC. Domestic electric circuits.

- ❖ **Magnet:** Magnet is an object that attracts objects made of iron, cobalt and nickel. Magnet comes to rest in – South direction, when suspended freely.
- ❖ **Properties of Magnet**

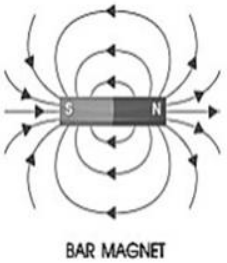
a. A free suspended magnet always points towards the north and south direction.
b. The pole of a magnet which points toward north direction is called north pole or north-seeking.
c. The pole of a magnet which points toward south direction is called south pole or south seeking.
d. Like poles of magnets repel each other while unlike poles of magnets attract each other.

- ❖ **Use of Magnets:**

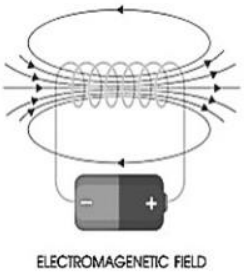
a. In refrigerators.
b. In radio and stereo speakers.
c. In audio and video cassette players.
d. In children's toys.

- ❖ **Magnetic field:** The area around a magnet where a magnetic force is experienced is called the magnetic field. It is a quantity that has both direction and magnitude, (*i.e.,* Vector quantity).
- ❖ **Magnetic field and field lines:** The influence of force surrounding a magnet is called magnetic field. In the magnetic field, the force exerted by a magnet can be detected using a compass or any other magnet.

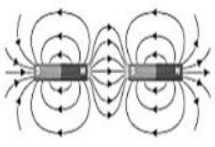
DIRECTIONS OF MAGNETIC LINES

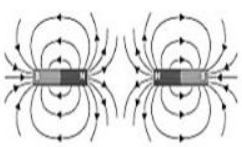


BAR MAGNET



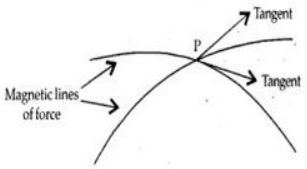
ELECTROMAGENETIC FIELD

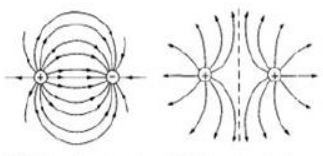

UNLIKE POLES ATTRACT


LIKE POLES ATTRACT

Two magnetic field lines never intersect each other -The direction of magnetic field at any point is obtained by drawing a tangent to the magnetic field line at that point. If, two magnetic field lines intersect each other magnetic field at intersect point will have two directions which is not possible.

Magnetic field are closed curves - It is taken by convention that the field lines emerges from north pole and merge at the south pole. Inside the magnet, the direction of field lines is from its south pole to its north pole. Thus, the magnetic field lines are closed curves.




(c) Positive and negative charge (d) Positive and positive charge

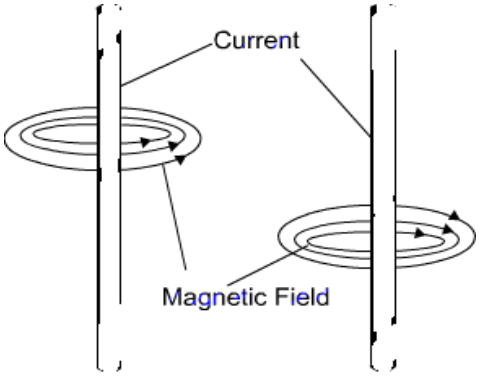
❖ **Direction of field line:**

- Outside the magnet, the direction of magnetic field line is taken from North Pole to South Pole.
- Inside the magnet, the direction of magnetic field line is taken from South Pole to North Pole.

❖ **Strength of magnetic field:** The closeness of field lines shows the relative strength of magnetic field, *i.e.* closer lines show stronger magnetic field and vice – versa. Crowded field lines near the poles of magnet show more strength.

❖ **Magnetic field lines due to current a current carrying straight conductor**

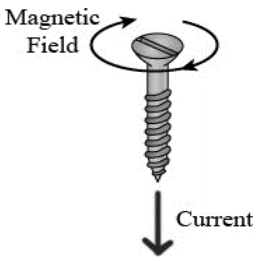
- A current carrying straight conductor has magnetic field in the form of concentric circles, around it. Magnetic field of current carrying straight conductor can be shown by magnetic field lines.

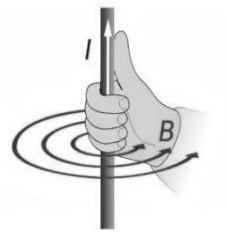


- The direction of magnetic field through a current carrying conductor depends upon the direction of flow electric current.

Note: Let a current carrying conductor be suspended vertically and the electric current is flowing from south to north. In this case, the direction of magnetic field will be anticlockwise. If the current is flowing from north to south, the direction of magnetic field will be clockwise.

- **The direction of magnetic field** - In relation to direction of electric current through a straight conductor can be depicted by using the Right-Hand Thumb Rule. It is also known as Maxwell ‘s Corkscrew Rule.
- **Maxwell’s Corkscrew rule:** As per Maxwell ‘s Corkscrew Rule, if the direction of forward movement of screw shows the direction of the current, then the direction of rotation of screw shows the direction of magnetic field.



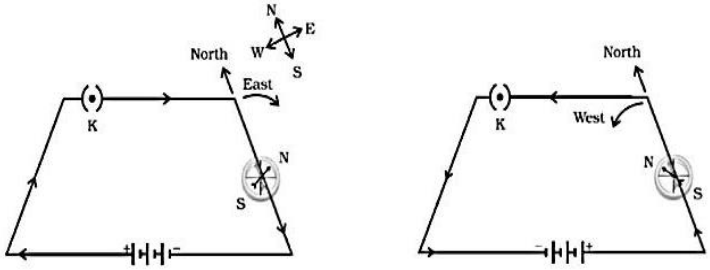


- **Right-Hand Thumb Rule:** If a current carrying conductor is held by right hand, keeping the thumb straight and if the direction of electric current is in the direction of thumb, then the direction of wrapping of other fingers will show the direction of magnetic field.

❖ **Properties of magnetic field**

- The magnitude of magnetic field increases with increase in electric current and decreases with decrease in electric current.
- The magnitude of magnetic field produced by electric current decreases with increase in distance and vice – versa. The size of concentric circles of magnetic field lines increases with distance from the conductor, which shows that magnetic field decreases with distance.
- Magnetic field lines are always parallel to each other inside the magnet.
- No two field lines cross each other.

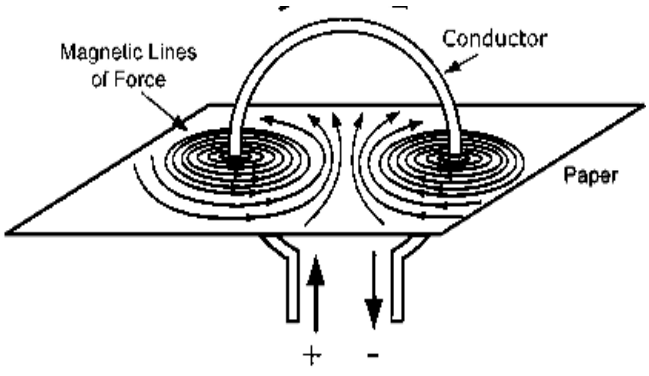
The deflection in the needle becomes opposite when the direction of the current is reversed



The electric current through a metallic conductor produces a magnetic field around it. If the current flows from north pole to the south pole, the north pole of the compass needle would move towards the east. If we will replace the cell connections in the circuit, this would result in the change of the direction of the current through the copper wire, that is from south to north. Observe the change in the direction of deflection of needle. You will see that now the needle moves in the opposite direction, that is towards the west. It means that the direction of magnetic field produced by the electric current is also reversed.

❖ **Magnetic field in circular current carrying conductor**: The magnetic field is produced in the same manner as it is in case of a straight current carrying conductor.

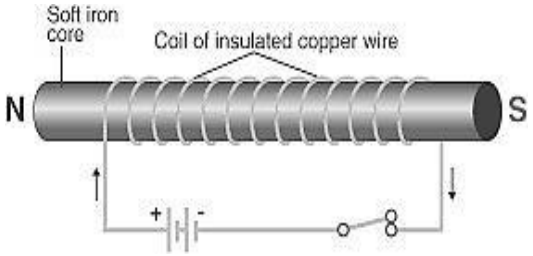
- In case of a circular current carrying conductor, the magnetic field lines would be in the form of iron concentric circles around every part of the periphery of the conductor. Since, magnetic field lines tend to remain closer when near to the conductor, so the magnetic field would be stronger near the periphery of the loop. On the other hand, the magnetic field lines would be distant from each other when we move towards the center of the current carrying loop. Finally, at the center, the arcs of big circles would appear as a straight line.



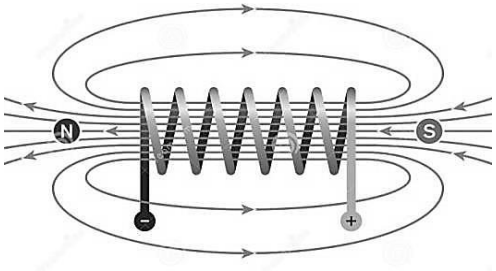
- **The direction of the magnetic field in loop conductor**
  - **Right Hand Thumb‘s Rule**. Let us assume that the current is moving in anti-clockwise direction in the loop. In that case, the magnetic field would be in clockwise direction, at the top of the loop. Moreover, it would be in an anti-clockwise direction at the bottom of the loop.
  - **Clock Face Rule:** A current carrying loop works like a disc magnet. The polarity of this magnet can be easily understood with the help of Clock Face Rule. If the current is flowing in anti – clockwise direction, then the face of the loop shows North Pole. On the other hand, if the current is flowing in clockwise direction, then the face of the loop shows South Pole.
- **Magnetic field and number of turns of coil:** Magnitude of magnetic field gets summed up with increase in the number of turns of coil. If there are ‘n‘turns of coil, magnitude of magnetic field will be ‘n‘ times of magnetic field in case of a single turn of coil. The strength of the magnetic field at the center of the loop(coil) depends on -
  - The radius of the coil: The strength of the magnetic field is inversely proportional to the radius of the coil. If the radius increases, the magnetic strength at the center decreases
  - The number of turns in the coil: As the number of turns in the coil increase, the magnetic strength at the centre increases, because the current in each circular turn is having the same direction, thus, the field due to each turn adds up.
  - The magnetic field produced by current carrying coil is directly proportional to the magnitude of the current passing through it.

❖ **Magnetic field due to a current in a Solenoid:**

- Solenoid is the coil with many circular turns of insulated copper wire wrapped closely in the shape of a cylinder.
- A current carrying solenoid produces similar pattern of magnetic field as a bar magnet. One end of solenoid behaves as the North Pole and another end behaves as the South Pole.
- Magnetic field lines are parallel inside the solenoid, similar to a **bar magnet**, which shows that magnetic field is same at all points inside the solenoid.
- The strength of magnetic field is proportional to the number of turns and magnitude of current.
- By producing a strong magnetic field inside the solenoid, magnetic materials can be magnetized. Magnet formed by producing magnetic field inside a solenoid is called **electromagnet.**



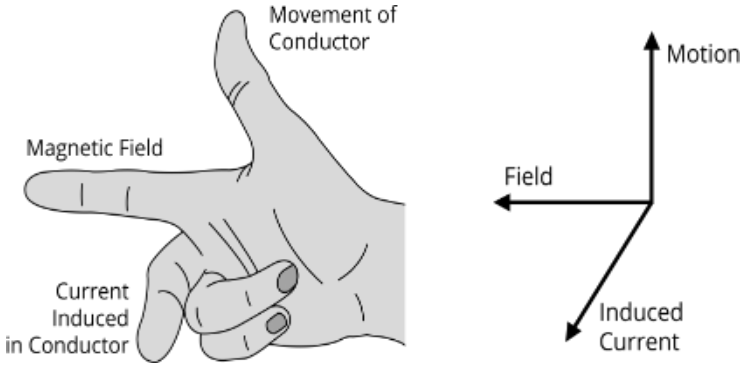
❖ **Electromagnet:** An electromagnet consists of a long coil of insulated copper wire wrapped on a soft iron.



❖ **Force on a current carrying conductor in a magnetic field:** A current carrying conductor exerts a force when a magnet is placed in its vicinity. Similarly, a magnet also exerts equal and opposite force on the current carrying conductor. This was suggested by Marie Ampere, a French Physicist and considered as founder of science of electromagnetism.

- The direction of force over the conductor gets reversed with the change in direction of flow of electric current. It is observed that the magnitude of force is highest when the direction of current is at right angles to the magnetic field.

- **Fleming's Left-Hand Rule:** If the left hand is stretched in a way that the index finger, the middle finger and the thumb are in mutually perpendicular directions, then the index finger and middle finger of a stretched left hand show the direction of magnetic field and direction of electric current respectively and the thumb shows the direction of motion or force acting on the conductor.
- Many devices, such as electric motor, electric generator, loudspeaker, etc. work on Fleming's Left Hand Rule.

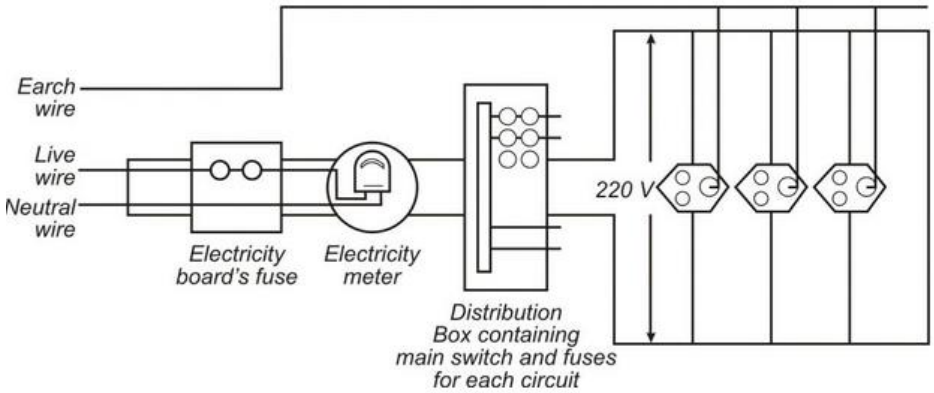


❖ **A.C. & D.C. CURRENT**

- **A.C. Current – Alternate Current**: Current in which direction is changed periodically is called Alternate Current. In India, most of the power stations generate alternate current. The direction of current changes after every 1/100 second in India, i.e., the frequency of A.C in India is 50 Hz.
- **D.C. – Direct Current:** Current that flows in one direction only is called Direct current. Electrochemical cells produce direct current.

- **Advantages of A.C. over D.C.**
  - A.C is transmitted up to a long distance without much loss of energy is advantage of A.C. over D.C.
  - Cost of generator of A.C is much less than that of D.C.
  - A.C can be easily converted to D.C.
  - A.C can be controlled by the use of choke which involves less loss of power whereas; D.C can be controlled using resistances which involves high energy loss.
  - AC machines are stout and durable and do not need much maintenance.
- **Disadvantages of AC**
  - AC cannot be used for the electrolysis process or showing electromagnetism as it reverses its polarity.
  - AC is more dangerous than DC.

❖ **Domestic Electric Circuits:** We receive electric supply through mains supported through the poles or cables. In our houses, we receive AC electric power of 220 V with a frequency of 50 Hz. (The AC changes direction after every 1/100 second).
❖ The 3 wires in domestic circuits are as follows
- **Live wire** – (**Red** insulated, Positive)
- **Neutral wire** – (**Black** insulated, Negative)
- **Earth wire** – (**Green** insulated) for safety measure to ensure that any leakage of current to a metallic body does not give any serious shock to a user.



- The potential difference (or voltage) which is supplied in India is 220V.
- The electric current in house is first passed through a circuit called a fuse (High resistant and low melting point metal/ore conductor wire). If any high voltage, overloading, voltage fluctuation or short circuit occurs, the fuse wire melts thereby restricting the current supply and preventing the high voltage from reaching the electric appliances.
- These wires are passed to different electric appliances of the house through the meter board.
- Generally, 2 types of electric circuits are used for household use:
  - 15A: Appliances that have higher power ratings. *i.e.* Geysers, ACs, Refrigerators.
  - 5A: Appliances that have lower power ratings. *i.e.* Television, Fans, Bulbs.

❖ **Short Circuit:** Short-circuiting is caused by the touching of live wires and neutral wire and sudden a large current flow. It happens due to
- Damage of insulation in power lines.
- A fault in an electrical appliance.
- Overloading of an Electric Circuit: The overheating of electrical wire in any circuit due to the flow of a large current through it is called overloading of the electrical circuit.
- A sudden large number of current flows through the wire, which causes overheating of wire and may cause fire also.

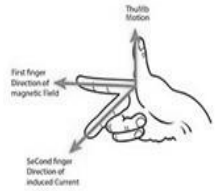
❖ **Electric Fuse:** It is a protective device used for protecting the circuit from short-circuiting and overloading. It is a piece of thin wire of material having a low melting point and high resistance.
- Fuse is always connected to live wire.
- Fuse is always connected in series to the electric circuit.
- Fuse is always connected to the beginning of an electric circuit.
- Fuse works on the heating effect.

Deleted Portion - 2023

Electromagnetic induction

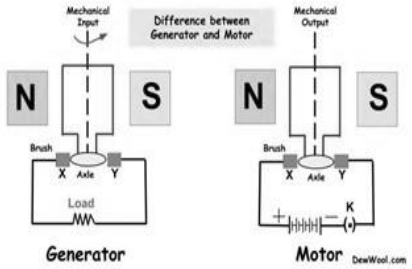
↓

Fleming's Right Hand Rule



Converts mechanical to Electrical energy

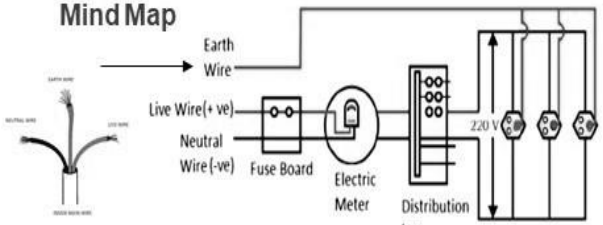
Electric Generator



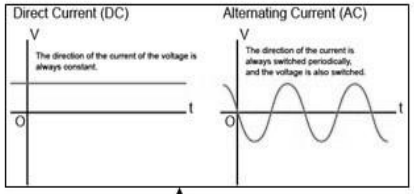
converts electrical to mechanical energy

Electric Motor

Mind Map



There are 3 types of wires in domestic circuits



DOMESTIC CIRCUITS

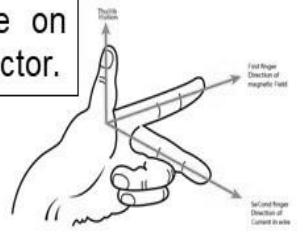
MAGNETIC EFFECTS OF CURRENT

magnetic fields by electric current

Force on current carrying conductor

French scientist Andre Marie Ampere suggested that the magnet must also exert an equal and opposite force on the current-carrying conductor.

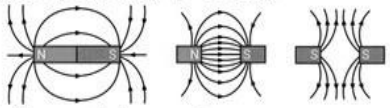
Fleming's left-hand rule



Field due to current carrying conductor

Magnetic Field lines

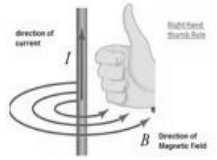
1. Move North to South



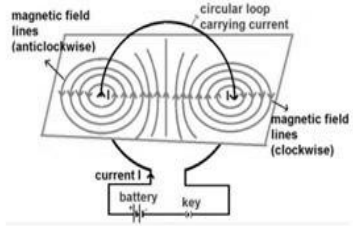
2. Never Intersect

3. Control direction of magnetic force

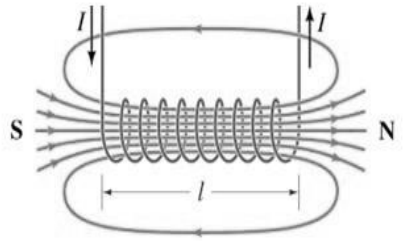
A. Field due to a straight conductor



B. Field due to a current through a circular loop



C. Field due to Solenoid



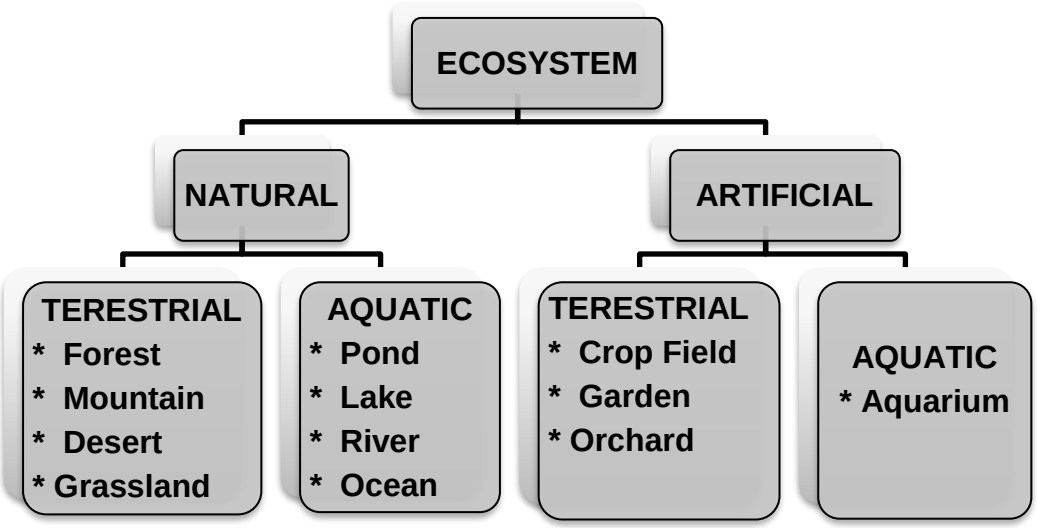
CHAPTER 13

OUR ENVIRONMENT

CONTENTS *(reference: CBSE SYLLABUS – 2024*)

- ❖ **Eco-system**
- ❖ **Environmental problems**
- **Ozone depletion**
- **Waste production and their solutions**
- **Biodegradable and non-biodegradable substances**

- ❖ **ENVIRONMENT-** All the living and nonliving components present in the surroundings of the organism forms an environment. The organism interacts with all environment components direct or indirect.
- ❖ **ECOSYSTEM-** It is a dynamic functional unit where the biotic and abiotic components are continuously interacting with each other in a given area.
- **Biotic components**- All the living things include Virus, Bacteria, Fungi, Algae, Plants and Animals.
- **Abiotic components** – All the non-living things include soil, air, water, sunlight, rain, temperature, humidity.



- ❖ **BIOTIC COMPONENTS**
- **Producer:** They are also known as autotrophic. They are always the initiative of any food chain and perform as an energy source. They may perform photosynthesis or chemosynthesis. Example- pants blue green algae and sulphur bacteria.
- **Consumer:** They are also known as heterotrophic. They consume the food either directly from the producer or indirectly by feeding on other consumers.

- Types of consumers –

✓ **Herbivores**

✓ **Carnivores**

✓ **Omnivores**

- **Decomposers:** feed on dead and decomposed products. *e.g.* fungi, bacteria. They break down the complex organic substance into simple inorganic substances, clean the environment and thus help in recycling the materials in the biosphere.

❖ **ENERGY FLOW IN AN ECOSYSTEM**

- Based on the law of conservation of energy, energy transfers as food from one trophic level to another in one direction.
- The flow of energy can be represented as food chain, food web, pyramids etc.
- A food chain follows 10% law for the transfer of energy from one trophic level to the next.

❖ **FOOD CHAIN:** The energy based interlinks sequence of living organisms where one organism depends on another organism for food.

- Grass → Goat → Tiger
- Grass → Insects → Frog → Snake → Eagle
- Planktons → Insects → Fish → Crane

❖ **10% LAW FOR TRANSFER OF ENERGY IN A FOOD CHAIN:** Only 10 % of energy is transferred from one trophic level to another. Rest of energy is lost as heat, into doing work, in digestion, growth, reproduction.

Note:

- The green plants capture 1% of solar energy that falls on their leaves and convert it into food energy.
- Since the loss of energy at each step is so great that very little usable energy remains after four trophic levels. So generally, food chains consist of only three or four steps.

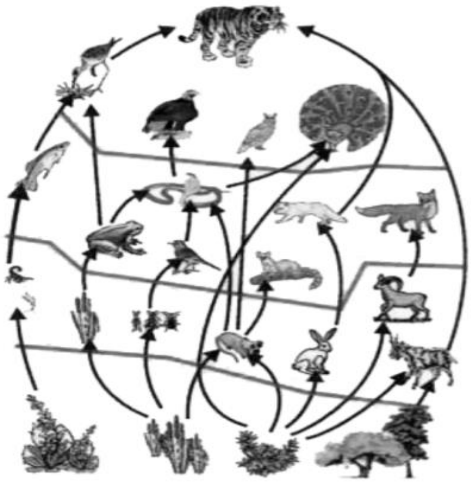
❖ **TROPHIC LEVELS:** The steps/ links /levels in a food chain/ food web at which the transfer of food as energy takes place.

❖ **ECOLOGICAL PYRAMID: It is a graphical** representation of the food chain.

❖ **FOOD WEB**

- It is interconnected food chains in an ecosystem.
- It forms a network of relationships between various species.

- In a food web, one organism may occupy a position in more than one food chain. More stable food chain / food web means a more stable ecosystem.



(Image Source- https://www.doubtnut.com/qna/642804036)

❖ **BIOMAGNIFICATION:** It is also known as bio amplification or biological magnification. It is the increase in concentration of a toxic substance (like pesticide, harmful chemicals) in the body of organisms in a food chain.

❖ **OZONE LAYER**

- Ozone (O3) is a molecule formed by three atoms of oxygen and is a deadly poisonous gas.
- At higher layers of atmosphere O3 shields the surface of the earth from ultraviolet (UV) radiation from the Sun. UV radiation is highly damaging to organisms. It may even cause skin cancer in human beings.
- Ozone at the higher levels of the atmosphere is a product of UV radiation acting on oxygen (O2) molecules. The higher energy UV radiations split apart some molecular oxygen (O2) into free oxygen (O) atoms. These atoms then combine with the molecular oxygen to form ozone.

$$O_2 \xrightarrow{UV} O + O$$

$$O + O_2 \rightarrow O_3$$
(Ozone)

(Source-https://ncert.nic.in/textbook.php?jesc1=13-13)

❖ **OZONE LAYER DEPLETION:** Ozone layer depletion is directly meant to the decreasing amount of this protective layer in the atmosphere. This phenomenon came in the 1980s. This decrease has been linked to synthetic chemicals like Chlorofluorocarbons (CFCs) which are used as refrigerants and in fire extinguishers.

- In 1987, the United Nations Environment Programme (UNEP) succeeded in forging an agreement to freeze CFC production at 1986 levels.

TYPES OF WASTE AROUND US	
BIODEGRADABLE WASTES	**NON-BIODEGRADABLE WASTE**
• Decomposers can decompose these types of wastes by natural biological processes. • Ecosystem is not harmed by these wastes. • Examples are Food waste, plants and animals and their wastes, sewage, plant and animal products.	• Decomposers cannot decompose these types of wastes by natural biological processes. • Ecosystem is harmed by these wastes and creates pollution of the environment. • Examples are Chemical pesticides, DDT, mercury, lead, plastics, polythene bags etc.

❖ **MANAGEMENT OF GARBAGE THAT WE PRODUCE**

- We have to use alternative substances creating only biodegradable wastes.
- We can encourage proper disposal of wastes.
- Follow Sewage treatment norms
- 5 R ‘principle to be encourage and made aware in the society-

✓ **REFUSE**

✓ **REDUCE**

✓ **REUSE**

✓ **REPURPOSE**

✓ **RECYCLE.**

❖ **REFERENCES**

- https://ncert.nic.in/textbook.php?jesc1=13-13
- https://docs.google.com/document/d/1x4PG4fqTinTBhaxdLsgk2D-9utxTUns6/edit
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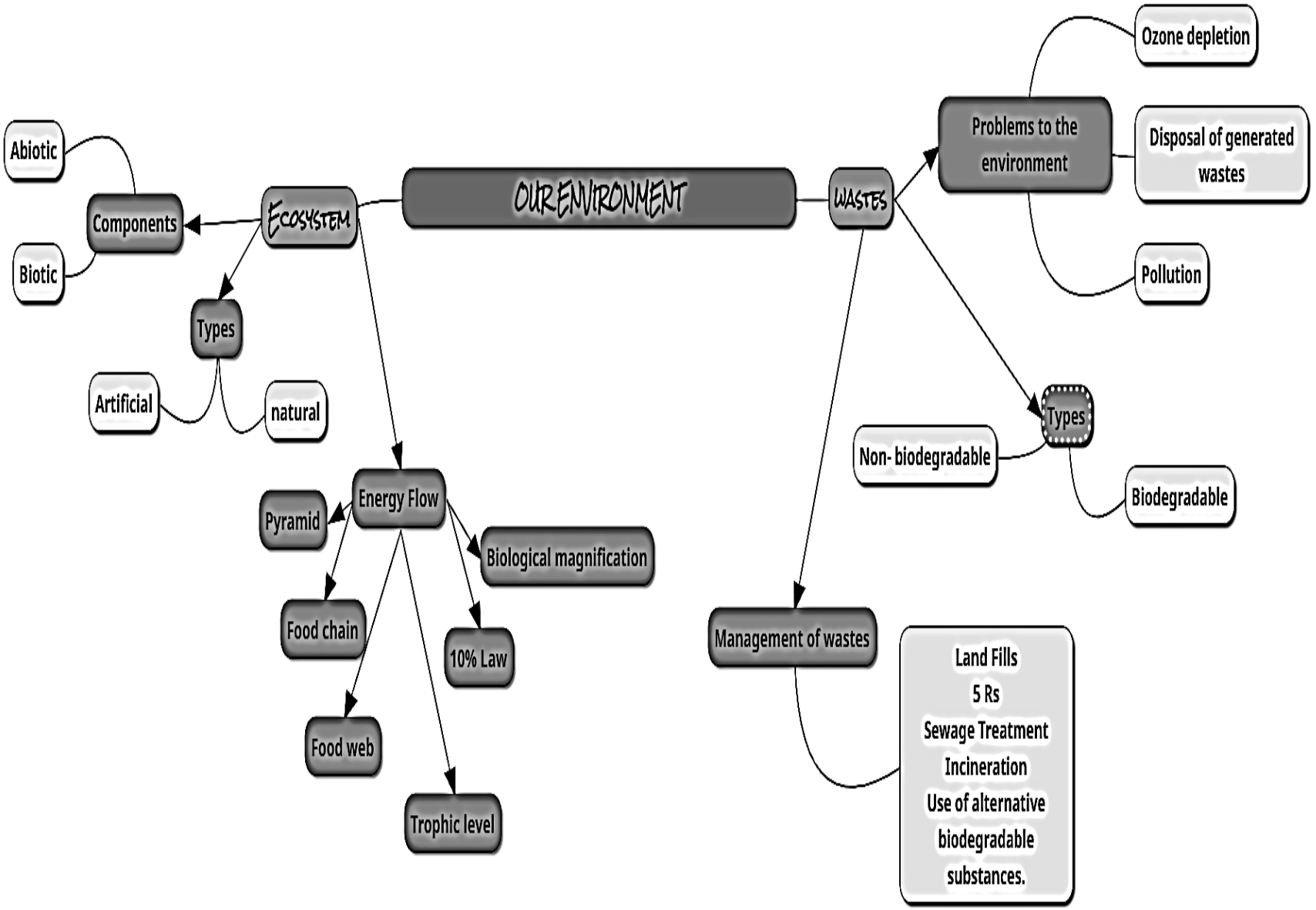

OUR ENVIRONMENT
ECOSYSTEM
Components
Abiotic
Biotic
Types
Artificial
natural
Energy Flow
Pyramid
Food chain
Food web
Trophic level
10% Law
Biological magnification
WASTES
Problems to the environment
Ozone depletion
Disposal of generated wastes
Pollution
Types
Non- biodegradable
Biodegradable
Management of wastes
Land Fills
5 Rs
Sewage Treatment
Incineration
Use of alternative biodegradable substances.

QUESTION BANK

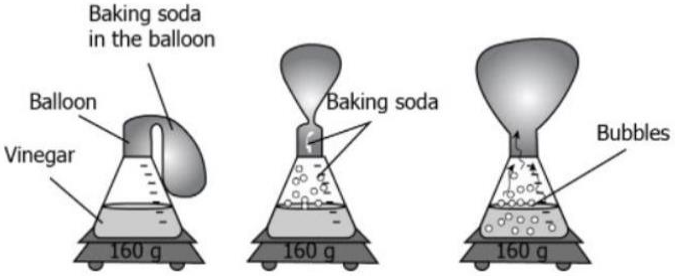
CHAPTER - 1

CHEMICAL REACTIONS AND EQUATIONS

Question Bank

Multiple Choice Questions

1. Choose the correct statements about the given reactions.
   $3Fe\ (s) + 4H_2O\ (g) \rightarrow Fe_3O_4\ (s) + 4H_2\ (g)$
   (i) Iron metal is getting oxidised
   (ii) Water is getting reduced
   (iii) Water is acting as reducing agent
   (iv) Water is acting as oxidising agent
   (A) (i), (ii) and (iii) (C) (ii) and (iv)
   (B) (i), (ii) and (iv) (D) (ii) and (iv)
2. Find out the exothermic processes from the following reactions:
   (i) Reaction of water with quicklime
   (ii) Dilution of an acid
   (iii) Evaporation of water
   (iv) Sublimation of camphor (crystals)
   (A) (i) and (ii) (C) (ii) and (iii)
   (B) (i) and (iv) (D) (ii) and (iv)
3. Which of the following is not a chemical reaction?
   (A) Souring of milk
   (B) Dissolution of sugar in water
   (C) Rusting of iron
   (D) Digestion of food
4. $Pb + CuCl_2 \rightarrow PbCl_2 + Cu$
   The above reaction is an example of:
   (A) Combination
   (B) Decomposition
   (C) Double displacement
   (D) Displacement
5. Out of the following metals, find out the one which is protected by a layer of its oxide?
   (A) Copper
   (B) Silver
   (C) Iron
   (D) Aluminium
6. A student poured 100 mL of water in a bottle and added 40mL vinegar to it. A balloon was filled with 20 g baking soda and was fixed at the mouth of the bottle. Slowly the shape of the balloon changed, as shown.



The student claims that a chemical change happened when the two substances were mixed. Is the claim made by the student, correct?
(A) Yes, as a new substance was formed in the form of a gas.
(B) Yes, as the mass remains the same throughout the experiment.
(C) No, as the formation of bubbles in the mixture shows a physical change.
(D) No, as the change in the shape and size of the balloon shows a physical change.

7. Give the ratio in which hydrogen and oxygen are present in water by volume.
(A) 1:2 (B) 1:1 (C) 2:1 (D) 1:8

ASSERTION AND REASON TYPE QUESTIONS

DIRECTION: Each of these questions contains an assertion (A) followed by reason (R). Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.
(a) If both Assertion and Reason are true and reason is the correct explanation of Assertion.
(b) If both Assertion and Reason are true, but reason is not the correct explanation of A.
(c) If Assertion is true but Reason is false.
(d) If Assertion is false but Reason is true.

1. **Assertion (A):** Photosynthesis is considered as an endothermic reaction.
Reason (R): Energy gets released in the process of photosynthesis.
2. **Assertion (A):** Decomposition of vegetable matter into compost is an example of exothermic reactions.
Reason (R): Exothermic reactions are those reactions in which heat is evolved.
3. **Assertion (A):** When HCl is added to zinc granules, a chemical reaction occurs.
Reason (R): Evolution of a gas indicates that the chemical reaction is taking place.
4. **Assertion (A):** Calcium carbonate when heated gives calcium oxide and water.
Reason (R): On heating calcium carbonate, decomposition reaction takes place.
5. **Assertion (A):** Brown fumes are produced when lead nitrate is heated.
Reason (R): Nitrogen dioxide gas is produced as a by-product due to the decomposition of lead nitrate.

SHORT ANSWER TYPE QUESTIONS

1. Translate the following statements into chemical equations and then balance them.
(a) Hydrogen gas combines with nitrogen to form ammonia.
(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
2. A shiny brown coloured element ‘X’ on heating in air becomes black in colour. Name the element ‘X’ and the black coloured compound formed.
3. Give reasons:
(a) Aluminium is a reactive metal but it is still used for packing food articles.
(b) Red litmus paper turns blue when touched with aqueous solution of white powder obtained by burning magnesium ribbon.
(c) We store silver chloride in dark coloured bottles.

LONG ANSWER TYPE QUESTIONS

1. A compound 'X' used for drinking, has pH =7. Its acidified solution undergoes decomposition in presence of electricity to produce gases 'Y' and 'Z' The volume of Y is double than Z. Y is highly combustible whereas Z is supporter

of combustion. identify X, Y & Z. Write the chemical reactions involved. List the use of X, Y and Z. Name the type of reaction involved in the process.

2. What happens when zinc granules are treated with dilute solution of H_2SO_4, HCl, HNO_3, NaCl and NaOH, also write the chemical equations if reaction occurs.
3. (i) Crystals of copper sulphate are heated in a test tube for some time.
   a. What is the colour of copper sulphate crystals before heating and after heating?
   b. What is the source of liquid droplets seen on the inner upper side of the test tube during the heating process?
   (ii) A metal 'X' when dipped in aqueous solution of aluminium sulphate, no reaction is observed whereas when it is dipped in an aqueous solution of ferrous sulphate, the pale green solution turns colourless. Identify metal 'X' with reason.
4. A student dropped few pieces of marble in dilute hydrochloric acid contained in a test tube. The evolved gas was then passed through lime water. What change would be observed in lime water? Identify the gas evolved. What happens when the evolved gas is passed in excess through lime water? Write balanced chemical equation for each change observed?
5. Complete the missing components/variables given as x and y in the following reactions:

(a) $Pb(NO_3)_2\ (aq) + 2KI(aq) \longrightarrow PbI_2\ (x) + 2KNO_3(y)$

(b) $Cu(s) + 2Ag\ NO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + x(s)$

(c) $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(x) + H_2(y)$

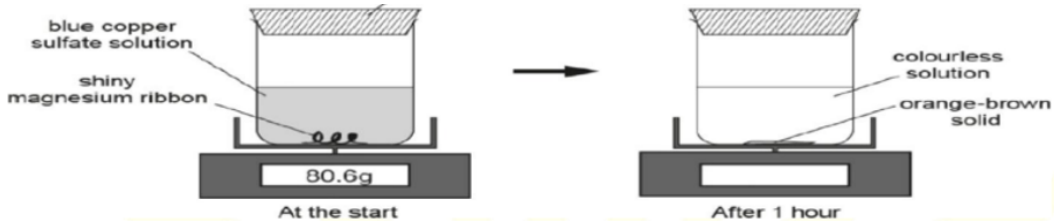
(d) $CaCO_3(s) \xrightarrow{x} CaO(s) + CO_2(g)$

(e) $Cu + x\ HNO_3$ ----------> $Cu(NO_3)_2 + yNO_2 + 2H_2O$

CASE BASED QUESTIONS

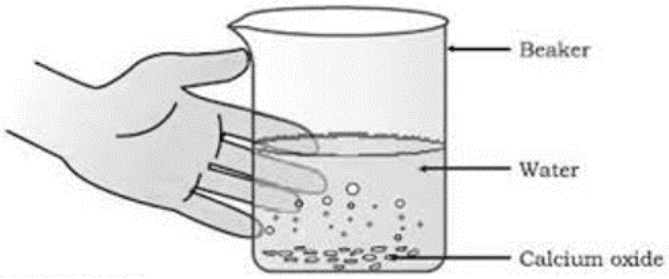
I.Read the following and answer the questions:

A student was asked to investigate what happens when a piece of shiny magnesium ribbon is added to copper sulphate solution. The apparatus was set up as shown below. The mass was recorded at the start and again after one hour.



1. Write the balanced chemical equation for the reaction taking place. (1)
2. Name the above reaction. (1)
3. The mass of the beaker and content after 1 hour is _____ (1)
4. The experiment was repeated using sodium sulphate solution instead of copper sulphate solution. What will be observed in this case? Write the chemical reaction taking place if any. Put the metals copper, magnesium and sodium in order of their increasing reactivity. (2)

II. Read the following and answer the questions:

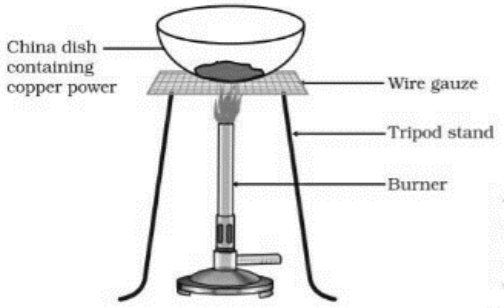


In the above image, a small amount of quick lime is taken in a beaker and water is added to it slowly. When we touch the beaker, we feel that the temperature of the beaker changes.

1. Name and define the type of reaction that has taken place? (1)
2. Chemical name of the quick lime…….. . (1)
3. Write balanced chemical equation for the above reaction and the chemical name of the product formed. (1)
4. List two main observations of this reaction. (2)

III. Read the following passage and answer the questions that follow:

Redox reactions are an important class of reactions. The oxidation and reduction reactions occur simultaneously in a redox reaction. The activity in which copper powder is taken in a china dish and heated helps in understanding redox reactions.



1. Observe the given figure and write what happens when copper powder is heated in a China dish. Write the chemical reaction taking place. (2)
2. Mention your observation if hydrogen gas is passed over the heated material obtained in the above reaction? (1)
3. Identify the substance oxidised and the substance reduced in the reaction in 2nd case given above. (1)
4. What is an oxidizing agent? (1)

CHAPTER - 1

CHEMICAL REACTIONS AND EQUATIONS

Answers

Multiple choice Questions

1. B
2. A
3. B
4. D
5. D
6. A
7. A

A-R TYPE

1. C
2. A
3. A
4. D
5. A

SHORT ANSWER TYPE:

1. (a) $3H_2$ (g) + N_2 (g) → $2NH_3$ (g)
   (b) H_2S (g) + $3O_2$ (g) → SO_2 (g) + $2H_2O$(l)

2. Element 'X' is copper (Cu). The black coloured compound is copper oxide (CuO). The reaction involved is

$$\underset{\text{Copper (Brown)}}{2Cu} + \underset{\text{Oxygen}}{O_2} \longrightarrow \underset{\text{Copper oxide}}{2CuO}$$

3. (a) Al forms a protective layer of Al2O3 which prevent further oxidation.
   (b) Magnesium hydroxide is basic in nature.
   (c) On exposure to sunlight, silver chloride decomposes to form silver and chlorine.

4. (i) Those reactions in which oxidation and reduction takes place simultaneously are called redox reactions.
(a) Fe_2O_3 is getting reduced to Fe and Al is getting oxidised to Al_2O_3.
(b) PbO is reduced to Pb and C is oxidised to CO_2.

5. When marble ($CaCO_3$) reacts with dil.HCl, CO_2 gas is evolved.

$$CaCO_3 (s) + 2HCl (aq) \longrightarrow CaCl_2 (aq) + H_2O (l) + CO_2 (g)$$

When the gas evolved is passed through lime water, it becomes milky due to the formation of insoluble calcium carbonate.

$$Ca(OH)_2 + CO_2 (g) \longrightarrow CaCO_3 (s) + H_2O (l)$$

When CO_2 gas is passed in excess through lime water, the milkiness disappears

$$CaCO_3 (s) + CO_2 (g) + H_2O (l) \longrightarrow Ca(HCO_3)_2 (aq)$$

LONG ANSWER QUESTIONS:

1. In the given situation, X = H_2O, Y = H_2 and Z = O_2 (1 ½ + 1+ 1 1/2)

Chemical reaction:

$$2H_2O \xrightarrow{\text{Electricity}} 2H_2 + O_2$$

Uses – H_2O – For drinking, cooking, washing, etc.
H_2 – For manufacture of ammonia
O_2 – For breathing, burning

It is Electrolytic decomposition reaction

2. (a) $Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$ (1*5=5)
(b) $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$
(c) Reaction with dilute HNO_3 is different as compared to other acids because nitric acid is an oxidising agent and it oxidises H_2 gas evolved to H_2O.
$4\ Zn(s) + 10\ HNO_3(aq) \rightarrow 4\ Zn(NO_3)_2(aq) + 5\ H_2O(l) + N_2O(g)$
(d) $Zn(s) + NaCl(aq) \rightarrow$ No reaction
(e) $Zn(s) + 2\ NaOH(aq) \rightarrow Na_2ZnO_2(aq) + H_2(g)$
Sodium zincate

3. (i) (a) Before heating – blue, after heating – white (2+1+2)
(b) Water of crystallization
(ii) X = zinc as more reactive so displaces iron from its solution.
$Zn + FeSO_4$ ----------$\rightarrow ZnSO_4 + Fe$

4. When marble ($CaCO_3$) reacts with dil.HCl, CO_2 gas is evolved. (2+1+2)
$CaCO_3(s) + 2HCl(aq)$ ---------$\rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$
When the gas evolved is passed through lime water, it becomes milky due to the formation of insoluble calcium carbonate.
$Ca(OH)_2 + CO_2(g)$ ---------$\rightarrow CaCO_3(s) + H_2O(l)$
When CO_2 gas is passed in excess through lime water, the milkiness disappears
$CaCO_3(s) + CO_2(g) + H_2O(l)$ ----------$\rightarrow Ca(HCO_3)_2(aq)$

5. (1*5 = 5)

(a) $Pb(NO_3)_2(aq) + 2KI(aq) \longrightarrow PbI_2(s) + 2KNO_3(aq)$
therefore '*x*' is (*s*), '*y*' is (*aq*).

(b) $Cu(s) + 2AgNO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + 2Ag(s)$
therefore '*x*' is Ag(*s*)

(c) $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + H_2(g)$ therefore
'*x*' is (*aq*), '*y*' is (*g*)

(d) $CaCO_3(s) \xrightarrow{heat} CaO(s) + CO_2(g)$
'*x*' is 'heat'.

(e) X = 4 and y = 2

CASE BASED QUESTIONS

(I)
1. $Mg(s) + CuSO_4(aq) \rightarrow MgSO_4(aq) + Cu(s)$
2. Displacement reaction
3. Same as before 80.6 g
4. No reaction would have taken place as sodium is more reactive than magnesium.
Na> Mg> Cu --- order of reactivity

(II)
1. Combination and exothermic reaction.
2. Calcium oxide
3. $CaO + H2O \rightarrow Ca(OH)2 + heat$

4. Quick lime reacts with water to form calcium hydroxide and releases heat. - The reaction is exothermic and causes the solution to become hot. - The hissing sound is due to the evolution of steam.

(III)

1. When copper powder is heated in the presence of oxygen, it reacts with oxygen to form copper oxide. The copper oxide is black in colour. It is formed due to due to oxidation of copper.

Chemical equation – $2Cu + O2 \rightarrow 2CuO$

2. Reverse reaction occurs and black colour changes to brown again.

$CuO + H2 \rightarrow Cu + H2O$

3. Substance oxidised – H_2
   Substance reduced – CuO
4. Oxidizing agent is the substance that oxidises the other substance and itself gets reduced.

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Chapter-2
ACIDS, BASES AND SALTS

Question Bank

Multiple Choice Questions

1.Identify the correct statement about an aqueous solution of an acid and of a base?

(i) Higher the pH, stronger the acid (ii) Higher the pH weaker the acid

(iii) Lower the pH, stronger the base (iv) Lower the pH, weaker the base

(a) i & iii (b) ii & iii (c) I & iv (d) ii & iv

2. Tooth enamel is made up of
(a) Calcium phosphate
(b) Calcium carbonate
(c) Calcium oxide
(d) Potassium sulphate

3. Rain is called acid rain when its:
(a) pH falls below 7 (b) pH falls below 6
(c) pH falls below 5.6 (d) pH is above 7

4. Sodium hydroxide turns phenolphthalein solution
(a) pink (b) yellow (c) colourless (d) orange

5. An aqueous solution turns red litmus solution blue. Excess addition of which of the following solution would reverse the change?
(a) Baking powder
(b) Lime
(c) Ammonium hydroxide solution
(d) Hydrochloric acid

6. If a substance has a pH value of 7, Which one of the given is true?
(a) The substance is a base
(b) The substance is an acid
(c) The substance is a neutral substance
(d) Either (A) or (B)

7. Two aqueous solutions P and Q have pH of 5 and 13 respectively. The correct inference is that:
(a) solution P is of HCl and Q is of NH_4OH
(b) solution P is of CH_3COOH and Q is of $Ca(OH)_2$
(c) solution P is of HNO_3 and Q is of NH_4OH
(d) solution P is of CH_3COOH and Q is of NaOH

8. The difference of molecules of water in gypsum and PoP is
(a) 5/2
(b) 2
(c) 3/2
(d) ½

9. Which of the following does not form an acidic salt?
(a) Nitric acid
(b) Carbonic acid
(c) Hydrochloric acid
(d) Sulphuric acid

10. Farmers neutralize the effect of Acidity on soil by adding
(a) Slaked Lime (b) Gypsum
(c) Caustic Soda (d) Baking Soda

ASSERTION REASON QUESTIONS

The following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below

A. Both A and R are true, and R is the correct explanation of A
B. Both A and R are true, and R is not the correct explanation of A
C. A is true but R is false
D. A is False but R is true

1. Assertion: Most of the metals do not give hydrogen while reacting with nitric acid.
   Reason: Nitric acid is a weak oxidising agent.
2. Assertion (A): HCl gas does not change the colour of dry blue litmus paper.
   Reason (R): HCl gas dissolves in the water present in wet litmus paper to form H+ ions.
3. Assertion (A): Acid must always be added to water with constant stirring.
   Reason (R): Mixing of an acid with water decreases the concentration of H+ ions per unit volume.
4. Assertion (A): Baking powder is used in making cake instead of using only baking soda.
   Reason (R): Baking powder contains tartaric acid which reacts with sodium removes bitter taste.

SHORT ANSWER QUESTIONS

1. Give the name and formula of two
   a. strong monobasic acids
   b. two weak dibasic acids
2. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd?
3. To a solution of sodium hydroxide in a test tube, two drops of phenolphthalein are added.
   a. State the colour change observed.
   b. If dil. HCl is added dropwise to the solution, what will be the colour change?
   c. On adding few drops of NaOH solution to the above mixture the colour of the solution reappears. Why?
4. A gas X reacts with lime water and forms a compound Y which is used as bleaching agent in the chemical industry. Identify X and Y. Give the chemical equation of the reaction involved.
5. When electricity is passed through a common salt solution, sodium hydroxide is produced along with the liberation of two gases ‘X’ and T. The gas ‘X’ burns with a pop sound whereas T is used for disinfecting drinking water.
   a. Identify X and Y.

b. Give the chemical equation for the reaction stated above.
c. State the reaction of Y with dry slaked lime.

LONG ANSWER TYPE QUESTION:

1. Explain why:
   (i) Common salt becomes sticky during the rainy season
   (ii) Blue vitriol changes to white upon heating
   (iii) If bottle full of concentrated sulphuric acid is left open in the atmosphere by
   accident, the acid out of the bottle.
2. (a) A metal compound 'X' reacts with dilute H2SO4 to produce effervescence. The gas evolved extinguishes a burning candle. If one of the compounds formed is calcium sulphate, then what is 'X' and the gas evolved? Also write a balanced chemical equation for the reaction which has occurred.
   (b) (i) Name one antacid. How does it help to relieve indigestion in stomach?
   (ii) A farmer treats the soil with quicklime or calcium carbonate. What is the nature of the soil? Why does the farmer treat the soil with quicklime?
3. (a) What is the action of red litmus on dry ammonia gas solution of ammonia gas in water?
   (b) State the observations you would make on adding ammonium hydroxide to aqueous solution of ferrous sulphate and aluminium chloride.
4. (a) Why does an aqueous solution of an acid conduct electricity?

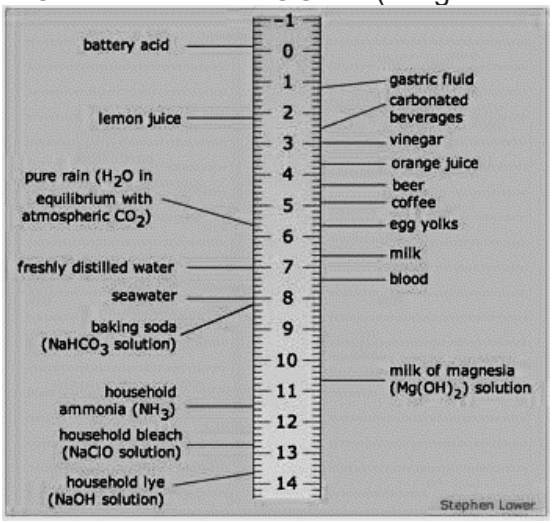
   (b) How does the concentration of hydrogen ions $[H_3O]^+$ change when the solution of an acid is diluted with water ?

   (c) Which has a higher pH value; a concentrated or dilute solution of hydrochloric acid?

   (d) What would you observe on adding dilute hydrochloric acid to sodium bicarbonate placed in a test tube?

CASE BASED QUESTIONS:

"POTENZ DE HYDROGEN" (Image source- Science buddies)



1. The image show pH of different substances, Observe and answer the questions

a) Circle Yes for those items which when consumed by human may affect protein digestion in stomach?

a. Milk of Magnesia Yes/No
b. Cold Drinks Yes/No
c. Rain water Yes/No
d. Baking soda Yes/No

b) Arrange the following in the increasing Hydroxide ion concentration.
Household lye, Ammonia solution, orange juice, fresh distilled water, rain water, battery acid.
c) Rain water is formed by evaporation of water from earth's surface but its pH is not 7 as distilled water. Give your reason for the less pH of rain water.
d) Drinking coffee after meal may affect the process of digestion? Do you agree with this statement. Support your answer with reason.

2. Sodium hydroxide When electricity is passed through an aqueous solution of sodium chloride (called brine), it decomposes to form sodium hydroxide. The process is called the chlor-alkali process because of the products formed– chlor for chlorine and alkali for sodium hydroxide.

i) Write the chemical equation involved in this process?
ii) What is the substance that are formed at anode and cathode on chlor- alkali process?
iii) What are the uses of chlorine?
iv) Where does the sodium hydroxide solution is formed? What are the uses of Sodium hydroxide?

Chapter -2
ACIDS, BASES AND SALTS
Answers

Multiple choice questions

1. d
2. a
3. c
4. a
5. d
6. c
7. d
8. c
9. b
10. a

A-R TYPE QUESTIONS

1. C
2. A
3. B
4. A

SHORT ANSWER TYPE QUESTIONS

1. (i) hydrochloric acid HCl, (ii) carbonic acid H_2CO_3
2. When milk changes into a curd, its pH value decreases i.e. lactose gets converted into lactic acid. As more of acid is formed, its pH value decreases.
3. i) On adding phenolphthalein to NaOH solution, the colour becomes pink.

ii)On adding dilute HCl solution dropwise to the same test tube, the pink colour disappears and the solution again becomes colourless.
iii)On again adding NaOH to the above mixture, the pink colour reappears because the medium becomes basic again.

4. A gas X reacts with lime water and forms a compound Y which is used as bleaching agent in the chemical industry. Identify X and Y. Give the chemical equation of the reaction involved.
5. a. The gas X' is H2 and gas 'Y' is Cl2.
   b. The chemical equation for the reaction is:

$$2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{(Electric current)}} 2NaOH\,(aq) + H_2(g) + Cl_2(g)$$

   c. Cl_2 reacts with slaked lime to form bleaching powder.

   $Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

LONG ANSWER TYPE QUESTION:

1. . (i) Common salt contains the impurity of magnesium chloride (MgCl2) which is of deliquescent nature. When exposed to atmosphere, it becomes moist. Therefore, common salt becomes sticky during the rainy reason.
   (ii) Blue vitriol (CuSO4.5H2O) upon heating changes to anhydrous copper sulphate (CuSO4) which is white in colour.
   (iii) Concentrated sulphuric acid is highly hygroscopic. It absorbs moisture from air and gets
   diluted. Since the volume increases, the acid starts flowing out of the bottle.
2. a. This is calcium carbonate
   $CaCO_3$(s) + H2SO4 (dil) → CaSO4 (aq) + H2O(l) + CO2(g)
   The gas evolved is carbon dioxide (CO_2).
   b. (i) NaHCO3(baking soda) is an antacid. If neutralises excess of HCl in stomach and gives relief.
   (ii) The nature of soil is acidic. The farmer treats the soil with quicklime (basic in nature) to neutralise the acidity of soil and make it fit for crops.
3. (a)Red litmus has no action on dry ammonia gas because it does not release any hydroxyl ions $(OH)^-$
   When passed through water, ammonia (NH3) is converted to ammonium hydroxide (NH4OH). It dissociates to give hydroxyl ions $(OH)^-$ and the solution is basic in nature. Red litmus acquires a blue colour.
   (b)A green precipitate of ferrous hydroxide would be formed by double displacement reaction.
   A white precipitate of aluminium hydroxide will be formed by double displacement reaction.
4. a) An aqueous solution of an acid conducts electricity because in water, an acid (e.g. HCl) dissociates.
   b) The concentration of hydronium ions (H_3O^+) decreases when a solution of an acid is diluted.

c) Dilute HCl has higher pH value than concentrated HCl because it has a smaller number of H^+ ions. If an acid in one of its solutions has higher pH value, then it means that the acid is in diluted form.

d) Carbon dioxide gas will evolve accompanied by brisk effervescence.
$NaHCO_3(s)+HCl(aq)\rightarrow NaCl(aq)+CO_2(g)+H_2O(aq)$

CASE BASED QUESTIONS:

1. a) a – Yes, b – No, c – No, d - Yes

b) Correct order-

Household Lye, Solution of ammonia, Distilled water, Rain water, Orange juice, Battery Acid.

c) Due to dissolution of acidic gases like carbon di oxide, sulphur di oxide and Oxides of nitrogen Ph of rain water decreases.

d) Yes, I agree with this statement. Process of digestion in stomach needs Acidic pH But drinking coffee may alter the pH to 5 temporarily that may slows down the process of protein digestion.

2. i) $2NaCl\ (aq) + 2H_2O(l) \rightarrow 2\ NaOH(aq) + Cl_2\ (g) + H_2(g)$
ii) At anode Chlorine gas & at cathode hydrogen gas are formed.
iii) Used for water treatment: Disinfectants, PVC, pesticides.
iv) It is formed near the cathode. Uses in making soaps and detergents artificial fibres paper making.

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Chapter-3

METAL AND NON-METALS

Question Bank

Multiple Choice Questions

1. Which of the following property is generally not shown by metals?
(a) Electrical conduction (b) Sonorous in nature (c) Dullness (d) Ductility
2. The ability of metals to be drawn into thin wire is known as
(a) ductility (b) malleability (c) sonorousity (d) conductivity
3. Aluminium is used for making cooking utensils. Which of the following properties of aluminium are responsible for the same?
(i) Good thermal conductivity (ii) Good electrical conductivity (iii) Ductility (iv) High melting point
(a) (i) and (ii) (b) (i) and (iii)
(c) (ii) and (iii) (d) (i) and (iv)
4. Which one of the following metals do not react with cold as well as hot water?
(a) Na (b) Ca (c) Mg (d) Fe
5. Which of the following oxide(s) of iron would be obtained on prolonged reaction of iron with steam?
(a) FeO (b) Fe_2O_3 (c) Fe_3O_4 (d) Fe_2O_3 and Fe_3O_4
6. What happens when calcium is treated with water?
(i) It does not react with water
(ii) It reacts violently with water
(iii) It reacts less violently with water
(iv) Bubbles of hydrogen gas formed stick to the surface of calcium
(a) (i) and (iv) (b) (ii) and (iii) (c) (i) and (ii) (d) (iii) and (iv)
7. Generally, metals react with acids to give salt and hydrogen gas. Which of the following acids does not give hydrogen gas on reacting with metals (except Mn and Mg)?
(a) H_2SO_4 (b) HCl (c) HNO_3 (d) All of these
8. Which one of the following properties is not generally exhibited by ionic compounds?
(a) Solubility in water
(b) Electrical conductivity in solid state
(c) High melting and boiling points
(d) Electrical conductivity in molten state
9. Which of the following metals exist in their native state in nature?
(i) Cu (ii) Au (iii) Zn (iv) Ag
(a) (i) and (ii)
(b) (ii) and (iii)
(c) (ii) and (iv)
(d) (iii) and (iv)
10. Metals are refined by using different methods. Which of the following metals are refined by electrolytic refining?
(i) Au (ii) Cu (iii) Na (iv) K
(a) (i) and (ii)
(b) (i) and (iii)

(c) (ii) and (iii)
(d) (iii) and (iv)

SHORT ANSWER TYPE QUESTIONS

1. Iqbal treated a lustrous, divalent element M with sodium hydroxide. He observed the formation of bubbles in reaction mixture. He made the same observations when this element was treated with hydrochloric acid. Suggest how can he identify the produced gas. Write chemical equations for both the reactions.
2. Why should the metal sulphides and carbonates be converted to metal oxides in the process of extraction of metal from them?
3. Compound X and aluminium are used to join railway tracks.
   (a) Identify the compound X
   (b) Name the reaction
   (c) Write down its reaction.
4. A metal M does not liberate hydrogen from acids but reacts with oxygen to give a black colour product. Identify M and black coloured product and also explain the reaction of M with oxygen.

LONG ANSWER TYPE QUESTIONS

1. A. non-metal A which is the largest constituent of air, when heated with H_2 in 1:3 ratio in the presence of catalyst (Fe) gives a gas
   B. On heating with O_2 it gives an oxide
   C. If this oxide is passed into water in the presence of air it gives an acid
   D which acts as a strong oxidising agent.
   (a) Identify A, B, C and D
   (b) To which group of periodic table does this non-metal belong?
2. Explain the following
   (a) Reactivity of Al decreases if it is dipped in HNO_3
   (b) Carbon cannot reduce the oxides of Na or Mg
   (c) NaCl is not a conductor of electricity in solid state whereas it does conduct electricity in aqueous solution as well as in molten state
   (d) Iron articles are galvanised.
   (e) Metals like Na, K, Ca and Mg are never found in their free state in nature.

CASE BASED QUESTIONS

A. Metals are the elements which are often found in nature in combined form (as ores) but few metals occur in free state too. Metals possess such specific properties which make them very useful in practical life. The properties shown by them are lustrous surface, they can also be polished for obtaining a highly reflective surface, hard and strong in nature, good conductor of heat and electricity and also malleable and ductile. But few metals are exceptionally different too in some properties like Sodium and Potassium are exceptional cases in this case as they can be cut with knife. Metallic elements possess high melting and boiling points too.

1.Which of the following metals is the most abundant in earth crust?
(a) Al (b) Fe (c) Na (d) Ca

2.Which of the following is the poor conductor of heat among given metals:
(a) Na (b) Ca (c) Pb (d) Hg

3.Metal with highest melting point:

(a) Tungsten (b) Mercury (c) Molybdenum (d) Osmium
4. Bauxite is an ore of:
(a) Na (b) Al (c) Pb (d) Hg

B. Non-metals are the elements which forms negatively charged ions by accepting electrons. They usually have 4,5,6 or 7 valence electrons in their outermost shell. They lack lustre and are poor conductors of heat and electricity. They are good insulators and are mostly gases, few solid and one liquid at room temperature.
1.Chlorides of non-metals are covalent because:
a) sharing electrons
b) as they donate electrons to chlorine
c) they can't share electrons with chlorine
d) they donate electrons to chlorine to form chloride ion.
2.Which is lustrous non-metal:
a) Oxygen
b) Sulphur
c) Iodine
d) Nitrogen
3.Which of the non-metals is liquid at room temperature:
a) Helium
b) Carbon
c) Mercury
d) Bromine
4. Which among the following contain non-metal as its constituent:
a) Brass
b) Amalgam
c) Gunmetal
d) None
Chapter-3
METAL AND NON-METALS
Answers
Multiple Choice Questions
1. (c)
2. (a)
3. (d)
4. (d)
5. (c)
6. (d)
7. (c)
8. (b)
9. (c)
10. (a)
SHORT ANSWER TYPE

1. The produced gas can be identified by bringing a burning match stick near the reaction vessel, a pop sound is produced
   $M + 2NaOH \rightarrow Na_2MO_2 + H_2$

$M + 2HCl \rightarrow MCl_2 + H_2$
The element is a metal.

2. It is easier to obtain metal from its oxide, as compared from its sulphides and carbonates.
3. (a) X — Fe_2O_3 (b) Thermite reaction (c) Fe_2O_3 (s) + 2Al(s) → 2Fe(l) + Al_2O_3 (s) + Heat
4. M = Cu; Black product— CuO
   $2Cu + O_2 \rightarrow 2CuO$

LONG ANSWER TYPE

3. (a) A — N_2; B — NH_3; C — NO; D — HNO_3
   (b) Element A belongs to Group –15 of the Periodic Table
   2. (a) Due to the formation of a layer of oxide i.e., Al_2O_3
   (b) Na or Mg are more reactive metals as compared to carbon
   (c) In solid NaCl, the movement of ions is not possible due to its rigid structure but in aqueous solution or molten state, the ions can move freely.
   (d) To protect from corrosion
   (e) They are highly reactive

CASE BASED QUESTIONS

A. 1. A 2.C 3. A 4.B
B 1. A 2.C 3. D 4.B

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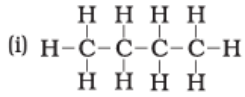
Chapter-4

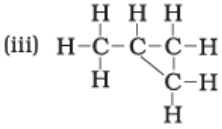
CARBON AND ITS COMPOUNDS

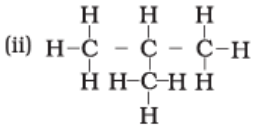
Question Bank

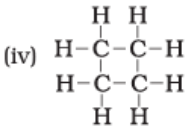
MULTIPLE CHOICE QUESTIONS

1. Carbon exists in the atmosphere in the form of
   (a) carbon monoxide only
   (b) carbon monoxide in traces and carbon dioxide
   (c) carbon dioxide only
   (d) coal
2. Which of the following statements are usually correct for carbon compounds? These
   (i) are good conductors of electricity
   (ii) are poor conductors of electricity
   (iii) have strong forces of attraction between their molecules
   (iv) do not have strong forces of attraction between their molecules
   (a) (i) and (iii)
   (b) (ii) and (iii)
   (c) (i) and (iv)
   (d) (ii) and (iv)
3. A molecule of ammonia (NH_3) has
   (a) only single bonds
   (b) only double bonds
   (c) only triple bonds
   (d) two double bonds and one single bond
4. Which of the following are correct structural isomers of butane?









   (a) (i) and (iii)
   (b) (ii) and (iv)
   (c) (i) and (ii)
   (d) (iii) and (iv)
5. $CH_3 - CH_2 - OH \xrightarrow{\text{Alkaline } KMnO_4 + \text{Heat}} CH_3 - COOH$

   In the above given reaction, alkaline KMnO4 acts as
   (a) reducing agent
   (b) oxidising agent
   (c) catalyst
   (d) dehydrating agent

6. Oils on treating with hydrogen in the presence of palladium or nickel catalyst form fats. This is an example of
   (a) Addition reaction
   (b) Substitution reaction
   (c) Displacement reaction
   (d) Oxidation reaction
7. In which of the following compounds, — OH is the functional group?
   (a) Butanone
   (b) Butanol
   (c) Butanoic acid
   (d) Butanal
8. Which of the following is the correct representation of electron dot structure of nitrogen?

   (a) $:\dot{\underset{\cdot\cdot}{N}} : \dot{\underset{\cdot\cdot}{N}}:$

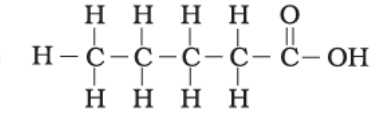
   (b) $:\dot{N}::\dot{N}:$

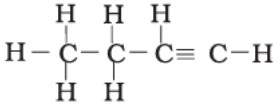
   (c) $:\dot{\underset{\cdot\cdot}{N}}\vdots\dot{N}:$

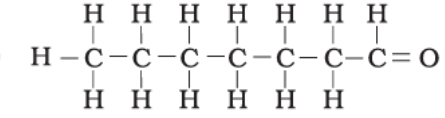
   (d) $:N\vdots\vdots N:$
9. Pentane has the molecular formula C_5H_{12}. It has
   (a) 5 covalent bonds
   (b) 12 covalent bonds
   (c) 16 covalent bonds
   (d) 17 covalent bonds
10. The name of the compound $CH_3 — CH_2 — CHO$ is
    (a) Propanal
    (b) Propanone
    (c) Ethanol
    (d) Ethanal

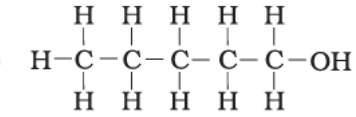
SHORT ANSWER TYPE QUESTIONS

1. Draw the electron dot structure of ethyne and also draw its structural formula.
2. Write the names of the following compounds

(a) 

(b) 

(c) 

(d) 

3. Why detergents are better cleansing agents than soaps? Explain.
4. Name the functional groups present in the following compounds
   (a) $CH_3COCH_2CH_2CH_2CH_3$

(b) $CH_3CH_2CH_2COOH$
(c) $CH_3CH_2CH_2CH_2CHO$
(d) CH_3CH_2OH

5. A gas is evolved when ethanol reacts with sodium. Name the gas evolved and also write the balanced chemical equation of the reaction involved.
6. In electron dot structure, the valence shell electrons are represented by crosses or dots.
   a) The atomic number of chlorines are 17.
   b) Write its electronic configuration
   b) Draw the electron dot structure of chlorine molecule.

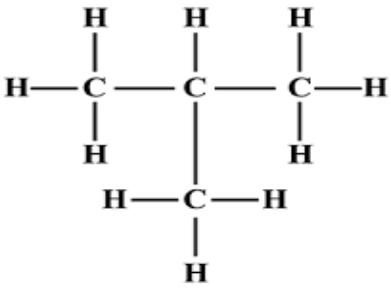
LONG ANSWER TYPE QUESTIONS

1. A salt X is formed and a gas is evolved when ethanoic acid reacts with sodium hydrogen carbonate. Name the salt X and the gas evolved. Describe an activity and draw the diagram of the apparatus to prove that the evolved gas is the one which you have named. Also, write chemical equation of the reaction involved.
2. (a) What are hydrocarbons? Give examples.
   (b) Give the structural differences between saturated and unsaturated hydrocarbons with two examples each.
   (c) What is a functional group? Give examples of four different functional groups.
3. (a) Write the formula and draw electron dot structure of carbon tetrachloride.
   (b) What is saponification? Write the reaction involved in this process.

CASE BASED QUESTIONS

CASE 1. Read the given passage and answer the questions that follow:

Carbon has the unique property to form bonds with other atoms of carbon.



Q.1. Name the characteristic property of carbon as depicted in the fig.

(A) Catenation

(B) Polymerization

(C) Isomerisation

(D) None of the above

Q. 2. Carbon forms large number of compounds due to:

(A) Catenation only

(B) Tetravalency only

(C) Both catenation and tetravalency

(D) None of the above

Q.3. Carbon is:

(A) Divalent

(B) Monovalent

(C) Tetravalent

(D) Trivalent

Q.4. Write the name and structure of a saturated compound in which 6 carbon atoms are arranged in a ring.

(A) Hexane

(B) Cyclohexane

(C) Pentane

(D) Cyclopentane

CASE 2. Read the given passage and answer the questions that follow:

Homologous series is a series of compounds with similar chemical properties and same functional group differing from the successive member by CH2. Carbon chains of varying length have been observed in organic compounds having the same general formula. Such organic compounds that vary from one another by a repeating unit and have the same general formula form a series of compounds. Alkanes with general formula C, H2n+2 alkenes with general formula C, H2 and alkynes with general formula C, H2-2 form the most basic homologous series in organic chemistry.

All the members belonging to this series have the same functional groups. They have similar physical properties and follow a fixed gradation with increasing mass. This series has enabled scientists to study different organic compounds systematically. They can predict the properties of organic compounds belonging to a particular homologous series based on the data available from the other members of the same series. The study of organic compounds has been simplified.

Q. 1. Name the fourth member of the alkane series.

Q. 2. The difference in the molecular formula of any two consecutive members of a homologous series of organic compounds is _____

Q. 3. Name the functional group present in the following compound:

(i) CH_3 COOH (ii) CH_3 C(O)CH_3

Q. 4. Define homologous series? Which two of the following organic compounds belong to the same homologous?

CASE 3. Read the given passage and answer the questions that follow:

Soaps and detergents are widely used as cleaning agents. Chemically soaps and detergents are quite different from each other. The common feature of soaps and detergents is that when dissolved in water the molecules of soap and detergent tend to concentrate at the surface of the solution or at interface. Therefore, the surface tension of the solution is reduced, it causes foaming of the solution. A sample of water which gives lather with soap with difficulty is known as hard water, while a sample of water which gives lather with soap easily is known as soft water. Hardness of water is due to the presence of bicarbonates, sulphates and chlorides of calcium and magnesium. When hardness of water is due to the presence of bicarbonates of magnesium and calcium, it is called temporary hardness. When hardness of water is due to the presence of sulphates and chlorides of magnesium and calcium, it is called permanent hardness.

Q. 1 How soap and detergent molecules differ chemically?

Q. 2. Micelle formation takes place when soap is added to water? State reason.

Q. 3. Give a reason why soaps do not form lather in hard water?

Q.4 List two problems that arise due to the use of detergents instead of soaps.

Chapter-4

CARBON AND ITS COMPOUNDS

Answers

MULTIPLE CHOICE QUESTIONS

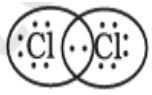
1. B
2. D
3. A
4. C
5. B
6. A
7. B
8. D
9. C
10. D

SHORT ANSWER TYPE

1. Electron dot structure of ethyne (C_2H_2)

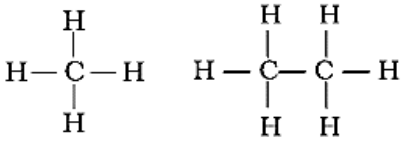
   Structural formula of ethyne 
2. (a) Pentatonic acid
   (b) Butyne
   (c) Heptanal
   (d) Pentanol
3. Detergents work as cleansing agent both in hard and soft water. The charged ends of detergents do not form insoluble precipitates with calcium and magnesium ions in hard water.
4. (a) Ketone (b) Carboxylic acid (c) Aldehyde (d) Alcohol
5. Gas evolved is hydrogen. $2CH_3CH_2OH + 2Na \rightarrow 2CH_3CH_2O^- Na^+ + H$
6. a) K, L, M 2, 8, 7

   b)

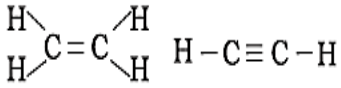
LONG ANSWER TYPE

1. $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2$
   X is sodium ethanoate Gas evolved is carbon dioxide
   Hint— Activity Lime water will turn milky, a characteristic property of CO_2 gas
2. (a) Compounds of carbon and hydrogen are called hydrocarbons. Example, methane, ethane etc.
   (b) Saturated hydrocarbons contain carbon- carbon single bonds. Unsaturated hydrocarbons contain at least one carbon - carbon double or triple bond.



Methane Ethane

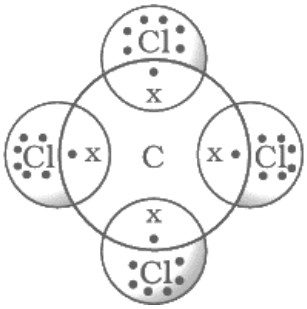
Unsaturated hydrocarbons



Ethene Ethyne

Saturated hydrocarbons

(c) Functional group – An atom/group of atoms joined in a specific manner which is responsible for the characteristic chemical properties of the organic compounds. Examples are hydroxyl group (–OH), aldehyde group (–CHO), carboxylic group (–COOH) etc.



3. a) CCl_4

(b) Saponification is the process of converting esters into salts of carboxylic acids and ethanol by treating them with a base. $CH_3COOC_2H_5$ CH_3COONa + C_2H_5OH

CASE BASED QUESTIONS

CASE 1. Read the given passage and answer the questions that follow:

1. (A) Catenation

2. (C) Both catenation and tetravalency

3. (C) Tetravalent

4. (B) Cyclohexane

CASE 2. Read the given passage and answer the questions that follow:

1. The fourth member of the alkane series is butane (C_4H_{10})

2. $-CH_2-$

3: (i) CH_3COOH=Carboxylic Acid Group (ii) $CH_3C(O)CH_3$=Ketone group

4. A homologous series is a series of compounds with the same functional group and similar chemical properties in which each successive member differs by CH_2.Compounds within a homologous series typically have a fixed set of functional groups that gives them similar chemical and physical properties.

Here, CH_4O and C_2H_6O are of same homologous series. Both are differed by CH_2.

CASE 3. Read the given passage and answer the questions that follow:

A 1.

SOAP	DETERGENT
1. They are sodium or potassium salts of fatty acids.	They are sodium or potassium salts of sulphonic acids.

2. Micelle formation takes place; this is because the hydrocarbon chains of soap molecules are hydrophobic while the ionic ends are hydrophilic and hence soluble in water.
3. Hard water is formed due to the dissolution of the salts of calcium and magnesium ions. It does not lather with soap because the salts of calcium and magnesium react with soap to form insoluble salts.
4. Two problems that arise because of the use of detergents instead of soap is given below:

1. Soaps are biodegradable, while detergents are non-biodegradable; hence, detergents are toxic to the environment.
2. Certain phosphate additives are added to detergents. These phosphate additives act as nutrients for algae which form a thick green scum over the river water and upset the animal life in the river.

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CHAPTER 5
LIFE PROCESSES
QUESTION BANK

MULTIPLE CHOICE QUESTIONS

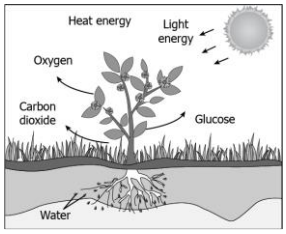
Q1. Haemoglobin and chlorophyll have similar structures.

- A molecule of haemoglobin is composed of atoms of 4 elements (carbon, hydrogen, oxygen and nitrogen, all four organised around iron.
- A chlorophyll is composed the same elements (carbon, hydrogen, oxygen and nitrogen, all four organised around magnesium)

Considering the above information, which element of haemoglobin is most likely to be responsible for red colour of our blood?

(a) Hydrogen (b) Nitrogen (c) Carbon (d) Iron

Q2. The image shows the process of making food by a plant.



Which statement can be concluded from the image?

(a) plants absorb CO_2 from air and H_2O from the soil as raw materials and convert them into glucose.
(b) plants absorb CO_2 from the soil and H_2O from air as raw materials and convert them into glucose.
(c) plants absorb O_2 from air and glucose from the soil as raw materials and convert them into light energy.
(d) plants absorb O_2 from air and minerals from the soil as raw materials and convert them into heat energy.

Q3. A student sets up an experiment to study the importance of nutrition in plants. The student takes 2 pots, pot 1 and pot 2 each with the same healthy plant. Both the pots were placed in the garden and watered properly. Pot 1 was kept as such, while pot 2 was kept in an air tight glass box with caustic soda. Caustic soda absorbs carbon dioxide present in the surrounding. After 2 days, the student observes that the plant kept in the garden is healthy while the plant placed in container shed leaves and droops. What is the likely reason for this observation?
(a) lack of nutrients in the soil
(b) absence of oxygen for survival
(c) inability to perform photosynthesis
(d) absorption of light by caustic soda restricting growth

Q4. Which of the equation show correct conversion of CO_2 and H_2O into carbohydrates in
plants?

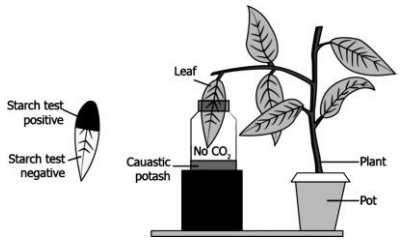
(a) $6CO_2 + 6H_2O \xrightarrow[\text{Heat energy}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2 + 12H_2O$ (Glucose)

(b) $6CO_2 + 6H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2 + 12H_2O$ (Glucose)

(c) $6CO_2 + 12H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2 + 6H_2O$ (Glucose)

(d) $6CO_2 + 12H_2O \xrightarrow[\text{Heat energy}]{\text{Chlorophyll}} C_6H_{12} + 6O_2 + 6H_2O$ (Glucose)

Q5. A student sets up an experiment to study the photosynthesis in plants. The student destarched a potted plant by keeping it in a dark room for 3 days. Half of the portion of destarched leaf was placed in a bottle containing caustic potash (absorbs CO2) as shown.



The student then places the plant in light and tests the leaf after 5 hours for the presence of starch. The portions inside the bottle shows negative starch test by reflecting no change in colour when react with iodine, however, other upper portions of the leaf gave positive starch test showing blue-black colour with iodine. What can be evaluated from this experiment?
(a) carbon dioxide is directly linked with the colour of leaf
(b) carbon dioxide is necessary for preparing carbohydrate
(c) lack of carbon dioxide increases amount of starch in plant
(d) lack of carbon dioxide slows the process of photosynthesis

Q6. What will be the likely happen if the number of villi increases in the intestine?
(a) increase in the absorption of food
(b) fast elimination of waste from the body
(c) increase in flow of blood in the small intestine
(d) fast breakdown of larger food particles into smaller ones

Q7. Which option correctly shows the transport of oxygen to the cell?
(a) Lungs→pulmonary vein→left atrium→left ventricle→aorta→body cells
(b) Lungs→pulmonary vein→right atrium→right ventricle→aorta→body cells
(c) Lungs→pulmonary artery→left atrium→left ventricle→venacava→body cells
(d) Lungs→pulmonary artery→right atrium→right ventricle→venacava→body cells

Q8. Nephron is a unit of filtration in kidneys that filters waste material. It selectively reabsorbs or excretes water with the help of capillaries that surround it. What is the likely benefit of this?
(a) It makes the process of filtration at Bowman's capsule easier.
(b) It helps keep the output of urine constant throughout the day.
(c) It helps to uptake and store excess amount of water in the body for later use.
(d) It maintains the concentration of urine based on the amount of water present in the body.
Q9. Choose the incorrect pair
(a) Ultrafiltration - glomerulus
(b) Storage of urine – urinary Bladder
(c) Reabsorption – tubule
(d) Concentration of Urine – urethra
Q10. We often hear a complaint of overproduction of acid in the stomach. The acid referred here is:
(a) HNO_3 (b) H_2SO_4 (c) HCl (d) H_3PO_4

ASSERTION & REASON TYPE

Following questions consist of two statements – Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

Q1. Assertion (A): Desert plants take in carbon dioxide for photosynthesis during the night.

Reason (R): In desert plants, the stomata are closed during the day to conserve water by reducing transpiration.
Q2. Assertion (A): Warm- blooded animals have their left and right side of the heart separated for more efficient supply of oxygen to the body.

Reason (R): Energy needs of warm- blooded animals are very low for maintaining their body temperature.

Q3. Assertion (A): Depending on the complexity of the carbon sources, different organism uses different kinds of nutritional processes
Reason (R) : Life on earth depend on carbon based molecules, most of these food sources are also carbon based.
Q4. Assertion (A): In the absence of oxygen the muscle cells undergo aerobic respiration.
Reason (R): In anaerobic respiration, pyruvate is converted into lactic acid which is also three carbon molecules**.**

Q5. Assertion (A): All the arteries carry oxygenated blood from the heart to various organs.

Reason (R): Pulmonary vein carries deoxygenated blood to the Heart.

Q6. Assertion (A): Artificial kidney is a device used to remove nitrogenous waste products from the blood through dialysis.
Reason (R): Reabsorption occur in artificial kidney.

Q7. Assertion (A): Rings of cartilage are present in the throat.
Reason (R): These ensure that the air-passage does not collapse.

VERY SHORT ANSWER

Q1.In respiration, glucose is broken down into a 3-C molecule called pyruvate, in the cytoplasm of the cell. Is this particular process aerobic or anaerobic in nature? Justify your answer.

Q2. In most adults, the left atrium is separated from the right atrium by a septum (wall) to prevent the oxygen-rich blood in the left atrium from mixing with the blood containing a higher amount of carbon dioxide in the right atrium. The patent foramen ovale (PFO) is a hole in the septum separating the left and right atria (upper chambers) of the heart. This hole exists in everyone before birth, but most often closes shortly after a baby is born. Explain why the hole in the septum separating the atria does not cause problems in a baby before it is born.

Q3.In diabetic patients, with high blood glucose levels, the urine sample also consists of high levels of glucose. This is mainly because, in the nephron, glucose is not reabsorbed back into the blood.Explain why does reabsorption not take place in two points.

Q4. Which respiratory pigment is present in the blood aiding in exchange of gases in man?

Q5**.** What will happen to a plant if its xylem is removed?

Q6. A student observed green dot like structures in some cells when a leaf peel was viewed under a microscope. Identify these dots and mention what is the green colour due to?

Q7. Lungs always contain residual volume. Why?

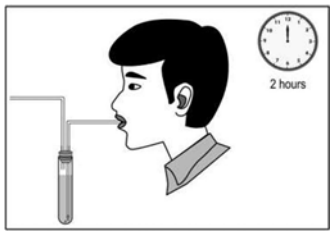
Q8. Name the material transported by the following in plants? (i) Xylem (ii) Phloem

Q9. Name any two major substances which are selectively reabsorbed from the tubules of a nephron.

Q10. In each of the following situations the rate of the photosynthesis will decrease? **(**a) Cloudy days (b) Good manuring in the area (c) Stomata get blocked due to dust

SHORT ANSWER TYPE

Q1 Given below is an image of an experiment conducted by a student to understand the process of respiration. He blows into a clear solution present in the test tube and sees that it turns cloudy.



(a) What is the most likely substance present in the test tube?

(b) What could be the aim of his experiment?

(c) What kind of respiration is shown in the experiment? Justify your answer.

Q2. There are different nutrients required by the human body. These are in 3 major categories of carbohydrates, fats and proteins (apart from vitamins, minerals and roughage).

(a) Digestion of nutrient R happens in the stomach. Identify R.

(b) Consider fats and oils from your diet as large globules in your digestive tract. Name the reaction that can help in making these easier to absorb.

(c)what is the difference in the kind of medium required for digestive enzymes in the stomach and the small intestine to work?

Q3.In the digestive tract, food is moved forward by the rhythmic contraction of muscles lining the tract. This process is called peristalsis.

list all the parts of the digestive tract in which peristalsis occurs.

Q4.Human systems work in coordination with each other. Pratik spent an hour in the swimming pool and found himself breathing heavily.

(a) Name the:

(i) system/s that help his body regain normalcy

(ii) system/s that help the systems mentioned in (a-i) to function

(b) What can happen to the composition of Pratik's blood if the system/s mentioned in (a-i) does/do not respond properly?

Q5. Illustrate with diagram the mechanism taking place when
(a) The guard cells swell when water flows in them
(b) The guard cells shrink when water leaves the cells.

Q6. Human beings exhibit ‘double circulation’.

(a) state the route of the first and the second circulation through the chambers of the heart .

(b) Name the (i) blood vessels that carry oxygenated blood from the lungs to the heart.

(ii) blood vessels that carry de oxygenated blood from the heat to the lungs.

Q7. There are various muscles present in the human digestive system known as sphincters. Two such examples are:

1. Pyloric sphincter – at the junction of stomach and small intestine.

2. Anal sphincter- at the anus. Write their functions.

LONG ANSWER TYPE

Q1 Aerobic respiration requires intake of oxygen to breakdown food to release energy.

(a) Name the structures through which gaseous exchange takes place in plants and human beings.

(b) Name the structures that controls the size of the chest cavity in humans to facilitate exchange of gases.

(c) What is the process by which gas exchange occurs in plants?

(d) Why is the process named in (c) not sufficient to carry oxygen throughout human body? How is this complemented in humans to ensure that oxygen is carried to all parts of the body?

(e) Reactions in living systems can absorb heat or release heat. State whether the heat energy is absorbed/ released during digestion. Also write the scientific term to denote the same.

Q2**.** (a) Draw a diagram depicting human alimentary canal and label the components- gall bladder, liver, and pancreas in it.
(b) State the role of pancreas in digestion of food.

Q3**.** (a) Draw a flow chart to show the breakdown of glucose by various pathways.
(b) Where does glycolysis and Krebs cycle occur in aerobic respiration?

CASE BASED / SOURCE BASED TYPE

Q1) Answer the questions based on the following information.

William Harvey (1578–1657) was one of the early biologists who studied the bodies of humans and animals. He even dissected the bodies and did experiments with the heart and blood vessels. He concluded from his experiments that the blood leaves the heart through the arteries and returns via the veins. However, he could not

explain how blood left the arteries to enter the veins. He said there must be some structure between arteries and veins but he could not find them. Marcello Malpighi (1628–1694) later discovered these structures while studying a dead frog's lungs under a microscope.

Q.1.1 Which vessels connecting arteries and vein did Malpighi might have discovered later while studying frogs under microscope?

Q.1.2 What is the most likely reason why Harvey could NOT find these structures?

Q1.3 Arteries have thicker walls than veins, but no valves. Why?

Q1.4 Which two chambers of the human heart have arteries connected to them?

Q2. Read the given passage and related study concepts answer the following questions.

Lung cancer is the most widely known and most harmful effect of smoking :98% of cases are associated with cigarette smoking. The damaging components of cigarette smoke include tar, carbon monoxide, nitrogen dioxide, and nitric oxide. Many of these harmful chemicals occur in greater concentrations in side-stream smoke (passive smoking) than in mainstream smoke (inhaled) due to the presence of a filter in the cigarette.

2.1 Why is passive smoking more dangerous than active smoking?

2.2 (i) What are the consequences if the membranes of alveoli tear off due to chain smoking?

(ii) lungs become weak making the person more susceptible to infections like pneumonia.

Q3. Read the given passage and related study concepts answer the following questions

This transport of soluble products of photosynthesis is called translocation and it occurs in the part of the vascular tissue known as phloem. Besides the products of photo-synthesis, the phloem transports amino acids and other substances. These substances are especially delivered to the storage organs of roots, fruits and seeds and to growing organs. The translocation of food and other substances takes place in the sieve tubes with the help of adjacent companion cells both in upward and downward directions. Unlike transport in xylem which can be largely explained by simple physical forces, the translocation in phloem is achieved by utilising energy, Material like sucrose is transferred into phloem tissue using energy from ATP. This increases the osmotic pressure of the tissue causing water to move into it. This pressure moves the material in the phloem to tissues which have less pressure. This allows the phloem to move material according to the plant’s needs. For example, in the spring, sugar stored in root or stem tissue would be transported to the buds which need energy to grow.

3.1. The translocation of food in plants takes place in which direction?

3.2. What is the term given for the transportation of food in plants by phloem elements?

3.3. Which main components of phloem help in the translocation process in plants?

Q4.Read the text below and answer the given questions
The heart is a muscular organ which is as big as our fist. Because both oxygen and carbon dioxide have to be transported by the blood, the heart has different chambers to prevent the oxygen-rich blood from mixing with the blood containing carbon dioxide. The carbon dioxide-rich blood has to reach the lungs for the carbon dioxide to be removed, and the oxygenated blood from the lungs has to be brought back to the heart. This oxygen-rich blood is then pumped to the rest of the body.
4.1. How many chambers are present in the heart of mammals and reptiles?
4.2. Name the device that measures blood pressure?
4.3 What is hypertension? Give two reasons which can cause it.

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5) https://ncert.nic.in/textbook.php?jesc1=5-13

6) https://docs.google.com/document/d/1x4PG4fqTinTBhaxdLsgk2D-9utxTUns6/edit

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CHAPTER 5
LIFE PROCESSES
ANSWER KEY

MULTIPLE CHOICE QUESTIONS

Q1. (d) Iron

Q2. (a) plants absorbCO2from air and H2O from the soil as raw materials and convert them into glucose.

Q3. (c) inability to perform photosynthesis

Q4.(c) $6CO_2 + 12H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2 + 6H_2O$ (Glucose)

Q5. (b) carbon dioxide is necessary for preparing carbohydrate

Q6. (a) increase in the absorption of food

Q7. (a) Lungs →pulmonary vein →left atrium →left ventricle →aorta → body cells

Q8.(d) It maintains the concentration of urine based on the amount of water present in the body.

Q9. (d) Concentration of Urine – urethra

Q10.(c) HCl

ASSERTION & REASON TYPE

Q1. (a)
Q2. (c)
Q3. (a)
Q4. (d)
Q5. (d)
Q6. (c)
Q7. (a)

VERY SHORT ANSWER

Q.1- anaerobic

-This step occurs in all organisms, even those that respire anaerobically and so this process is likely to be anaerobic.

Q2. The hole in the septum does not cause problems in an unborn infant as the developing embryo gets nutrition and oxygen from the mother's blood through the placenta and umbilical cord.

Q3. When some of the glucose from the blood is filtered in the urine, it does not get reabsorbed as the concentration of glucose is already high in the blood and so there is little/no concentration gradient causing glucose to be retained in the urine.

Q4. haemoglobin**.**

Q5.Flow of water will be disrupted and the process of photosynthesis will be affected leading to Wilting and death.

Q6.Chloroplast; chlorophyll

Q7. The residual volume acts as a reservoir, ensuring a constant supply of oxygen for diffusion into the bloodstream and removal of carbon dioxide.

Q8. (i) Xylem- Water and dissolved minerals (ii) Phloem- Organic nutrients (food)

Q9. Glucose and aminoacids

Q10. (a) Cloudy days and (c) Stomata get blocked due to dust

SHORT ANSWER TYPE

Q1 (a) lime water / dilute aqueous solution of calcium hydroxide/ Ca(OH)2

(b) To prove that carbon dioxide is released during respiration

(c) aerobic respiration; CO_2 is a product of either aerobic respiration or fermentation, fermentation does not take place in human cells.

Q2. (a)Protein

(b) emulsification

(c)Digestive enzymes in the stomach need an acidic medium while those in the small intestine need an alkaline medium

Q3.-pharynx

- oesophagus
- stomach
- small intestine
- large intestine

anus

Q4.(a)(i) circulatory and respiratory systems

(ii) nervous system

(b) increased carbon dioxide quantity in blood

Q5. (a)The opening and closing of the pore is a function of the guard cells. The guard cells swell when water flows into them, causing the stomatal pore to open.

(b) Similarly, if the guard cells shrink the pore closes.

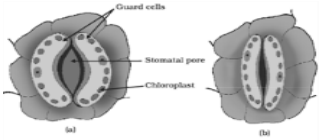

Figure 5.3 (a) Open and (b) closed stomatal pore

Q6. (a) – during first circulation: oxygenated blood from lungs come to the left atrium to left ventricle to pass to the body.

- during second circulation: deoxygenated blood from the body comes to the right atrium and then right ventricle to pass for oxygenation to the lungs again.

(b) (i) Pulmonary vein (ii) Pulmonary artery

Q7.1. controls the flow of partially digested food (chyme) from the stomach into the small intestine.

2.The anal sphincter controls the bowel movements (stool continence) and the passage of faeces.

LONG ANSWER TYPE

Q1. (a)Plants: stomata/guard cells Human beings: alveoli/ lungs

(b) Diaphragm & ribs

(c) diffusion

(d) because diffusion is a slow process and human beings have complex tissues that might not allow diffusion to happen effectively and easily - carried by the blood/haemoglobin in the blood.

(e) use up heat – endothermic

Q2. (a) Figure 5.6 page 85- NCERT text book
(b) The enzymes in the pancreatic juice further help in digestion as follows:

1) Trypsin	Protein digestion
2) Amylase	Carbohydrates digestion
3) Lipase	Fat digestion

Q3. (a) Figure 5.8 page 88 NCERT text book
(b) glycolysis – cytoplasm Krebs cycle- mitochondria

CASE BASED / SOURCE BASED TYPE

Q.1.1 capillaries
Q.1.2 These structures were too small to be seen by the naked eye.
Q1.3 Walls are thicker to withstand the high pressure of blood pumped by the heart.
- Arteries don't need valves because blood generally flows in one direction away from the heart. The elasticity of the arteries themselves help maintains this unidirectional flow.
Q1.4. left ventricle and right ventricle.

Q2.1 smoke if inhaled contains a significant amount of harmful chemicals that can cause serious health problems like allergies, asthma, bronchitis etc.
Q2.2 (i) When an alveolar sac tears, it becomes less efficient in gas exchange leading to shortness of breath.
(ii) lungs become weak making the person more susceptible to infections like pneumonia.

Q3.1. In both in upward and downward directions
Q3.2. translocation.
Q3.3. Sieve Tubes and Companion Cells.

Q4.1. Three
Q4.2. Sphygmomanometer

Q4.3. A condition arising due to high blood pressure. Reason that can cause hypertension are- Diabetes, Kidney problems, Hyperthyroidism, Pregnancy, Obesity (any of these)

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CHAPTER 6

CONTROL AND COORDINATION

QUESTION BANK

MULTIPLE CHOICE QUESTIONS

Q1. In a neurons conversion of electrical signal to a chemical signal occurs at/ in

(a) cell body (b) axonal end (c) dendritic end (d) axon.

Q2. Sapna suffers from a condition due to which her blood sugar level is 174mg/dL. The average blood sugar level in a healthy adult is < 140mg/dL. Which of the following could be the cause of Sapna's condition?

(a) insufficient production of thyroxin in her body

(b) insufficient production of insulin in her body

(c) excess production of thyroxin in her body

(d) excess production of insulin in her body

Q3. Walking in a straight line and riding a bicycle are that activities which are possible due to a part of brain, Choose the correct location and name of this part from the given table.

PART OF BRAIN	NAME
a) Fore brain	Cerebellum
b) Mid brain	Medulla oblongata
c) Hind brain	Hypothalamus
d) Hind brain	Cerebellum

Q4. A gardener wants the plants in the hedge that he is growing to become bushier with more branches. Which of the following step he should do?

(a) spray water on the tips of stems to increase growth

(b) dig around the plant roots and apply more manure

(c) trim the hedge by cutting off the tips of the stems

(d) remove all weeds that grow around the hedge.

Q5. How will information travel within a neuron?

(a) Dendrite→cell body→axon→ nerve ending

(b) Dendrite→axon→ cell body→nerve ending

(c) Axon→dendrite→cell body→ nerve ending

(d) Axon→cell body→dendrite→nerve ending

Q6. Which option correctly shows the order of events when a bright light is focused on our eyes?

(a) Bright light→ receptors in eyes → sensory neuron→spinal cord→motor neurons→eyelid closes.

(b) Bright light→ receptors in eyes→spinal cord→sensory neuron→ motor neurons→eyelid closes.

(c) Bright light→ receptors in eyes→sensory neuron→motor neurons→spinal cord→ eyelid closes.

(d) Bright light→ receptors in eyes→spinal cord→motor neurons→sensory neuron→eyelid closes.

Q7. Which parts of the brain controls the blood pressure?

(a) fore brain -cerebrum (b) fore brain - hypothalamus

(c) mid brain- pons (d) hind brain- medulla

Q8. When we touch the leaves of "touch-me-not" plant, they began to fold up and droop. How does the plant communicate the information of touch?

(a) The plant uses electrical signals to transfer information from external environment to cells.

(b) The plant uses electrical-chemical signals to transfer information from cell to cell.

(c) The plant uses electrical-chemical signals to transfer information from tissue to specialized cells.

(d) The plant uses electrical signals to transfer information from cell to specialized tissues.

Q9. The gap between nerve ending of one nerve cell and dendrite of the other nerve cell is -----

(a) Synapse (b) Axon

(c) Cell body (d) Nucleus

Q10.The growth of tendrils in pea plants is due to

(a) effect of light

(b) effect of gravity

(c) rapid cell division in tendrillar cells in contact with the support

(d) rapid cell divisions in tendrillar cells that are away from the support.

ASSERTION REASON TYPE

Following questions consist of two statements – Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

Q1. Assertion (A): All reflex actions are involuntary actions but only some involuntary actions are reflex actions.
Reason (R): Reflex actions take the shortest route from the receptor (detector of stimulus) to the effector (producer of response).

Q2. Assertion (A): Blood cells do not receive or pass information to the rest of the human body.
Reason (R): Blood cells are not directly connected with neurons.

Q3. Assertion: Cytokinins are present in highest concentration in seeds.
Reason: Cytokinins are a responsible for promoting cell division.

Q4. Assertion: It is advised to have iodised salt in our diet.
Reason: It prevents us from goitre.

Q5. Assertion(A): A receptor is a specialized group of cells in a sense organ that perceive a particular type of stimulus.
Reason (R): Different sense organs have different receptors for detecting stimuli.

Q6. Assertion(A): The spinal nerves are 31 in number.
Reason (R): The spinal nerves assist the spinal cord to function.

Q7. Assertion(A): Walking, riding a bicycle are involuntary actions controlled by hind brain.
Reason (R): Walking, riding a bicycle are controlled by cerebellum.

VERY SHORT ANSWER TYPE

Q1. Which signals will get disrupted in case of a spinal cord injury?

Q2. As first line of defense, stress hormones are released in humans.As an equivalent, which hormone is likely to be released as first line of defense in plants

Q3. Sheila saw a snake and instantly jumped back. She slowly moved away from the snake. What is the difference between the actions of instantly jumping and walking away?

Q4. While on a roller coaster ride, Aditya noticed an increase in his heart beat and his breathing. Which hormone is responsible for the changes in Aditya's body?

Q5. Rita, say she suffers from hypothyroidism. Which is function is disrupted in this deficiency disease?

Q6. Name the structure that protects the spinal cord.

Q7. Which stimulus is related to thigmotropism?

Q8. Pick out the dual glands from the followingand give reason.

(i) Salivary glands (ii) Liver (iii)Pancreas

Q9. Name the gland which is associated with the following problems:
(i) A girl has grown extremely tall
(ii) A woman has swollen neck

Q10.Which of the following actions are involuntary.

(i) Shivering when it is too cold.

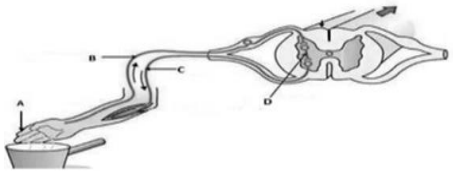
(ii) Cutting fruits for making fruit salad.

(iii) Changing channels on TV to watch your favourite programme.

(iv) Peristaltic movement in oesophagus when swallowing food.

SHORT ANSWER TYPE

Q1. Write the name and function of parts in the diagram given below:



Q2. Draw a neat diagram of neuron and label the following.

(i) Part where information is first received**.**

(ii) Part through which impulse travels**.**

(iii) Part through which it is released into synapse**.**

Q3. Raj is blindfolded. He is made to taste the food without seeing it. He concludes that the food is burnt.

(a) What specific component of the tongue helped him conclude the taste of the food?

(b) If the food was crunchy, which part of the brain would help him recognize this texture of the food?

Q4. Raghav was watching Nia and made the following observation:

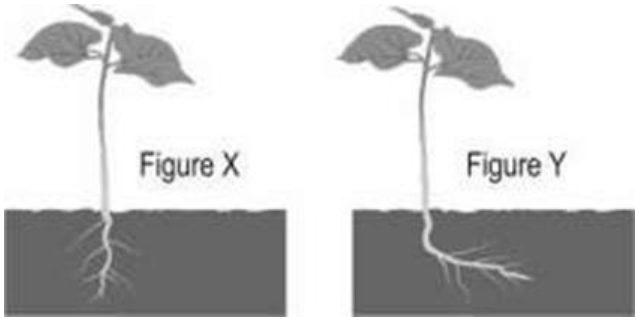
Nia was practicing boxing. As her opponent swung an arm, Nia ducked down and retaliated with a punch.

(a) Raghav said that ducking down is a reflex action. Is he correct? Justify.
(b) Explain the nervous process involved in Nia's retaliation with a punch.

Q5. Here is a picture of a germinating seed.

(a)What is the environmental stimulus required for the seed to develop roots downwards and shoots upwards? Name the respective phenomenon.

(b)What environmental factor in the experimental setup shown below can be altered in Figure X to observe the direction of root growth as observed in Figure Y?



(c) Name the tropic movement that occurs when pollen tubes grow towards ovules.

Q6. Ovary is a dual gland. Justify.
Q7. How does feedback mechanism regulate hormone secretion?

LONG ANSWER TYPE

Q1. Answer the following questions:
(i) Why is the use of iodised salt advisable? Name the disease caused due to deficiency of iodine in our diet and state its one symptom.
(ii) How do nerve impulses travel in the body? Explain.

Q2.(a) Give the difference between a reflex action and reflex arc?
(b) Write the differences between the manner in which movement takes place in a sensitive plant and movement in our legs?

Q3. What are reflex actions? Give examples? Explain reflex arc with an example with labelled diagram?

CASE BASED/ SOURCE BASED

Q1. Read the following passage and answer the questions followed

Some plants like the pea plant climb up other plants or fences by means of tendrils. These tendrils are sensitive to touch. When they come in contact with any support, the part of the tendril in contact with the object does not grow as rapidly as the part of the tendril away from the object. This causes the tendril to circle around the object and thus cling to it. More commonly, plants respond to stimuli slowly by growing in a particular direction. Because this growth is directional, it appears as if the plant is moving.

1.1 Name different types of tropism are shown by plants?

1.2 The movement of 'touch me not' plant is different from growth of shoot in the response to light What is the difference?

1.3 Give one example of chemotropism?

1.4 Name the plants hormones which promote and inhibit cell division in plants.

Q2. Read the following passage and answer the questions followed:-

The term neurodegeneration is a combination of two words - "neuro," referring to nerve cells and "degeneration," referring to progressive damage. The term "neurodegeneration" can be applied to several conditions that result in the loss of nerve structure and function. This deterioration gradually causes a loss of cognitive abilities such as memory and decision making. Neurodegeneration is a key aspect of a large number of diseases that come under the umbrella of "neurodegenerative diseases." Of these hundreds of different disorders, so far attention has been mainly focused on only a handful, with the most notable being Parkinson's disease, Huntington's disease and Alzheimer's disease. A large proportion of the less publicized diseases have essentially been ignored.

2.1 Name any two diseases that are caused due to neurodegeneration.

2.2 Neurodegenerative diseases are cause of concern. Give reason.

Q3. Study the table given below and answer the questions.

S. No	Name of the plant hormone	Uses
1	Abscisic acid	Seed dormancy
2	Cytokinins	Cell elongation and termination
3	Auxins	Promotes cell division
4	Ethylene	Ripening of fruits

3.1 Name the plant hormone that regulates phototropism.

3.2 State the plant hormone that stimulates ripening of fruits.

3.3 Name the plant hormone that helps stimulate the opening and closing of stomata.

3.4 Name the plant hormone that participates in the process of thigmotropism.

Q4 Read the information and answer the questions

Body consists of dense networks of intricately arranged neurons. It sits in the forward end of the skull, and receives signals from all over the body which it thinks about before responding to them. Obviously, in order to receive these signals, this thinking

part of the brain in the skull must be connected to nerves coming from various parts of the body.

4.1 Define reflex action?
4.2 Name the main organs of CNS.
4.3 Draw a flow chart of a reflex arc?

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CHAPTER 6

CONTROL AND COORDINATION

ANSWER KEY

MULTIPLE CHOICE QUESTIONS

Q1. (c) dendritic end

Q2. (b) insufficient production of insulin in her body

Q3.

d) Hind brain	Cerebellum

Q4. (c) trim the hedge by cutting off the tips of the stems

Q5. (a) Dendrite→cell body→axon→nerve ending

Q6. (a)Bright light→ receptors in eyes → sensory neuron→spinal cord→motor neurons→eyelid closes.

Q7. (d)hind brain- medulla

Q8. (b)The plant uses electrical-chemical signals to transfer information from cell to cell.

Q9. (a) Synapse

Q10. (d) rapid cell divisions in tendrillar cells that are away from the support.

ASSERTION REASON TYPE

Q1. (b)
Q2. (d)
Q3. (a)
Q4. (a)
Q5. (a)
Q6. (d)
Q7. (c)

VERY SHORT ANSWER TYPE

Q1. Reflex actions

Q2. Abscisic Acid/ABA

Q3. Instant jumping- involuntary & reflex action; walking away- voluntary & slow action

Q4. Adrenaline

Q5. Thyroid hormones play a key role in regulating metabolism, Hypothyroidism slows down carbohydrate, protein and fat metabolism, leading to fatigue and weight gain.

Q6. Vertebral column

Q7. Thigmotropism is a directional growth movement exhibited by some plants and fungi in response to touch or physical contact with a solid object.

Q8. Pancreas: The pancreas is a dual gland because it has:

- Exocrine function: It releases digestive enzymes to break down carbohydrates, proteins and fats.
- Endocrine function: It also secretes hormones like insulin and glucagon regulating blood sugar levels.

Q9. (i) A girl has grown extremely tall – Pituitary gland
(ii) A woman has swollen neck- Thyroid gland.
Q10. (i) Shivering when it is too cold.
(iv) Peristaltic movement in oesophagus when swallowing food.

SHORT ANSWER TYPE

Q1. a- receptor – to receive stimulus and triggers a signal.
b-sensory neuron- carries the signal generated by the receptor towards the spinal cord (CNS) as an electrical impulse.

c- motor neuron- The motor neuron carries the outgoing signal after interpretation by spinal cord (CNS) to the effector organ.

d- spinal cord- This is the processing centre of the reflex arc, where the signal is interpreted an appropriate response is decided.

Q2. (i)dendrites. (ii) axon (iii) nerve ending.

Figure 6.1 page 101 NCERT

Q3. (a)The gustatory receptors on the tongue help us to identify the taste of the food.

(b) Fore brain has a specialized function of hearing. Crunch in the food can be heard, and this is processed by the forebrain

Q4. Yes, (a) Nia ducked down because of reflex action.
(b)-Nia's brain received the signal from the eyes through sensory nerves, and the brain processed this signal.

- The brain sent the signal to the hand, through motor nerves to punch back.

Q. 5(a) –roots growing downwards -stimulus:gravity, phenomenon:positive geotropism

-shoot growing upwards -stimulus: sunlight, phenomenon:positive phototropism

(b)The environmental factor that can be altered is adding a source of water/nutrients towards one side of the root.

(c)The tropic movement that occurs when pollen tubes grow towards ovules is called chemotropism.

Q 6 Ovary performs two main functions:

(i) Reproductive Function: The ovary produces female sex cells or ova (eggs).

(ii) Endocrine Function: The ovary secrets hormones like oestrogen and progesterone for the female reproductive system and overall health.

Q. 7 The timing and amount of hormone released are regulated by feedback mechanisms. For example, if the sugar levels in blood rise, they are detected by the cells of the pancreas which respond by producing more insulin. As the
blood sugar level falls, insulin secretion is reduced.

LONG ANSWER TYPE

Q1. (i) Iodised salt is advisable because iodine is necessary for the formation of thyroxin hormone by thyroid gland. Goitre is the disease caused due to its deficiency. Symptom: The neck of the person appears to be swollen due to the enlargement of thyroid gland. (ii) Two neurons are not joined to one another completely. There is a small gap between a pair of neurons. This gap is called synapse. The nerve impulses are carried out to this gap by the help of neuro transmitter (chemical

substance). The conduction of nerve impulse through the synapse takes place in the form of electrical nerve impulse. When a stimulus acts on the receptor, an electrical impulse is produced with the help of chemicals through the synapse and then to the other neuron. Thus, in this way nerve impulses travel in the body.

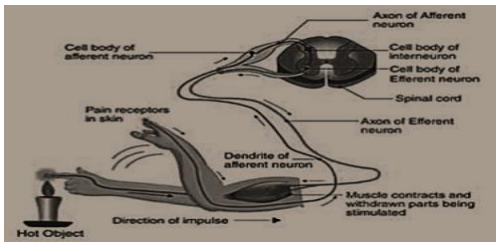
Q2.(a) Reflex Action: A reflex action is an involuntary, automatic, rapid response to a stimulus at the level of spinal cord for our protection and well-being.

Reflex Arc: is the pathway through which a reflex action occurs.

(b)

Movement in a sensitive plant	Movement in our legs
No specialized tissue	Specialized nervous tissue
Change shape depending upon the amount of water in them.	Contract or relax by the movement.
Do not have specialized proteins.	Have specialized proteins.

Q3. Reflex action is a quick, automatic, involuntary, unconscious response in the body brought about by a stimulus.



Examples of reflex action:
1. Withdrawal of hand suddenly on touching a hot plate.
2. Withdrawal of finger suddenly when pricked by a thorn.
3. Shivering of the body on feeling cold.
4. Sudden closure of the eyelids when bright light falls on the eye.

Reflex arc: It is the shortest route taken by impulse from receptor to effector.
Example: When we touch a hot plate by our finger, we instantly withdraw our hand. Here stimulus is touching a hot plate, receptors are our fingers. The specialised epithelial cells of our fingers respond to stimulus and convert into impulse. This impulse is carried by sensory neuron to spinal cord which generates a motor impulse. This impulse is carried by motor neuron to effector organ i.e., muscles of hand. Response is withdrawal of our hand

CASE BASED/ SOURCE BASED

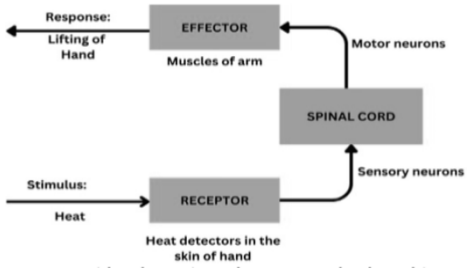
Q1.1 phototropism, geotropism, chemotropism, thigmotropism and hydrotropism. (any two)
Q1.2 The movement of ‘touch me not’ plant is a nastic movement.
Q1.3 growth of pollen tubes to ovules is one example of chemotropism.
Q1.4 Cytokinins promotes cell division in plants. Abscisic acid inhibits plant growth.
Q2.1 Parkinson’s disease, Huntington’s disease, Alzheimer’s disease (any two)

Q2.2 Neurodegenerative diseases are cause of concern because they gradually cause loss of cognitive abilities such as loss of memory and decision making

Q3.1 auxin
Q3.2 ethlyene
Q3.3 Cytokinin.
Q3.4 Auxin

Q4.1 Path through which a reflex action travel.
Q4.2 Brain and Spinal Cord

Q4.3



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CHAPTER 7

HOW DO ORGANISMS REPRODUCE?

QUESTION BANK
MULTIPLE CHOICE QUESTIONS

Q1. Contraceptives help in preventing pregnancies. What function would a contraceptive loop inserted at T serve?

(a) Stopping sperms from reaching and fertilizing eggs

(b) Stopping release of sperms

(c) Blocking the release of eggs

(d) Stopping egg creation

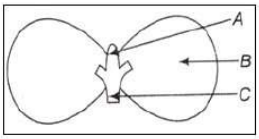
Q2. Identify the example that best describes a response to a stimulus.

(a)Absorption of sunlight by chloroplast
(b) Germination of pollen grains on the stigma
(c) Absorption of nutrients from the soil through root hairs
(d)Transportation of water and nutrients through the xylem

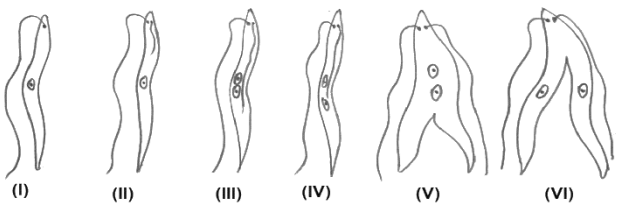
Q3. The thread like structure that develop on a moist slice of bread in Rhizopus are:
(a) Sporangia
(b) Filaments
(c) Rhizoids
(d) Hyphae

Q4. In the male reproductive system along the path of the vas-deferens the secretions of which gland provide nutrition and mobility to the sperms? (a) Prostate glands (b) Seminal vesicles (c) both a and b (d) Scrotum

Q5. In the below figure the parts A, B and C are sequentially
(a) Cotyledon, plumule and radicle
(b) Plumule, radicle and cotyledon
(c) Plumule, cotyledon and radicle
(d) Radicle, cotyledon and plumule



Q6. Choose the correct order of the stages of binary fission in Leishmania.



(a) I, II, III, IV, V, VI
(b) I, III, II, V, IV, VI

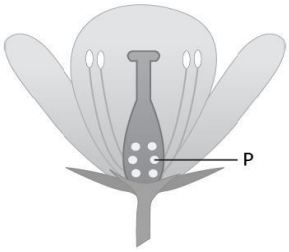
(c) I, III, V, II, VI, IV
(d) I, II, III, V, VI, V

Q7. Among the following diseases, which is not sexually transmitted?
(a) Syphilis (b) Hepatitis
(c) HIV-AIDS (d) Gonorrhoea

Q8. Select the correct sequence of acts that leads to pregnancy in a female
1) Fertilisation of egg 2) ovulation 3) Formation of zygote 4) implantation
(a) 4,3,2,1 (b) 2,1,3,4

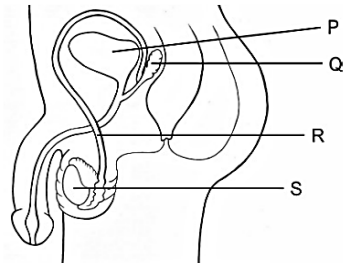
(c) 1,2,3,4 (d) 4,3,1,2

Q9. The image shows the structure of a flower. Out of the following processes, which one is likely be disturbed or not will not take place, if the labelled part is removed from the flower?



(a) formation of fruit
(b) transport of pollen
(c) formation of pollen
(d) development of pollen tube.

Q10. The diagram below represents the male human reproductive system.
Identify the part that is resposible for the secretion of testosterone.



(a) P (b) Q (c) R (d) S

ASSERTION REASON TYPE

Answer the question selecting appropriate options given below:
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true

Q1. Assertion (A): Plants that can reproduce asexually cannot reproduce sexually.

Reason (R): Asexual reproduction does not involve the production of gametes.

Q2. Assertion (A): An organism with 24 chromosomes undergoes binary fission to give rise to daughter cells with 12 chromosomes each.
Reason (R): Binary fission gives rise to two identical daughter cells.

Q3. Assertion (A): Testes in human males are located outside the abdominal cavity in scrotum.
Reason (R): scrotum provides a lower temperature than the normal body temperature for sperm formation.

Q4. Assertion (A): Amoeba takes in food using finger like extensions of the cell surface.
Reason (R): In all unicellular organism the food is taken in by the entire cell surface**.**

Q5. Assertion: Zygote is formed by fusion of sperm with Egg.
Reason: Both the sperm and the egg are haploid.

Q6. Assertion: Urethra forms the common passage for both the sperms and urine.
Reason**:** It carries both of them outside the male body.

Q7. Assertion: HIV-AIDS is a viral disease.
Reason: It does not spread through sharing of food and shaking hands.

VERY SHORT ANSWER TYPE

Q1 Kirti wants to produce a hybrid variety of tomatoes. She has tomato plants X and Y belonging to two different varieties, one with smooth, long fruits and the other one with wrinkled, round fruits. Tomatoes have bisexual flowers. Kirti carries out the following steps carefully to cross pollinate the flowers of plants X and Y:

i. She removes a part of the flowers of tomato plant X just before the flowers bloom.
ii. She manually pollinates the flowers of tomato plant X using pollen from the flowers of tomato plant Y.
iii. She ties small plastic bags around the pollinated flowers of tomato plant X. The plastic bags are removed after a couple of days.

What could be reason for covering the pollinated flowers of plant X?

Q2. A new sugarcane plant is genetically the same as the parent plant, but a child of human parents is genetically not the same as its parents. Explain why.

Q3. Sita is very fond of gardening. She has different flowering plants in her garden. One day few naughty children entered her garden and plucked many leaves of Bryophyllum plant and threw them here in the garden. After few days, Sita observed that new Bryophyllum plants were coming out from the leaves which fell on the ground. What does the incident sited in the paragraph indicate?

Q4. Name two bacterial STDs.

Q5. What is the site of fertilization in human being?
Q6. Give the full form of IUCD.
Q7. How is binary fission different from multiple fission?
Q8. Which of the following is a unisexual flower bearing plant?
Q9. Which of the two self-pollination or cross pollination has greater chances of bringing variations in the progeny? If yes, then why?
Q10. Which tissue provides nutrition to the growing fetus in the womb?

SHORT ANSWER TYPE

Q.1 Compare the reproductive parts of flowers and humans and answer the questions below:

(a) Which part of the human female reproductive system has a similar function as the stigma in a flower? Give a reason to support your answer.

(b) Testes in the male reproductive system would correspond to which part of the male reproductive system in a flower? Justify.

(c) The style of a flower and the fallopian tube in humans correspond functionally with each other. Is this statement true? Justify your answer.

Q2. Walnut plants belong to a category of plants where the male and female flowers grow separately on the same plant. A scientist took three plants - P, Q and R. He removed the male flowers from plant P and the female flowers from plant Q. Plant R, he left as it is - with both flowers on the same plant. He kept all three plants in an open space. Will any of these plant/s bear fruits? Justify your answer.

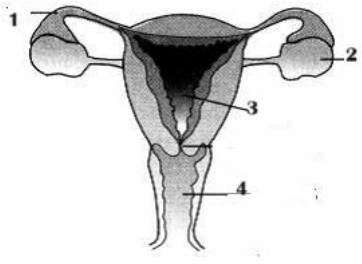
Q3. Bindu wants to try producing a hybrid variety of pumpkins from two varieties P and Q. Pumpkin plants have unisexual flowers, with both male and female flowers on all plants. There is a slight variation in the procedure as described below:

- She does NOT remove any part from the pumpkin flowers she wants to pollinate.
- However, she still ties small plastic bags around the manually pollinated flowers.

Explain why Bindu does not remove any part from the flowers to be pollinated, but still ties small plastic bags after pollination.

Q4. Justify the following statement:
“The use of contraceptive methods has a direct effect on the health and prosperity of a family.”
Q5. List differences between pollination and fertilization.

Q6. (a) Name the parts 1 to 4 of human female reproductive system.
(b) Name the part where implantation takes place in the system.



Q7. Read the table and fill the where “? “present

Plant/ animal	Reproduction type
Amoeba	?
?	Multiple fission
Strawberry	?
?	Regeneration
?	Budding
Mango, Apples, Pea	?
?	Spore formation
Rose, chrysanthemum, grapes	?

LONG ANSWER TYPE

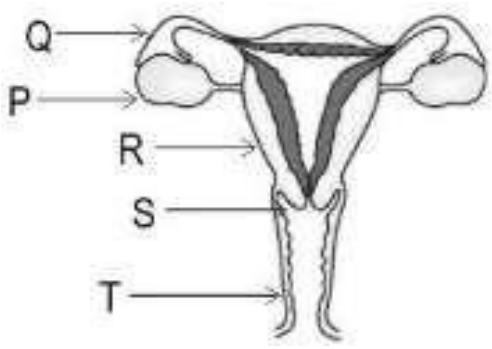
Q1. Water hyacinths reproduce both sexually and asexually. They reproduce sexually by producing seeds through flowers, and asexually by bud formation or fragmentation. It undergoes reproduction through either of the methods depending on environmental conditions. Water hyacinths bloom freely in water-rich conditions whereas, reproduction for survival is more effort- intensive in water-scarce conditions.

(a) Explain why this variation in reproduction is required in water hyacinths.

(b) Which mode of reproduction is likely to occur in the following conditions?

(i) abundance of water (ii) scarcity of water

Q2. Vasectomy is a method of contraception in males where the vasa differentia is tied or sealed so as to prevent sperm from entering the urethra. The diagram below represents the human female reproductive system with some of its parts marked P, Q, R, S, T.



(a) Identify the labelled part that will be operated on for 'tubectomy' in females. State its function.

(b) Kavya says that if part R is removed the female would not be able to produce eggs. Is she correct? Justify.

Q3. Flower if the reproductive organ in the plants. Answer the following questions

A) Name the essential and non- essential parts of

the flower.

B) Where the pollen grains developed?

C) Which parts produced fruit and seed after the process of fertilization in

flowering plants?

CASE BASED/ SOURCE BASED

Q1**.** Menstrual cycle is the cycle of events taking place in female reproductive organs, under the control of sex hormones, in every 28 days. At an interval of 28 days, a single egg is released from either of two ovaries. Regular menstrual cycle stopped abruptly in a married woman. She got herself tested and was happy to discover that she is pregnant with her first baby.

1.1 Write the function of placenta.

1.2 What is the average duration of menstrual flow per month for normal adult female?

1.3 Give reason why menstruation stops in a pregnant female?

Q2. A newly married couple does not want have children for few years. They consulted a doctor who advised them barrier method and chemical method of birth control. Yet another couple who already have two children and are middle aged also consulted doctor for some permanent solution to avoid unwanted pregnancy. Doctor advised them surgical method of birth control.

2.1 Give two barrier methods of birth control.

2.2 How oral contraceptive pills prevent pregnancy?

2.3 What are the side effects of using Copper T by females? Irritation of uterus and can cause infection.

2.4 Which parts of reproductive systems are blocked surgically to control pregnancies?

Q3**.** X, Y and Z are three sexually transmitted diseases (STDs). X and Z are caused by bacteria whereas Y is caused by virus P. Virus P lowers the immunity of a person and leads to an incurable disease. X starts as painless sores on genitals rectum or mouth. Z causes painful urination and abnormal discharge from genitals.

3.1 If X: Gonorrhoea, Z: _____?

3.2 Identify virus P from the given paragraph.

3.3 How can disease Y be prevented?

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CHAPTER 7

HOW DO ORGANISMS REPRODUCE?

ANSWER KEY

Multiple choice questions

Q1.(a) Stopping sperms from reaching and fertilizing eggs
Q2.(b) Germination of pollen grains on the stigma
Q3. (d) Hyphae
Q4. (c) both a and b
Q5. (c) Plumule, cotyledon and radicle
Q6. (a) I, II, III, VI, V, VI
Q7. (b) Hepatitis
Q8. (b) 2,1,3,4
Q9. (a) formation of fruit
Q10.(d) S

ASSERTION REASON TYPE

Q1.(d)
Q2.(d)
Q3.**(**a)
Q4.(c)
Q5.(b)
Q6.(a)
Q7.(a)

VERY SHORT ANSWER TYPE

Q1. to prevent pollen from other plants from reaching the stigma.

Q2. New sugarcane plants are produced by vegetative propagation which is an asexual method of reproduction. Only one parent is involved and there is no mixing of gametes.

Humans reproduce through sexual reproduction involving two parents and the mixing of male and female gametes, which results in the offspring having the genes of both parents.

Q3. Bryophyllum leaves have notches along their margins. These notches are where tiny plantlets, with roots and shoots, develop. Bryophyllum exhibited vegetative propagation, a type of asexual reproduction.

Q4. Syphilis and Gonorrhoea

Q5. Oviduct / Fallopian tube

Q6. Intrauterine Contraceptive Device.

Q7. Binary fission: Results in the formation of two daughter cells from the parent cell.

Multiple fission: Results in the formation of multiple (more than two) daughter cells from the parent cell.

Q8. Papaya, Watermelon

Q9. In cross-pollination, pollen from the stamen of one plant fertilizes the ovule of a different plant. This mixing of genetic material from two different parents creates offspring with a greater chance of genetic variation.

Q10. The tissue that provides nutrition to the growing foetus in the womb of the mother is the placenta.

SHORT ANSWER TYPE

Q.1 (a) Vagina - Reason - The stigma of the flower serves as the point of entry of the male gametes/pollen grains, similarly, the cervix serves as the point of entry of the male gametes/sperm in humans/ vagina receives the male gametes in humans.

(b) Part - anther - Function - produces male gametes in form of pollen, just like testes which produce sperms

(c) False - Reason - the main function of the fallopian tube is to serve as the point of fertilisation, which is not the function of the style in flowers.

Q2. Plants P and R will bear fruits. Plant P has the female reproductive organs which can receive pollen and fertilisation can take place.

Plant R has both sexes on the same plant facilitating pollination and fertilisation.

Q3. She does not remove any part from the flowers to be pollinated because the female pumpkin flowers don't have any male parts.

She still ties the pollinated flowers because the pollen from other male flowers can still reach the stigma.

Q4. (i) Contraception allows couples to plan their family size and space births. With control over family size, families can better manage their finances.

(ii) Unplanned pregnancies, especially for young women or those with health concerns, can pose significant health risks. Contraception helps women avoid unwanted pregnancies and potential complications during pregnancy and childbirth.

(iii) Some contraceptive methods, like condoms, offer protection against sexually transmitted infections (STIs), which can benefit the overall sexual health of both partners.

Q5.

Pollination	Fertilization
1)Transfer of pollen grains on stigma.	1) fusion of gametes
2) physical process with the help of external agents needed	2) chemical process followed by pollination.
3) self or cross pollination take place in plants	3) Double fertilization occurs in flowering plants

Q6. (a) 1- fallopian tube/ oviduct 2- ovary 3- uterus 4- vagina (b) Uterus

Q7.

Plant/ animal	Reproduction type
Amoeba	**Binary fission/ Asexual reproduction**
Plasmodium	Multiple fission
Strawberry	**Vegetative reproduction/ Asexual reproduction**
Hydra/ Planaria	Regeneration
Hydra/ Yeast	Budding
Mango, Apples, Pea	**Sexual reproduction**
Rhizopus	Spore formation
Rose, chrysanthemum, grapes	**Vegetative propagation / asexual reproduction**

LONG ANSWER TYPE

Q1. (a)The population of each species thrives in its specific habitat/niche, having particular environmental conditions which can change due to reasons beyond the organisms' control - Having variation ensures greater chances of survival through such changes.

(i) abundance of water- asexual reproduction - In its natural environment, the organism is likely to undergo an energy- efficient method of reproduction such as asexual reproduction.

(ii) scarcity of water - sexual reproduction - In a stressed environment, the organism is likely to opt for the effort-intensive method for survival.

Q2. (a) Part Q - Fallopian tube Function - Acts as the fertilization place for egg & sperm.

(b) No, she is not correct.

Q3. A. (i)essential- stamen and pistil

(ii)Non-essential – sepals and petals

B. anther

C. (i)Ovary develops into fruit

(ii)ovule develops into seed.

CASE BASED/ SOURCE BASED TYPE

Q1.1 Provide nutrition to the growing foetus and removes wastes from the growing foetus through mother's body.

Q1.2 four to five days

Q1.3 Menstruation is triggered by the unfertilized egg leaving the ovary. During pregnancy, ovulation (release of an egg) stops. The uterine lining to thicken and prepare for implantation, and consequently, no menstruation occurs.

Q2.1 Condom, Diaphragm

Q2.2 Bring about hormonal imbalance affecting release eggs

Q2.3 Irritation of uterus and can cause infection.

Q2.4 Fallopian tube in female and vas deferens in male

Q3.1 Syphilis

Q3.2 P is Human immunodeficiency virus (HIV)

Q3.3 Use of sterilised needles and blades, protected sexual contact, blood transfusion only after blood tests etc.

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CHAPTER 8

HEREDITY

QUESTION BANK

MULTIPLE CHOICE QUESTIONS:

Q1) If a tall pea plant bearing red flowers (TTRr) is crossed with another pea plant that is short and has white flowers (ttrr), what percentage of GAMETES will have both alleles for short and white flowers?

(a) 0% (b) 25% **(c)** 50% (d) 75%

Q.2 Manisha is an Indian actress. She was born in Delhi to a homemaker mother and an engineer father. She is around 5 feet tall. She has naturally curly hair. She has trained in contemporary and ballet dancing. Which of these is MOST LIKELY to be true about her children?

(a) They may dance well.

(b) They may grow up to have curly hair.

(c) They may be born to an engineer father.

(d) They may become famous actors one day.

Q3. Which statement explains the Mendel's law of segregation?

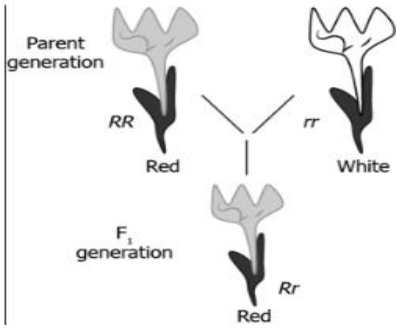
(a) A trait in an offspring is due to the combination of an allele each from both the parent.

(b) A trait in an offspring is due to the combination of two alleles each from both the parent.

(c) A trait in an offspring is due to the combination of two alleles each from either of the parent.

(d) A trait in an offspring is due to the combination of one allele each from either of the parent. Q4.

Q4. The inheritance of color trait in flower is as shown. R and r denote two different genes for color.



Which law of Mendel can be explained using the image?

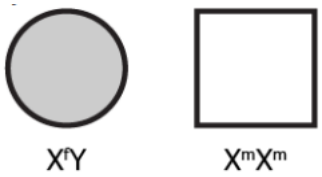
(a) Only Law of segregation

(b) Only Law of independent assortment

(c) Only Law of segregation and Law of dominance

(d) none of the above

Q5. Two individuals are as shown using geometric shapes. Their sex chromosomes are respectively denoted by Xf Xm, and Y. What are the possible combinations of sex chromosomes for their male and female offspring respectively?



(a) Xf Xm and Xm Xm
(b) Xm Y and Xm Xm
(c) Xf Y and Xm Y
(d) Xm Y and Xm Xf

Q6. Attached earlobes in humans is an inherited condition. The allele for attached earlobes is recessive. What are the chances of parents, both having attached earlobes, to have a child with attached earlobes.
(a) 0% (b)25% (c) 75% (d) 100%

Q7. Mendel conducted his famous breeding experiments by working on the following organism.
(a) Drosophila (b) Escherichia Coli (c) *Pisum sativum* (d) All of these

Q8. Which of the following is an example of genetic variation?
(a) One person has a scar, but his friend doesn't.
(b) One person is older than the other.
(c) Reeta eats meat, but her sister Geeta is a vegetarian.
(d) Two children have different eye colour.

Q9. A monohybrid cross is conducted between one variety of pea plants having pods that are full (FF) and another having pods that are constrcted(ff). What is the percentage of heterozygous offsprings in F1 generation.
(a) 100% (b) 75% (c)50% (d) 25%

Q10. The section of DNA that provide information for one protein?
(a) Nucleus (b) Chromosome (c) Trait (d) Gene

ASSERTION REASON TYPE

Following questions consist of two statements – Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q1. Assertion: Accumulation of variation in a species increases the chances of its survival in changing environment.
Reason: Accumulation of heat resistance in some bacteria ensures their survival even when temperature in environment rises too much.

Q2. Assertion (A): Mendel selected the pea plant for his experiments.
Reason (R): Pea plant is cross-pollinating and has unisexual flowers.

Q3. Assertion: Genes present in every cell of an organism control the traits of the organisms.
Reason: Gene is specific segment of DNA occupying specific position on a chromosome.

Q4. Assertion (A): The sex of a child is determined by the mother.
Reason (R): Humans have two types of sex chromosomes: XX and XY.

Q5. Assertion: Monohybrid cross deals with inheritance of one pair of contrasting characters.
Reason: Dihybrid cross deals with inheritance of two pairs of contrasting characters.

Q6. Assertion: Genetics is described as a science which deals with heredity.
Reason: Heredity is the transmission of characters from parents to off springs.

Q7. Assertion: When pea plants having round yellow seeds are crossed with plants having wrinkled green seeds, then all pea plants obtained in F1, generation bear wrinkled green seeds.
Reason: Round and yellow seeds are dominant to wrinkled and green seeds.

VERY SHORT ANSWER TYPE

Q1 The farmer concludes that the allele for green seeds shows dominance over that of yellow seeds. Is he right? Justify your answer.

Q2. The farmer crosses two heterozygous green seeded plants and obtains 100 plants in the F1 generation.What would be the number of green and yellow seeds respectively in F1 generations.

Q3. What should be the genotype of the parent plants to give green and yellow seeds in equal proportions?

Q4. Haploid (n) means a cell has one set of chromosomes and Diploid (2n**)** means a cell has two sets of chromosomes. Based on this information write the ploidy of (i) human gamete and (ii) human body cell.

Q5. What is the ratio of monohybrid and dihybrid cross?

Q6. Give the term for generation obtained on a cross between first set of parents.

Q7. Who is called the father of genetics?

Q8. Which type of variation is shown by two siblings having different eye colors?

Q9. An allele/trait, whose phenotype (physical appearance) will be expressed even in the presence of another allele of that gene. It is represented by a capital letter. It is called _____.

Q10. Mendel studied seven pairs of contrasting characters in pea plants to study heredity. What is the scientific name of the pea plant?

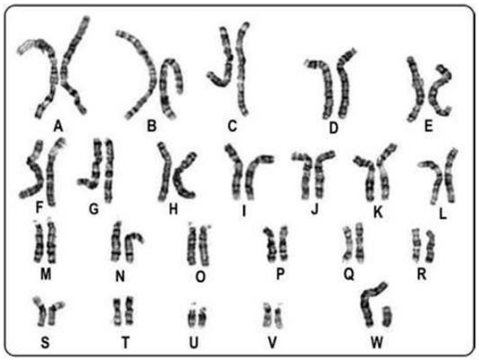
SHORT ANSWER TYPE

Q1. The picture below is of the chromosome pairs present in a cell of a person.

(a) Identify the sex of the person. Give reasons for your answer.

(b) State the number of chromosomes pairs present in a male or female gamete.

Q2. Sex determination in humans happens through sex chromosomes. Along with other parameters, such processes often help in forensic studies in crime investigations and/or identification of accidents and natural calamities. In order to



determine whether an accident victim is male or female, which cells can be used and why?

Q3. Why did Mendel select pea plant for his experiments?

Q4. “Only variations that confer an advantage to an individual organism will survive in a population.” Justify this statement.

Q5. Name the organism Mendel used for his experiments. Explain about F1 and F2 progeny obtained by

Mendel when he bred tall and short varieties of the organism he experimented with.

Q6. Genotype of a plant bearing purple flowers is PP and one with white flowers is pp. When these are crossed:

(a) Identify the colour of the flowers would you find in F1 progeny?

(b) Give the percentage of white flowers if F1 plants are self-pollinated.

Q7. In a monohybrid cross of tall Pea plants denoted by TT and short pea plants denoted by tt, Preethi obtained only tall plants (denoted by Tt) in F1 generation. However, in F2 generation she obtained both tall and short plants. Using the above information, explain the law of dominance.

LONG ANSWER TYPE

Q1. Consider a pea plant that is recessive for plant height. It’s genotype is ‘stand ‘phenotype’ is dwarf.

(a) Assuming that the gene for plant height obeys the Mendel’s laws of inheritance, indicate the genotypes and phenotypes of all possible parents that could have dwarf offspring.

(b) Perform a cross between Tt x Tt to show the genotypes of the offspring that might arise in the next generation.

Q2**.** (i) Differentiate between Homozygous and Heterozygous allele.

(ii) Why dwarf character not expressed in F1 generation of Monohybrid cross?

Q3. How do Mendel’s experiments show that the (a) Traits may be dominant or recessive, (b) Traits are inherited independently?

CASE BASED/ SOURCE BASED

Q1 Gregor Mendel conducted hybridisation experiments on garden peas for seven years and proposed the laws of inheritance in living organisms. He investigated characters in the garden pea plant that were manifested as two opposing traits, e.g., tall or dwarf plants, yellow and green seeds, etc

Q1.1 Among the seven pairs of contrasting traits in pea plant as studied by Mendel, how many traits were related to flower, pod and seed respectively.

Q1.2 In a dihybrid cross what are the possible genotypes of (i) Round and yellow seeds (ii) wrinkled and green seeds

Q2. The most obvious outcome of the reproduction process is the generation of individuals of several designs, but in sexual reproduction they may not be exactly alike. The resemblances as well as differences are marked. The rules of heredity

determine the process traits and characteristics are reliably inherited. Many experiments have been done to study the rules of inheritance.

Q2.1 Which generation will the recessive trait for seed colour and shape of a pea plant will be expressed in a dihybrid cross.

Q2.2 Write the phenotype and genotype of all progeny in F2 generation in a dihybrid cross when a round and yellow seeds are crossed with wrinkled and green seeds.

Q2.3 While performing experiments, what is the difference between F1 and F2 generation?

Q3**.** Sex determination is the method by which distinction between males and females is established in a species. The sex of an individual is determined by specific chromosomes. These chromosomes are called sex chromosomes or allosomes. X and Y chromosomes are called sex chromosomes. The normal chromosomes other than the sex chromosomes of an individual are known as autosomes.

Q3.1 A couple has six daughters. Give the percentage of possibility of their having a girl next time?

Q3.2 What is the number of autosomes present in liver cells of a human female is?

Q3.3 In XX-XY type of sex determination, which gametes are produced by a human male?

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CHAPTER 8

HEREDITY

ANSWER KEY

MCQ

Q1.(b) 25%

Q2.(b) They may grow up to have curly hair.

Q3. (a) A trait in an offspring is due to the combination of an allele each from both the parent.

Q4. (c) Only Law of segregation and Law of dominance

Q5. (d) Xm Y and Xm Xf

Q6.(d) 100%

Q7. *(c) Pisum sativum*

Q8. (d) Two children have different eye colour.
Q9. (a) 100%
Q10. (d) Gene

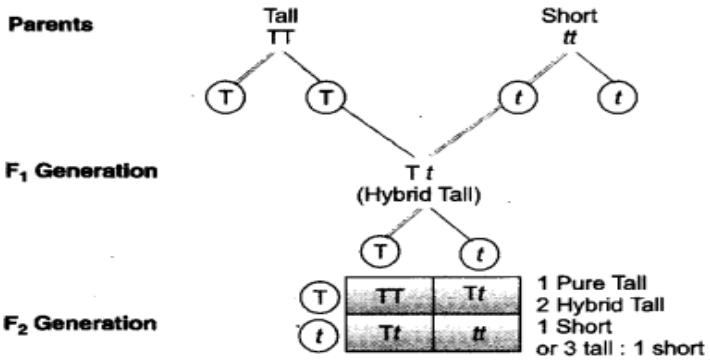
ASSERTION REASON TYPE
Q1. (a)
Q2. (c)
Q3. (b)
Q4. (d)
Q5. (b)
Q6. (b)
Q7.(d)

VERY SHORT ANSWER TYPE
Q1. Yes, he is right, Since the offspring pod has all green seeds, the allele for green seeds is dominant even if present in heterozygous state.
Q2. Green seeds- 75 and yellow seeds- 25
Q3. First parent- Gg Second parent - gg
Q4. (i)Human gametes (egg and sperm cells) have a **haploid (n)** ploidy, (ii) human body cells have a **diploid (2n)** ploidy.
Q5. Monohybrid- 3:1 dihybrid – 9:3:3:1
Q6. First Filial 1 generation / F1 generation
Q7. Gregor Mendel**.**
Q8. Genetic variation
Q9. dominant allele**.**
Q10. *Pisum sativum**.***

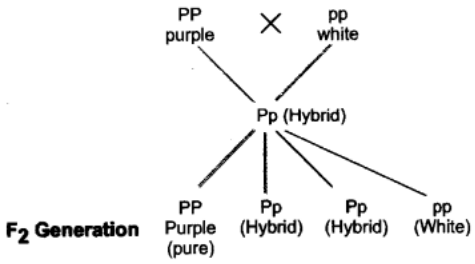
SHORT ANSWER TYPE
Q1. (a) male. 23rd pair has X and Y chromosomes. (b) 23
Q2. (i) Any cell of the body (ii) every cell has a 23rd chromosome as sex chromosome
– if the sex chromosome is XX- then the victim is female and if the cell has sex chromosome is XY – then the victim is male.
Q3. (i)Pea plants have a relatively short growing season, allowing Mendel to observe multiple generations in a short period.
(ii)Pea plants possess several distinct, contrasting traits like seed colour (green or yellow), seed shape (round or wrinkled), flower colour (purple or white), and plant height (tall or short). These clear-cut differences made it easy for Mendel to track inheritance patterns.
(iii) Mendel could also easily control pollination by manually transferring pollen between different plants (cross-pollination). This control allowed him to study the effects of specific crosses.
(iv)Pea plants produce many seeds in each pod, providing Mendel with a large number of individuals to analyse in each generation.
(v)Pea plants are common and relatively easy to grow and maintain in a garden.

Q4. Variation can increase the chance of survival, by favoring the propagation of genes that increase survival chances and reproduction in a particular environment. Over time, this process leads to populations better adapted to their surroundings.

Q5. Organism: Garden or Edible Pea (*Pisurn sativum*).



Q6. (a) Purple. (b) 25%

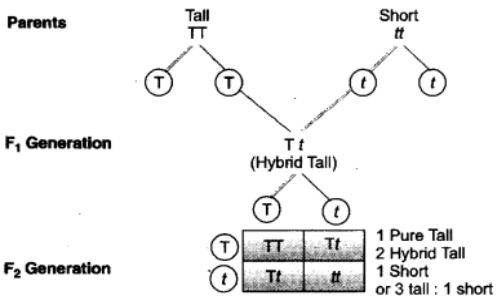


Q7. Appearance of trait of shortness in F2 generation shows that the trait was present in F1 generation but was not expressed while the trait of tallness expressed itself. The trait which expresses itself in the presence of its contrasting form is called dominant. The other trait which is unable to express its effect in the presence of its contrasting trait is known as recessive.

LONG ANSWER TYPE

Q1.(a) (i) Tt (tall) x Tt (tall) (ii) Tt (tall) x tt (dwarf) (iii) tt (dwarf) x tt (dwarf)

(b)



Q2(i)

Homozygous allele	Heterozygous allele
1) Refers to a pair of genes where both alleles are identical for a	1) Refers to a pair of genes where the alleles are different for a

particular trait.	particular trait.
2) Represented with two lowercase letters (e.g., tt for recessive trait) or two uppercase letters (e.g., GG for dominant trait).	2) Represented with one uppercase letter and one lowercase letter (e.g., Tg)
3) An organism with homozygous alleles will always express the corresponding trait, whether dominant or recessive.	3) The dominant trait will only be expressed and the recessive trait remain masked.

(ii) because the dominant allele masks the presence of the recessive allele.

Q3. (a) Dominant and Recessive Traits: Monohybrid Crosses: Mendel conducted crosses between purebred plants with contrasting traits (e.g., tall vs. short). In the F1 generation, all offspring displayed only one parental trait. This suggested the existence of alleles, different versions of a gene. The expressed trait in the F1 generation represents the dominant allele, while the masked trait represents the recessive allele.

(b) Traits are Inherited Independently: Dihybrid Crosses: Mendel also performed crosses involving two contrasting traits (e.g., round yellow seeds vs. wrinkled green seeds). F1 Generation: Interestingly, the F1 generation did not show any combinations of the non-dominant traits (wrinkled yellow or round green). All F1 plants exhibited the dominant combination (round yellow). This observation supported independent inheritance. The inheritance of one trait (seed shape) wasn't influenced by the inheritance of the other trait (seed colour).

CASE BASED/ SOURCE BASED

Q1.1 - 2 traits related to flower: Flower colour (purple or white) and Flower position (axial or terminal).

2 traits related to pod: Pod shape (inflated or constricted) and Pod colour (green or yellow).

2 traits related to seed: Seed shape (round or wrinkled) and Seed colour (yellow or green).

Q1.2 (i) Round and yellow seeds – RRYY, RRYy, RrYY, RrYy (ii) wrinkled and green seeds.- rryy

Q2.1 F2 generation.

Q2.2

Phenotype	Genotype
Round, Yellow	RRYY, RRYy, RrYY, RrYy (9 plants)
Round, Green	RRyy, Rryy (3 plants)
Wrinkled, Yellow	rrYY, rrYy (3 plants)
Wrinkled, Green	rryy (1 plant)

Q2.3

F1 generation

1) Usually heterozygous progeny 2) Dominant trait often expressed

F2 generation

1) Progeny show more genetic variations- homozygous and heterozygous. 2) Ration of dominant and recessive phenotypes based on inheritance pattern.

Q3.1 50%

Q3.2 22 pairs that is 44 number of autosomes.

Q3.3 males produce two different types of gametes. Males have one X chromosome and one Y chromosome (XY). That are their gametes can be either sperm with an X chromosome or sperm with a Y chromosome.

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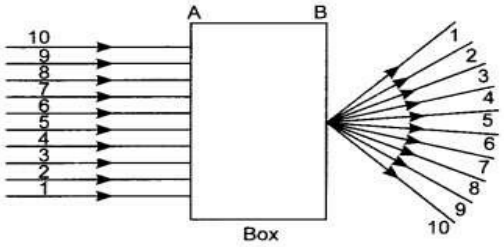
CHAPTER - 9

LIGHT- REFLECTION AND REFRACTION

Question Bank

Multiple Choice Questions

1. A beam of light is incident through the holes on side A and emerges out of the holes on the other side B as shown in the figure below:



Which of the following could be inside the box?

A. Concave lens

B. Rectangular glass slab

C. Prism

D. Convex lens

2. Rays from sun converge at a point 15 cm in front of a concave mirror. Where should an object be placed so that size of its image is equal to that of the object?

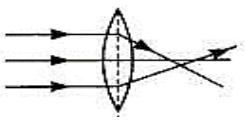
A. 30 cm in front of a mirror

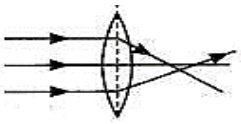
B. 15 cm in front of a mirror

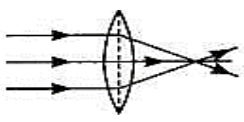
C. Between 15 cm and 30 cm in front of a mirror

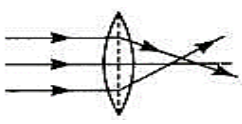
D. More than 30 cm in front of a mirror

3. The distance between the optical centre and point of convergence is called focal length in which of the following cases?

A. 



C. 



4. A student focused the image of a candle flame on a white screen using a convex lens. He noted down the position of the candle, screen and the lens as under:

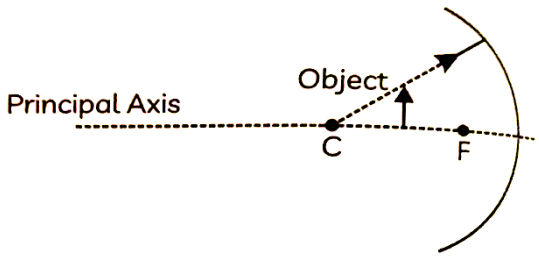
- Position of candle- 26 cm

- Position of convex lens- 50 cm
- Position of screen- 90 cm

Select the row containing the correct values as per sign convention:

	Object distance(u) cm	Image Distance (v) cm	Focal length(f)
A.	- 26 cm	- 50 cm	+ 30 cm
B.	- 26 cm	- 40 cm	- 15 cm
C.	- 24 cm	- 40 cm	+ 15 cm
D.	- 24 cm	+ 40 cm	+ 15 cm

5. While looking at the diagram a student named Drishti concluded the following:



(i) The image of the object will be a virtual one.

(ii) The reflected ray will travel along the same path as the incident ray but in opposite direction.

(iii) The image of the object will be inverted.

(iv) This is a concave mirror and hence the focal length will be negative.

Which one of the above statements is correct?

A. (i) and (ii)

B. (i) and (iii)

C. (ii), (ii) and (iv)

D. (i), (ii), (iii) and (iv)

6. The refractive index of flint glass is 1.65 and that for alcohol is 1.36 with respect to air. What is the refractive index of the flint glass with respect to alcohol?

A. 0.82

B. 1.21

C. 1.11

D. 1.01

7. The refractive index of medium A is 1.5 and that of medium B is 1.33. If the speed of light in air is 3 X 10^8 m/s, what is speed of light in medium A and B respectively?

A. 2 X 10^8 m/s and 1.33 X 10^8 m/s

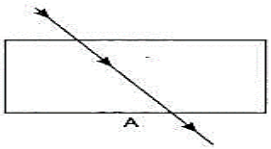
B. 1.33 X 10^8 m/s and 2 X 10^8 m/s

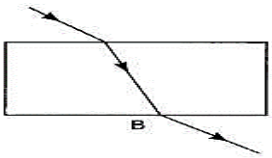
C. 2.25 X 10^8 m/s and 2 X 10^8 m/s

D. 2 X 10^8 m/s and 2.25 X 10^8 m/s

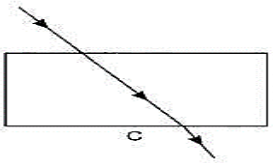
8. The path of a ray of light coming from air passing through a rectangular glass slab traced by four students are shown as A, B, C and D in figure. Which one of them is correct?

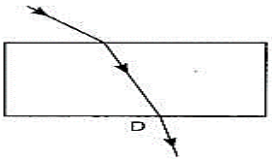
A.





C.





ASSERTION REASON QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason(R). Mark the correct choice as:

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true and R is NOT the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

1. **Assertion (A):** The word **AMBULANCE** on the hospital vans is written in the form of its mirror image in inverted form.

   Reason(R): The image formed in a plane mirror is same size of the object.

2. **Assertion (A):** A ray of light passing through the center of curvature of a concave mirror is reflected back along the same path.

   Reason (R): The incident ray, reflected ray and the normal at the point of incidence lie on the same plane.

3. **Assertion (A):** The image formed by a concave mirror is certainly real, if the object is virtual.

   Reason(R): The image formed by a concave mirror may be real or virtual depending on the position of the object.

4. **Assertion (A):** when a concave mirror is held under water, its focal length will increase.

   Reason(R): The focal length of a concave mirror is independent of the medium in which it is placed.

SHORT ANSWERS QUESTIONS

1. Name two mirrors used in the beauty shop.
2. Why do we prefer a convex mirror as a rear-view mirror in vehicles?
3. The magnification produced by a plane mirror is +1. What does this mean?
4. List two precautions which a student should observe while determining the focal length of a given convex lens by obtaining image of a distant object on a screen.
5. An object of 2 cm high is placed at a distance of 64 cm from a white screen on placing a convex lens at a distance of 32 cm from the object it is found that a distant image of the object is formed on the screen. What is the focal length of the convex lens and size of the image formed on the screen?
6. The refractive index of water is 1.33 and kerosene is 1.44. Calculate the refractive index of kerosene with respect to water.
7. State the laws of refraction of light. Explain the term “Absolute refractive index of a medium”. Write an expression to relate it with the speed of light in vacuum.
8. The radius of curvature of a spherical mirror is 20 cm. What is its focal length?

LONG ANSWERS QUESTIONS

1. A converging lens has focal length of $12cm$, calculate at what distance should the object be placed from the lens so that it forms an image at $48cm$ on the other side of the lens.

2. Analyse the following observation table showing variation of image distance (v) with object distance (u) in case of a convex lens and answer the questions that follow without doing any calculations:

S. No	Object distance(u)	Image distance(v)
1	-100	+25
2	-60	+30
3	-40	+40
4	-30	+60
5	-25	+100
6	-15	+120

a) What is the focal length of the convex lens? Give reason to justify you answer.

b) Write the serial number of the observation which is not correct. On what basis have you arrived at this conclusion.

c) Select an appropriate scale and draw a ray diagram for the observation at S. No. 2. Also find the approximate value of magnification.

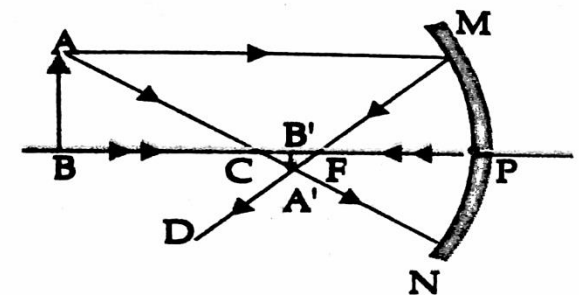
3. (a) Two lens have power of +2D and - 4D. What is the nature and focal length of each lens?

(b) An object is kept at a distance of 100 cm for a lens of power – 4D. Calculate image distance.

CASE BASED / DATA BASED QUESTIONS

1. Read the following passage and answer the questions:

Following figure illustrates the ray diagram for the formation of image by a concave mirror. The position of the object is beyond the centre of curvature of the concave mirror.



A. If the focal length of the concave mirror is 10 cm, the image formed will be _____.

B. An image formed by a concave mirror is virtual, when the object is at _____.

C. A negative sign in the magnification value indicates that the image is_____.

D. If the size of the object in the given figure is 5 cm and the magnification produced is -0.5, the size of the image is ____cm.

2. A girl was playing with a thin beam of light from a laser torch by directing it from different directions on a convex lens held vertically. She was surprised to see that in a particular direction, the beam of light continues to move along the same direction after passing through the lens.

A. State the reason for her observation.

B. Draw a ray diagram to support your answer.

C. What is concave and convex mirror?

3. One of the most common uses of convex mirror is the passenger side mirror on your car. Convex mirrors are also often found in the hallway of various buildings,

hospitals etc.

A. As the object is moved away from the focus of the convex mirror, what will be the effect on the size of the image?

a. Size of the image increases

b. Size of the image decreases

c. Size of the image remains same

d. Size of the image decreases if the image shifts from focus towards the pole

B. Explain, why convex mirrors are used in shopping malls for security purposes?

C. What happened with image area cover range if we replace the convex mirror with plane mirror?

LIGHT- REFLECTION AND REFRACTION
Answer Question Bank

Answer Key

Multiple Choice Questions
1. A
2. A
3. C
4. A
5. C
6. B
7. D
8. B

Assertion-Reason Question Answers
1. B
2. B
3. B
4. D

Short Answer Questions

1. In beauty shops two mirrors.

Concave Mirror: Concave mirror has reflecting surface inside. It is also called as converging mirror as the light converges at a point.

Plane Mirror: It produce real time, same size image and prepare infinite image in two plane mirror combination.

2. Convex mirror always gives smaller, virtual image and wider view of the road while we are driving.

3. Size of image is equal to the size of the object

4. Any two of the following-
   i. While placing the distant object, the object should be clearly visible.
   ii. The image on the screen should be sharp and well defined.
   iii. While measuring all the distances the scale should be kept parallel to the ground.
   iv. The meter should be properly placed between screen and centre of convex lens.

5. According to the question object-screen distance is equal to the lens-image distance. That means the object is at a distance of 2f from the lens and the image should be of the same size of the object. Here the Object lens distance is equal to 2f = 32cm
   So 2f = 32cm
   f=16cm

   Height of image = Height of object = 2cm.

6. Refractive index of water =n_w=1.33
   Refractive index of kerosene =n_k=1.44
   ∴ Refractive index of kerosene with respect to water is n_w/n_k
   So Refractive index of kerosene with respect of water = 1.33/1.44 = 1.082

7. Laws of Refraction: Snell's Law
   - The incident ray, the refracted ray and the normal to the interface of two media at the point of incidence all lie in the same plane.
   - For the light of a given color and for given pair of media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant.
     $n_1 \sin\Theta_1 = n_2 \sin\Theta_2$
     n_1 = incident index
     n_2 = refracted index
     Θ_1 = incident angle
     Θ_2 = refracted angle

8. Focal length = 1/2 x Radius of curvature = 1/2 x 20 cm = 10 cm

Long Answer Questions

1. Data given in question

The focal length of a converging lens is
f=+12cm (Focal length of a converging lens is positive)
Image distance
v=+48cm (Distance measured on the right side of the optical centre is positive)

Lens formula,
$1/f=1/v-1/u$ Where u is the object distance

Substitute the values into the formula.

- $1/12cm=1/48cm-1/u$
- $1/u=1/48-1/12$
- $1/u=1-4/48$
- $u=48/-3u$
- $u=-16cm$

To form an image at $48cm$ on the right side of the converging lens of focal length $12cm$, the object should be placed at $16cm$ on the left side of the lens.

2. Data given in question

a) The focal length is calculated by f=R/2

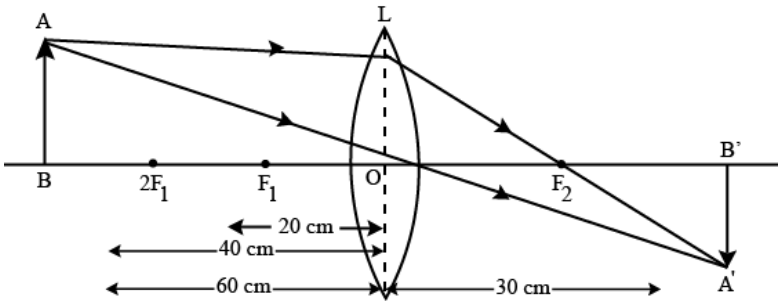
Here in the table 3rd observation suggest the 2F (radius of curvature) value is 40 as distance of object and the distance of the image is same. We know, focal length is half of the radius of curvature.

f=R/2

f=40/2

f=20cm

(b) S. No. 6 is not correct, because for this observation the object distance is between focus and pole and for such cases, the image formed is always virtual. But in this case real image is formed as the image distance is positive.



(c)

From the figure, object distance u = - 60 cm and image distance v = 30 cm.
Magnification = v/u
Magnification = +30/−60
Magnification = −0.5

3. Data given in question

(a) Power of a lens is given by reciprocal of its focal length. *i.e.* $P=1/$(in meter)
A negative power means a negative focal length and positive power means positive focal length. As we know, a converging or convex lens has a positive focal length and a diverging or concave lens has a negative focal length. Therefore,
(i) The lens with positive power '+2D' is a converging lens
(ii) The lens with negative power '−4D' is a diverging lens in nature.

(b)Power of the lens = +2D, $P=1/$(in meter)
Focal length $=1/P$

1/P=1/2m = 50cm
Object distance = -100 cm

Using the lens formula,
1/v-1/(-100)=1/50
1v=1/100
v=100cm
So, the image distance for the first lens is 100 cm.
Magnification of the lens = v/u
v/u=100cm/-100cm=-1

(ii) Power of the lens = -4D, P=1/(in meter)
Focal length =1/P=-1/4m=-25cm
Object distance = -100 cm
Using the lens formula,
1/v-1/(-100)=-1/25
1/v=-1/20
v=-20cm

So, the image distance for the second lens is -25 cm.
Magnification of the lens = v/u
v/u = -25cm/-100cm = ¼
v/u = 0.25

Case Based Questions Answers

1. **A.** More than 10 cm

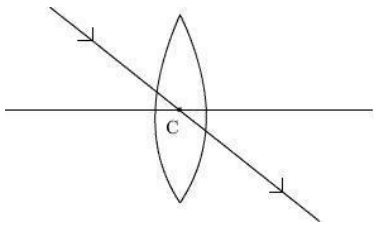
B. Between pole and focus

C. Real and inverted

D. 2.5

2. **A.** A ray of light passes non-deviated through the optical centre of the lens. It means that the ray of light passes along the same direction after passing through the optical centre of the lens.

B.



C. If the inner side of the spherical mirror is reflecting, it is called a concave mirror. If the outer side of the spherical mirror is reflecting, it is called a convex mirror.

3. **A.** B. Size of the image decreases

B. Convex mirror is used for security purposes in shopping malls because of its wider field of view. For the same purpose, neither a concave mirror nor a plane mirror is suitable because of narrower field of view.

C. The plane mirror produces same size of image and the coverage area is perpendicular parallel to the mirror so the purpose to place it on turns will be not solved.

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CHAPTER - 10

THE Human Eye and the Colorful World

Question Bank

Multiple Choice Questions

1. When we enter a dark room coming from outside, immediately the things inside the room do not appear clear to our eyes. This is because

   A. Pupils do not open at all in the dark

   B. Pupils take time to adjust.

   C. Light travels slower in a dark room.

   D. Pupils open very quickly in the dark.

2. Near and far points of a young person normal eye respectively are

   A. 0 and infinity

   B. 0 and 25 cm

   C. 25 cm and infinity

   D. 25 cm and 150 cm

3. Myopia and Hypermetropia can be corrected by

   A. Concave and Plano-convex lens

   B. Concave and convex lens

   C. Convex and concave lens

   D. Plano-concave lens for both defects.

4. Safar cannot see through the fog while driving, because

   A. Refractive index of the fog is very high

   B. Light suffers total reflection at droplets

   C. Fog absorbs light

   D. Light is scattered by the droplets

5. Twinkling of stars is due to atmospheric

   A. Dispersion of starlight by water droplets of the atmosphere

   B. Refraction of starlight by different layers of varying refractive indices

   C. Scattering of light by dust particles of the atmosphere

   D. Reflection of starlight by different layers of varying refractive indices

6. A person cannot see distinctly objects kept beyond 4 m. This defect can be corrected by using a lens of power

   A. +0.4D

   B. –0.4D

   C. +0.25D

   D. –0.25D

7. With both eyes open, a person's field of view is about:

   A. 90^o

   B. 150^o

   C. 180^o

   D. 360^o

8. Read statement A and B and choose the correct options from the following

   a) Astigmatism usually is caused by an irregularly shaped cornea.
   b) Rainbow is the natural phenomenon in which dispersion takes place.

   A. Both 'a' and 'b' are true statements

   B. Both 'a' and 'b' are false statements.

   C. 'a' is true while 'b' is false.

   D. 'a' is false while 'b' is true

ASSERTION REASON QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason(R). Mark the correct choice as:

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true and R is NOT the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

1. **Assertion (A):** The near-point of a hypermetropic eye is more than 25 cm away.

   Reason(R): Hypermetropia is corrected using spectacles containing concave lenses.

2. **Assertion (A):** The light emerges from a parallel-sided glass slab in a direction perpendicular with that in which enters the glass slab.

   Reason (R): The perpendicular distance between the original path of incident ray and emergent ray coming out of glass slab is called lateral displacement of the emergent ray of light.

3. **Assertion (A):** A rainbow is sometimes seen in the sky in rainy season only when observer's back is towards the Sun.

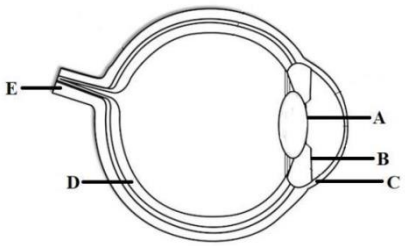
   Reason (R): Internal reflection in the water droplets causes dispersion and the final rays are in backward direction.

4. **Assertion (A):** The Sun appears flattened at sunrise and sunset.

   Reason (R): The Sun appears red at sunrise and sunset.

SHORT ANSWERS QUESTIONS

1. Write the name of A, B, C, D, E in the given parts of human eye picture with



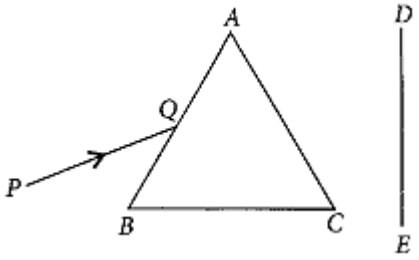
function.

(i) Cornea (ii) Iris (iii) Crystalline lens (iv) Ciliary muscles

2. What is the power of accommodation of human eye? Explain why the image distance in the eye does not change when we change the distance of an object from the eye?

3. Draw a labeled diagram to explain the formation of a rainbow in the sky.

4. A narrow **PQ** of white light is passing through a glass prism **ABC** as shown in the diagram. Trace it on your answer sheet and show the path of the emergent beam as observed on the screen **DE**.



5. List two causes of hypermetropia.

6. List the factors responsible for color of scattered light depends on.

7. Give reason -

a) No rainbow could be observed from the surface of moon by the astronauts.

b) If the Earth has no atmosphere, what change would be observed in the length of day?

8. A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?

LONG ANSWERS QUESTIONS

1. Explain the refraction of light through a triangular glass prism using a labeled ray diagram. Hence define the angle of deviation.

2. How will you use two identical prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light? Draw the diagram.

3. Give reason for the following

a) Danger signals are red in colour
b) Sun is visible two minutes before actual sunrise
c) Sky appears to be blue
d) Stars appears to twinkle
e) Sky appears to be dark from the surface of the moon

CASE BASED / DATA BASED QUESTIONS

1. **Read the following and answer the following questions**

Atmospheric refraction is the phenomenon of bending of light on passing through earth's atmosphere. As we move above the surface of earth, density of air goes on decreasing. Local conditions like temperature etc. also affect the optical density of earth's atmosphere. On account of atmospheric refraction, stars seen appear higher than they actual are; advanced sunrise; delayed sunset, oval appearance of the sun at sunrise and sunset; stars twinkle, planets do not.

a) **Due to atmospheric refraction, apparent length of the day**
(A) Increases
(B) Decreases
(C) Remains the same
(D) All of these

b) **Apparent position of the star appears raised due to**
(A) atmospheric refraction
(B) scattering of light
(C) both (a) and (b)
(D) none of these

c) **The illusion of the flat and oval appearance of the sun during the sunset is known as the-**
(A) Mirage
(B) Looming
(C) Dispersion
(D) Atmospheric refraction

d) **Twinkling of stars and non-twinkling of planets is accounted for by**
(A) Scattering of light
(B) Dispersion of light
(C) Atmospheric refraction
(D) Done of these

2. Whether the color of the ocean and the color of the sky are related? Is this the same reason? But they occur independently of each other. In both the cases, the preferential absorption of long wave length light gives rise to blue. The Ocean looks blue, the blue wave length returned predominantly than longer wave length. Note that this effect only works if the water is very pure.

A. Which phenomenon of light is the reason for blue color of sky?

B. The intensity of scattered light will be more in _____ (shorter / longer) wavelength

C. Say Yes or No for the following:

(i) Red color of sun during sunset is due to scattering

(ii) Twinkling of stars is due to scattering of light

3. Shalu observes that a 14-year-old student is not able to see clearly the questions written on the blackboard placed at a distance of 5 m from him. Few questions came to her mind. Give answers to the below questions:

(i) Name the defect of vision he is suffering from.

(ii) Name the type of lens used to correct this defect.

(iii) What is the other name of myopia?

CLASS X

Chapter – 10

The Human Eye and the Colorful World

Answer Key

Multiple Choice Questions

1. B. Pupils take time to adjust.
2. C. 25 cm and infinity
3. B. Concave and convex lens
4. D. Light is scattered by the droplets
5. B. Refraction of starlight by different layers of varying refractive indices
6. C. +0.25 D
7. C. 180^{o}
8. A. Both 'a' and 'b' are true statements

Assertion-Reason Question Answers

1. C
2. D
3. A
4. B

Short Answer Questions

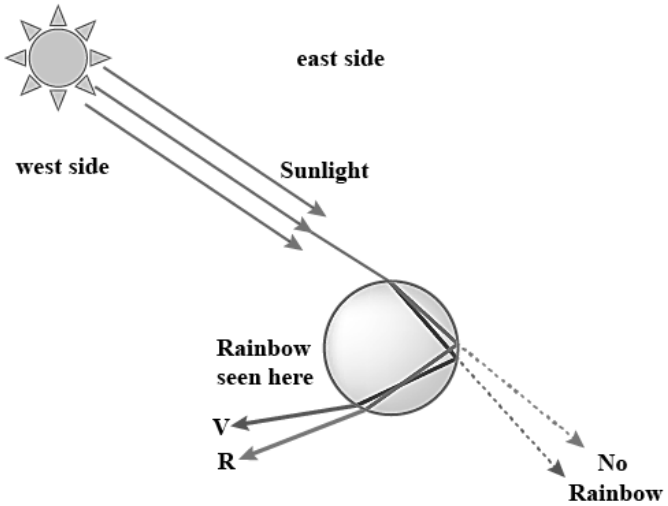
1.

A. Eye lens – The eye's crystalline lens is located directly behind the pupil and further focuses light.
B. Iris – The Iris of the eye controls the amount of light reaching the back of the eye, by automatically adjusting the size of the aperture.
C. Cornea – Light is focused primarily by the Cornea, which is the clear front of the eye. Cornea acts like a camera lens for the human eye.
D. Retina – Light focused by the cornea and crystalline lens then reaches the retina, the light sensitive inner lining of the back of the eye.
E. Blind Spot - Blind spot is the region where the optic nerve passes through the optic disk and out of the eyes.

2. The ability of the eye lens to adjust its focal length is called power of accommodation. The ciliary muscles modify the curvature to some extent. The change in the curvature of the eye lens can thus change its focal length. Thus, the

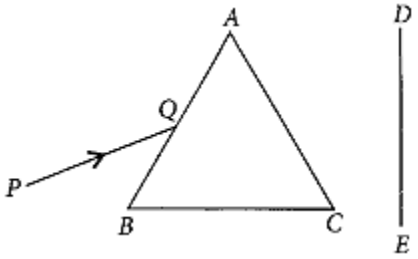
focal length of the human lens increases or decreases depending on the distance of the object value to this distance of the image does not change. For example, when the ciliary muscles are relaxed, the lens becomes thin and its focal length increases, thus enables us to see distant object clearly.

3. A rainbow is a natural spectrum appearing in the sky after a rain shower. It is caused by dispersion of sunlight by rain water droplets. A rainbow is always formed opposite to the Sun. The water droplets act like small prisms. They refract



and disperse the incident sunlight, then reflect it internally, and finally, refract it again when it comes out of the raindrop. Due to the dispersion of light and **internal reflection**, different colors reach the observer's eye.

4. If PQ were a ray of white light, then on screen AB, after the dispersion the emergent light will be observed as a spectrum, consisting of seven colors arranged from bottom to top as follows - **Violet, Indigo, Blue, Green, Yellow,**



Orange, and Red (VIBGYOR) on screen DE.

5. Hypermetropia is caused due to following reasons:
   (i) Shortening of the eyeball
   (ii) Focal length of crystalline lens is too long.

6. The color of the scattered light depends on the size of the scattering particles. Very fine particles scatter mainly blue light while particle of larger size scatters light of longer wavelengths

7.

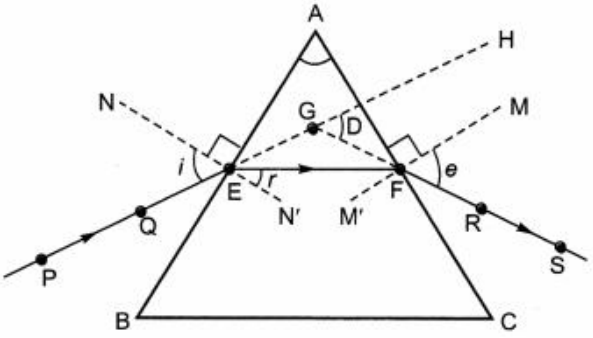
a) Moon does not have atmosphere and consequently no water droplets present. Hence no dispersion of sun rays is possible.

b) In the absence of Earth's atmosphere, the atmospheric refraction would not take place and we would see the actual crossing of the horizon by the Sun at the time of sun rise and sun set. The day time would have been decreased by four minutes.

8. A student has difficulty in reading the blackboard while sitting in the last row. It shows that he is unable to see distant objects clearly. He is suffering from myopia. This defect can be corrected by using a concave lens.

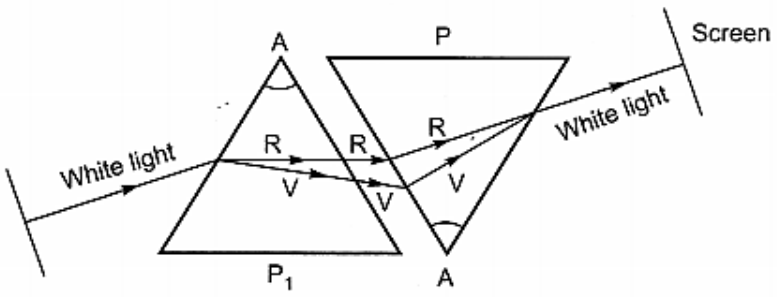
Long Answer Questions

1. Refraction of light through prism



PE – Incident ray
EF – Refracted ray
FS – Emergent ray
∠A – Angle of the prism
∠i – Angle of incidence
∠r – Angle of refraction
∠e – Angle of emergence
∠D – Angle of deviation
Refraction of light through a triangular glass prism
The refraction of light takes place at two surfaces firstly when light enters from air to prism and secondly when light emerges from prism.
Angle of prism: The angle between the two lateral faces of the prism is called angle of prism.
Angle of deviation: The angle between incident ray (produced forward) and emergent ray.

2. When an inverted prism is kept a little distance away from the prism causing dispersion or basically in the path of splitted beam, the spectrum recombines to form white light. Recombination of the spectrum of white light



3.
(a) Due to its longer wavelength red is least scattered and can be seen from far places.
(b) Because of atmospheric refraction.
(c) Due to the selective scattering of the blue component present in the sunlight by the molecules present in the atmosphere.
(d) Stars appear to twinkle due to atmospheric refraction of starlight and physical conditions of the earth's atmosphere is not being stationary.

(e) Sky appears to be dark from the surface of the moon because there are no atmosphere particles to scatter sunlight.

Case Based Questions Answers

1. a) (A) Increase

Note: The sun is visible 2 minutes before the actual sunrise and 2 minutes after the actual sunset due to atmospheric refraction. So, the total time lengthened is 2 + 2 = 4 minutes.

b) (A) Atmospheric refraction Real and inverted

c) (A) Mirage

d) (C) Atmospheric refraction

2. A. Scattering

B. Shorter

C. Yes, No in that order

3. A. The defect of vision he is suffering from is called short -sightedness (Myopia).

B. Concave lens (minus lens) is like two prisms placed apex to apex. Light passing through a concave lens is diverged. Concave lenses are used to treat myopia.

C. Myopia, also known as near-sightedness and short-sightedness.

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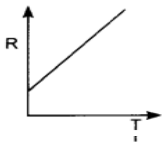
CHAPTER - 11

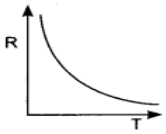
Electricity

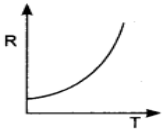
Question Bank

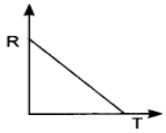
Multiple Choice Questions

1. The temperature of a conductor is increased. The graph best showing the variation of its resistance is

A. 



C. 



2. Two devices are connected between two points say A and B in parallel. The physical quantity that will remain the same between the two points is

A. Current

B. Voltage

C. Resistance

D. None of these

3. A fuse wire repeatedly gets burnt when used with a good heater. It is advised to use a fuse wire of

A. More length

B. Less radius

C. Less length

D. More radius

4. What is the maximum resistance which can be made using five resistors each of 1/5 W?

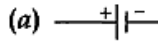
A. 1/5 Ω

B. 10 Ω

C. 5 Ω

D. 1 Ω

5. Which of the following is/are correctly matched?

(*a*)  : An electric cell

(*b*)  : A resistor

(*c*)  : Open plug key

A. a only

B. b only

C. b and c both

D. All a, b and c

6. Electric potential is a

A. Scalar quantity

B. Vector quantity

C. Neither scalar nor vector

D. Sometimes scalar and sometimes vector

7. A battery of 10 volt carries 20,000 C of charge through a resistance of 20 Ω. The work done in 10 seconds is

A. 2×10^3 J

B. 2×10^5 J

C. 2×10^4 J

D. 2×10^2 J

8. Two bulbs are rated 40W, 220V and 60W, 220V. The ratio of their resistances will be

A. 4:3

B. 3:4.

C. 2:3

D. 3:2

ASSERTION REASON QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason(R). Mark the correct choice as:

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true and R is NOT the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

1. **Assertion (A):** The resistivity of a substance does not depend on the nature of the substance and temperature.

Reason (R): The resistivity of a substance is a characteristic property of the material.

2. **Assertion (A):** The coil of a heater is cut into two equal halves and only one of them is used into heater. The heater will now require half the time to produce the same amount of heat.

Reason (R): The heat produced is directly proportional to square of current.

3. **Assertion (A):** In a chain of bulbs, 50 bulbs are joined in series. One bulb is removed now and circuit is completed again. If the remaining 49 bulbs are again

connected in series across the same supply, then light gets decreased in the room.

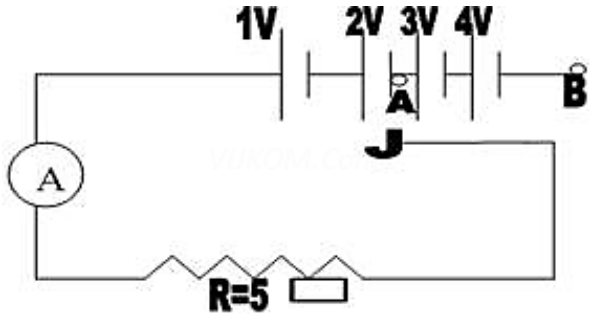
Reason (R): Net resistance of 49 bulbs will be less than 50 bulbs.

4. **Assertion (A):** The connecting wires are made of copper.

Reason (R): The electrical conductivity of copper is high.

SHORT ANSWERS QUESTIONS

1. Define one ampere?
2. Find the energy in joules Is An electric bulb is connected to a 220 V generator. The current is 2.5 A. Calculate the power of the bulb?
3. How two resistors, with resistances R1 Ω and R1 Ω respectively are to be connected to a battery of emf V volts so that the electrical power consumed is minimum?
4. Two identical resistors are first connected in series and then in parallel. Find the ratio of equivalent resistance in two cases.
5. Why are alloys commonly used in electrical heating devices? Give reason.
6. In the given figure what is ratio of ammeter reading when J is connected to A and then to B.

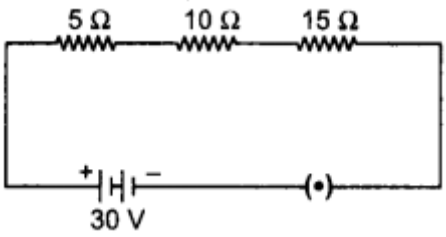


7. Will current flow more easily through a thick wire or a thin wire of the same material, when connected to the same source? Why?
8. Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal?

LONG ANSWERS QUESTIONS

1. How will you infer with the help of an experiment that the same current flows through every part of a circuit containing three resistors in series connected to a battery?

2. Consider the given circuit and find the current flowing in the circuit and potential difference across the 15 Ω resistor when the circuit is closed.



3. A copper wire has diameter 0.5 mm and resistivity 1.6 × 10-8 Ω m. Calculate the length of this wire to make it resistance 100 Ω. How much does the resistance change if the diameter is doubled without changing its length?

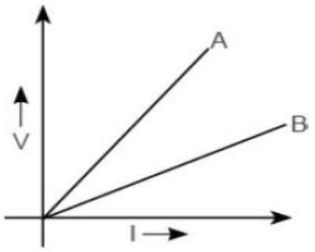
CASE BASED / DATA BASED QUESTIONS

1. **Read the following and answer the following questions**

In a circuit, several resistors may be combined to form a network. The combination must have two endpoints to connect it with a battery or other elements of the circuit. When the resistors are connected in series then the current flowing in each remains the same but potential differences across each resistor will vary. When the resistances are connected in parallel, the potential difference across each resistor will be the same though a different amount of current will flow in each resistor.

a) **Two resistances 10 Ω and 3 Ω are connected in parallel across a battery. If there is a current of 0.2 A in 10 resistors, the voltage supplied by the battery is:**
(A) 2V
(B) 1V
(C) 4V
(D) 8V

b) **Two wires each having a resistance value equal to R are first connected in series and then connected in parallel. The plot shows the graphical representation of resistances in both cases.**



(A) A denotes parallel combination
(B) B denotes series combination
(C) A denotes series combination and B denotes parallel combination
(D) None of the above

c) **The household circuits are connected in:**
(A) Series
(B) Parallel
(C) Both series and parallel
(D) Neither series nor parallel

d) **The equivalent resistance of two resistors x and y is z when connected in series and M when connected in parallel. Z:M is:**

(A) xy
(B) x + y × y
(C) (x + y)2/xy
(D) xy (2x + 2y)

2. Read the passage given below and answer the following questions from the heating effect of current is obtained by transformation of electrical energy in heat energy. Just as mechanical energy used to overcome friction is converted into heat, in the same way, electrical energy is converted into heat energy when an electric current flow through a resistance wire. The heat produced in a conductor, when a current flow through it is found to depend directly on (a) strength of current (b) resistance of the conductor (c) time for which the current flows. The mathematical expression is given by H = I2Rt.

The electrical fuse, electrical heater, electric iron, electric geyser etc. all are based on the heating effect of current.

a) A fuse wire melts at 5 A. It is is desired that the fuse wire of same material melts at 10 A. The new radius of the wire is

(A) 4 times (B) 2 times (C) 1/2 times (D) 1/4 times

b) What are the properties of heating element?

(A) High resistance, high melting point

(B) Low resistance, high melting point

(C) High resistance, low melting point

(D) Low resistance, low melting point.

c) What are the properties of electric fuse?

(A) Low resistance, low melting point

(B) High resistance, high melting point.

(C) High resistance, low melting point

(D) Low resistance, high melting point

d) When the current is doubled in a heating device and time is halved, the heat energy produced is

(A) Doubled

(B) Halved

(C) Four times

(D) One fourth times

CLASS X
Chapter – 11
Electricity

Answer Key
Multiple Choice Questions
1. A. Resistance is directly proportional to temperature of the conductor.

2. B In parallel combination, voltage remains same across two points.
3. D. In order to get the working of heater properly, fused wire of higher rating must be used.
4. D. 1 Ω

Hence, $R = R_1 + R_2 + R_3 + R_4 + R_5$

$$= \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{5}{5} = 1\ \Omega$$

Series combination provides the maximum resistance.

5. D.
6. A. Scalar quantity
7. B. 2×10^5 J
8. D. 3:2

Assertion-Reason Question Answers
1. D
2. B
3. B
4. A

Short Answer Questions
1. One ampere is constituted by the flow of one coulomb of charge per second.
   1A = 1C/1S
2. Data in given question

   V= 220 V and I = 2.5 A

   Power of the bulb P = VI = 220 × 2.5 W = 550W
3. Power consumed is minimum when current through the circuit is minimum, so the two resistors are connected in series.

4. Two identical resistors are first connected in series and then in parallel. Find the ratio of equivalent resistance in two cases.

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \quad \text{or} \quad R_p = \frac{R_1 R_2}{R_1 + R_2}$$

$$\text{So, } R_p = \frac{R \times R}{R + R} = \frac{R}{2}$$

$$\text{Required ratio} = \frac{R_s}{R_p} = \frac{2R}{R/2} = 4:1$$

5. Alloys are commonly used in electrical heating devices due to the following reasons
   a) Alloys have higher resistivity than metals
   b) Alloys do not get oxidized or burn readily.

6. When J is connected to A

   I=V/R=3/5A=O.6A

   When J is connected to B

V=1+2+3+4=1OV

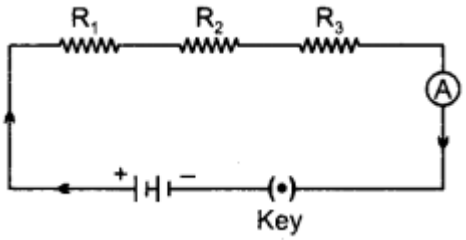
I=1O/5=**2A**

7. The current flows more easily through a thick wire as compared to thin wire of the same material, when connected to the same source. It is due to the reason that resistance increases with decrease in thickness.

8. Coils of electric toasters and electric irons are made of an alloy due to the following reasons:
A. Resistivity of an alloy is generally higher than that of pure metal.
B. At high temperature, an alloy does not oxidize readily. Hence, coil of an alloy has longer life.

Long Answer Questions

1. Let three resistors R1, R2 and R3 are connected in series which are also connected with a battery, an ammeter and a key as shown in figure.



When key is closed, the current starts flowing through the circuit. Take the reading of ammeter. Now change the position of ammeter to anywhere in between the resistors and take its reading. We will observe that in both the cases reading of ammeter will be same showing same current flows through every part of the circuit above.

2. Given in the question

R1 = 5 Ω, R2 = 10 Ω, R3 = 15 Ω, V = 30 V

Total resistance, R = R1 + R2 + R3 [∵ 5 Ω, 10 Ω and 15 Ω are connected in series]

= 5 + 10 + 15

= 30 Ω

Potential difference, V = 30 V

Current in the circuit, I = ?

From Ohm's law.

I = V/R = 30/30 = 1 A

Current flowing in the circuit = 1 A

Potential difference across 15 Ω resistors = $IR_3 = 1 \times 15 = 15$ V

3. Given in the question
Resistivity of copper = 1.6×10^{-8} Ω/m,
Diameter of wire, d = 0.5 mm
Resistance of wire, R = 100 Ω
Radius of wire, r = d/2 = 0.52mm/2

= 0.25mm = 2.5×10^{-4} m

Area of cross-section of wire, A = nr^2

∴ A = $3.14 \times (2.5 \times 10^{-4})^2$

= 1.9625×10^{-7} m^2

= 1.9×10^{-7} m^2

As, R = ρl/A

∴ 100 Ω = 1.6×10^{-8}Ωm×l1.9×10^{-7} m^2

l = 1200 m

If diameter is doubled (d' = 2d), then the area of cross-section of wire will become

A' = $\pi r^2 = \pi(d'2)^2 = \pi(2d2)^2 = 4A$

Now R ∝ 1A, so the resistance will decrease by four times or new resistance will be R'= R4 = 1004 = 25Ω.

Case Based Questions Answers

1. a) A
   b) C
   c) B
   d) C
2. a) B
   b) A
   c) C
   d) A

****

CHAPTER - 12

Magnetic Effects of Electric Current

Question Bank

Multiple Choice Questions

1. The north pole of a long bar magnet was pushed slowly into a short solenoid connected to a galvanometer. The magnet was held stationary for a few seconds with the north pole in the middle of the solenoid and then withdrawn rapidly. The maximum deflection of the galvanometer was observed when the magnet was:

   A. Moving towards the solenoid

   B. Moving into solenoid

   C. At rest inside the solenoid

   D. Moving out of the solenoid

2. The magnetic field lines inside a current-carrying solenoid, are:

   A. Along the axis and parallel to each other

   B. Circular, but they do not intersect each other

   C. Circular at the ends inside the solenoid

   D. None of these

3. A TV set consumes an electric power of 230 watts and runs on 230 volts mains supply. The correct fuse for this TV set is:

   A. Five A

   B. Three A

   C. One A

   D. Two A

4. The back face of a circular loop of wire is found to be south magnetic pole. The direction of current in this face of the circular loop of wire will be:

   A. Clockwise

   B. Towards south

   C. Anticlockwise

   D. Towards north

5. A plotting compass is placed near the south pole of a bar magnet. The pointer of the plotting compass will:

   A. Point away from the south pole

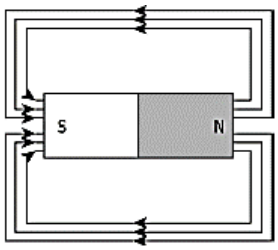
   B. Point parallel to the south pole

C. Point towards the south pole

D. Point at right angles to the south pole

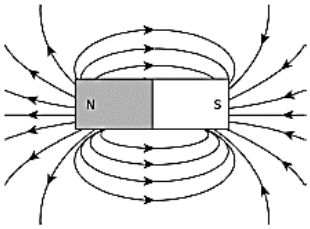
6. A student learns that magnetic field strength around a bar magnet is different at every point. Which diagram shows the correct magnetic field lines around a bar

A.

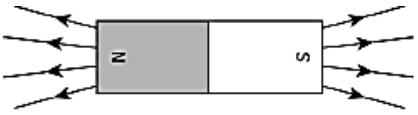


B.

C.



D.



7. A student inserts a bar magnet in the coil. The student observes deflection in the galvanometer connected to the coil. What will happen if the magnet is continuously getting in and out of the coil?

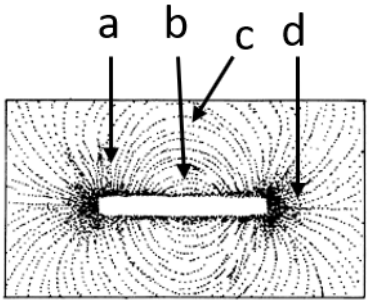
A. The current induced in the coil will increase

B. The current will change its direction continuously

C. The magnetic field will create a motion in the coil

D. The magnetic field of the bar magnet would keep decreasing

8. A student places some iron filings around a magnet. The iron fillings arrange themselves as shown in the image. The student labelled four different regions around the magnet. Where would the magnetic field be the strongest?



A. a

B. b

C. c

D. d

ASSERTION REASON QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason(R). Mark the correct choice as:

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true and R is NOT the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

1. **Assertion (A):** When the direction of velocity of moving charge is perpendicular to the magnetic field, it experiences a maximum force.

   Reason (R): Force on the moving charge does not depends on the direction magnetic field in which it moves.

2. **Assertion (A):** Steel core is used as an electromagnet.

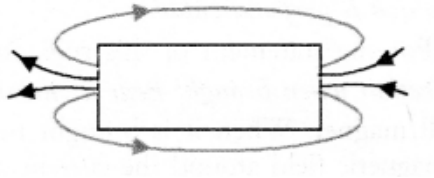
   Reason (R): Steel gets permanently magnetized when the current flows through the coil wound around.

3. **Assertion (A):** It is fatal to touch a live electric wire as the person gets a severe electric shock. In some cases, electric shock can even kill a person.
   Reason (R): The electric current passes through the body to the earth forming a circuit and burns the blood.

4. **Assertion (A):** On changing the direction of flow of current through a straight conductor, the direction of a magnetic field around the conductor is reversed.
   Reason (R): The direction of a magnetic field around the conductor can be given in accordance with left hand thumb rule.

SHORT ANSWERS QUESTIONS

1. State the color of wire conventionally used for 1) Live 2) Earth 3) Neutral?
2. What is full form of MCB? What kind of risk may increase if we not use MCB in domestic circuit?
3. How does the strength of the magnetic field produced by a current carrying solenoid increased?
4. What we need to do If we need to reduce risk of overloading in our home?
5. State one main difference between AC and DC. Why AC is preferred over DC foe long range transmission of electric power? Name one source each of DC and AC.
6. Give examples of sources produce alternating current?
7. Identify the poles of a magnet in the figure.



8. How does the strength of the magnetic field at the center of a circular coil of wire depends on –
   a. The radius of the coil
   b. The number of turns of wire in the coil
   c. The strength of the current flowing in the coil

LONG ANSWERS QUESTIONS

1. (a) State three factors on which the strength of magnetic field produced by a current carrying solenoid depends.
   (b) Draw circuit diagram of a solenoid to prepare an electromagnet.

2. State the various advantages and disadvantages of AC over DC.

3. Define magnetic field lines. Give any 4 properties of these. Draw the magnetic lines of force through and around -

   a. single loop of wire carrying electric current
   b. a solenoid carrying electric current

CASE BASED / DATA BASED QUESTIONS

1. **Read the following and answer the following questions**

Michael Faraday was a physicist. He introduces the concept of magnetic lines of force to represent magnetic field. According to his experiments, when bar magnet is surrounded by little bits of iron fillings, each a little magnet of its own. By tapping iron fillings arranged themselves in a pattern.

a) A piece of material that has both attractive and directive properties is called

   A. Magnet
   B. Iron fillings
   C. Resistor
   D. Coil

b) A bar magnet is cut into two pieces along its length. Which of the following statement is true?

   A. Two new bar magnets are created with half of pole strength.
   B. Two new bar magnets are created with double pole strength
   C. Bar magnet is demagnetized.
   D. One part creates magnetic field and other creates electric field.

c) In uniform magnetic field, the lines are

   A. Perpendicular
   B. Parallel
   C. Slanting
   D. Zig zag

d) The direction of magnetic field lines outside bar magnet is

   A. Mouth to north
   B. North to south
   C. Towards east from both pole
   D. Towards west from both poles

2. **Read the passage given below and answer the following questions**

In India AC is used for domestic supply. Two separate wires are used for this purpose. Live wire is maintained at 220 volts while neutral is at 0 volt. As a result, potential difference is maintained across these two wires. A third wire called Earth wire is also used in domestic circuits.

a) Mention the colour of live wire
   A. Black
   B. Red
   C. Blue
   D. Green

b) wires of fuse have -------melting points.

   A. High

B. Low
C. Average
D. None of them

c) -----wire transfers the extra current from circuit to below the earth.

A. Live wire
B. Earth wire
C. Neutral wire
D. All of these

d) Choose the safety device from the following

A. MCB
B. Fuse
C. Earth wire
D. All of these

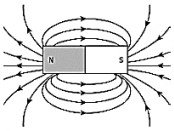
CLASS X

Chapter – 12

Magnetic Effects of Electric Current

Answer Key

Multiple Choice Questions

1. D. Moving out of the solenoid
2. A. Along the axis and parallel to each other
3. D. Two A
4. A. Clockwise
5. C. Point towards the south pole
6. C. 

7. B. The current will change its direction continuously
8. D. d

Assertion-Reason Question Answers

1. C
2. D
3. A
4. C

Short Answer Questions

1. Live wire—Red
   Neutral wire—Black
   Earth wire—Green
2. Miniature Circuit Breaker. MCB is responsible in our circuit breaker is to protect an installation or appliance against sustained overloading and short-circuit faults, but it will also give protection against earth faults provided that the earth fault loop impedance is low enough.

3. The magnetic field strength of a current carrying solenoid can be increased by-

   (i) increasing the number of turns in the solenoid.

   (ii) increasing the current flowing through the solenoid.

   (iii) Using soft iron as core in the solenoid.

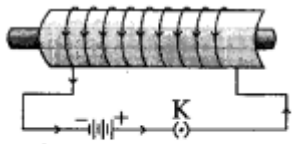
4. The precautions that should be taken to avoid overloading of household electric circuits are as follows:
   a. An excess number of devices should not be connected to the same socket.
   b. The appliances that are malfunctioning should not be connected to the socket.
   c. Multiple high-power consumption devices should not be connected at the same time.
5. The needle of the compass deflects when the magnetic field of the bar magnet intercepts the magnetic field of the needle in the compass as it experiences a different magnetic field which results in the movement of the needle that is either attraction or repulsion.
6. The sources are hydroelectric power plants, thermal power generators, nuclear power generators, AC generators produce alternating current.
7. A- north pole, B- south pole
8. Answers as follows-
   a. More the radius weaker the field.
   b. Field strength is directly proportional to the number of turns in the coil.
   c. More the strength of current, more will be the strength magnetic field.

Long Answer Questions

1. a) Strength of magnetic field produced by a current carrying solenoid depends upon the following factors:

- Number of turns in the coil
- Amount of current flowing through it
- Radius of coil
- Material of core of the solenoid.

(b) A strong magnetic field produced inside a solenoid can be used to magnetize a piece of magnetic material, like soft iron, when placed inside the coil. The magnet so formed is called an electromagnet.



An electromagnet-A current-carrying solenoid coil which is used to magnetise steel rod inside it.

2.

ADVANTAGES OF AC	DISADVANTAGES OF AC
• AC is less expensive and easy to generate than DC. • AC can be transmitted across long distances without much energy loss,	• It cannot be used for electroplating. • The average value of alternative current over a half cycle is less

unlike DC. • The power loss during transmission in AC is less when compared to DC.	than its rms value. • Hence for a given value of current, wires carrying AC require better insulation. (iii) AC meters have a non-linear scale

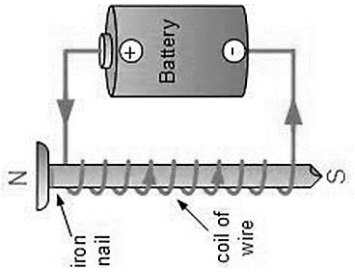
3. a) A long tightly wound helical coil of metallic wire containing soft iron in its core is called an electromagnet.

Uses—1) for electrical devices such as electric trains

2)for moving big objects of iron from one place to another

3)for removing small iron splinter from an eye of a patient.

b)



c) The soft iron is used to make the electromagnets because the soft iron has good or high magnetic properties. It can provide a strong magnet.

Case Based Questions Answers

1. a) A

   b) A

   c) B

   d) B

2. a) B

   b) B

   c) B

   d) D

****

CHAPTER 13

OUR ENVIRONMENT

QUESTION BANK

MULTIPLE CHOICE QUESTIONS

Q1. Given below are some biotic and abiotic components of an ecosystem. rock, rainfall, sunlight, mango tree, rabbit Which of these components can continue to exist in the absence of the other component/s?

(a) Only sunlight (b) Only rock and sunlight

(c) Only mango tree and rabbit (d) Only rock, sunlight and rainfall

Q2) At which of the level of a food chain can an omnivore be present?

(a) Only secondary consumers

(b) Only secondary and tertiary consumers

(c) Only primary and secondary consumers

(d) Only primary, secondary and tertiary consumers

Q3. The table lists some components of an ecosystem. A student wants to classify these into abiotic components from biotic components separately. Which option correctly shows the classification done by the student?

(a)

Biotic Component	Abiotic Component
Rain, grass, bacteria, fungi	Water, fungi, sunlight, air

(b)

Biotic Component	Abiotic Component
Air, grass, butterfly, fungi	Water, fungi, sunlight, rain

Biotic Component	Abiotic Component
Grass, bacteria, fungi, butterfly	Water, rain, sunlight, air

(c)

- Rain
- Water
- Butterfly
- Air
- Grass
- Bacteria
- Fungi
- Sunlight

(d)

Biotic Component	Abiotic Component
Rain, grass, bacteria, fungi	Water, butterfly, sunlight, Air

Q4. Which statement shows interaction of an abiotic component with a biotic component in an ecosystem?

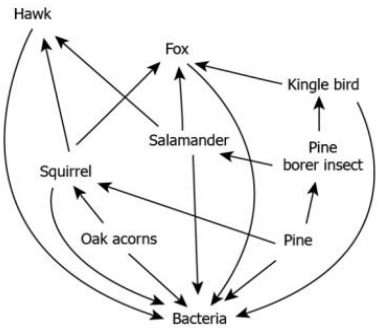
(a) A grasshopper feeding on a leaf.

(b) Rainwater running down into the lake.

(c) An earthworm making a burrow in the soil.

(d) A mouse fighting with another mouse for food.

Q5. The image shows a food web. Observe and select the correct option.



(a) Fox feeds on hawk to obtain energy.

(b) Hawk feeds on oak to obtain energy

(c) Squirrel feeds on pine borer to obtain energy

(d) Salamander feeds on pine borer to obtain energy

Q6. The manufacturing of Chlorofluorocarbons free refrigerators is mandatory throughout the world. How this help prevents ozone depletion?
(a) This will help convert oxygen molecules into ozone.
(b) This will help convert the CFCs into ozone molecules.
(c) This will reduce the production of CFC from oxygen molecules.
(d) This will reduce the release of CFCs that reacts with ozone molecules
Q7. Ozone forms by combination of free oxygen atoms and oxygen molecules. How do free oxygen atoms form at higher levels of atmosphere?
(a) by splitting of molecular oxygen into free oxygen atoms in the presence of low energy UV radiations
(b) by splitting of a molecular oxygen into free oxygen atoms in presence of high energy UV radiations
(c) by the combination of two molecular oxygen in the presence of high energy UV radiations
(d) by the combination of two free oxygen atoms in the presence of lower energy UV radiations
Q8. The table lists some waste products. Which group of waste materials can be classified as non- biodegradable?

Grass cutting, polythene bags, plastic toys, used tea bags, paper straw, old clothes, broken foot wears

(a) grass cuttings, used tea bags (b) polythene bags, plastic toys
(c) used tea bags, paper straw (d) old clothes and broken foot wears
Q9. The table shows some waste materials that changed and remained unchanged when buried in the soil. Classify them as biodegradable and non- biodegradable.

Plastic box, bubble wrap, vegetable peels, rubber tyre, empty carton, tree leaves

(a)

Biodegradable	Non-biodegradable
Vegetable peels, bubble wrap	Plastic box, empty carton

(c)

Biodegradable	Non-biodegradable
empty carton, rubber tyre, bubble wrap	Plastic box, tree leaves

(b)

Biodegradable	Non-biodegradable
Vegetable peels, empty carton	Plastic box, bubble wrap

(d)

Biodegradable	Non-biodegradable
Rubber tyre, bubble wrap	Plastic box, vegetable peels

Q10.What is the ratio of average amount of energy absorbed by producers to the average amount of energy absorbed by the primary consumers?
(a) 1:2 (b) 2:1 (c) 1: 10 (d)10:1

ASSERTION REASON TYPE
Answer the question selecting appropriate options given below:
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct

explanation of (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true

Q1. ASSERTION: Herbivores are known as producer in an ecosystem.
REASON: Producers prepare food by the process of photosynthesis.

Q2. ASSERTION: Ecosystem consists of components continuously interacting with each other.
REASON: An ecosystem is made up of only biotic components.

Q3. ASSERTION: All habitats in aquatic medium constitute aquatic ecosystems.
REASON: Ocean and rivers are the examples for aquatic terrestrial ecosystem.

Q4. ASSERTION: Microorganisms are known as the decomposers of an ecosystem.
REASON: Bacteria and fungi degrade non- biodegradable waste in the environment.

Q5. ASSERTION: The energy is transfers from one trophic level to another trophic level in one direction in an ecosystem.
REASON: Producers occupy the first trophic level in a food chain.

Q6. ASSERTION: CFC was emitted from appliances like refrigerators.
REASON: H_2S is a greenhouse gas.

Q7. ASSERTION: Energy available at each level of an ecosystem goes on decreasing.
REASON: Energy flow from one trophic level to next follows 10% law.

VERY SHORT ANSWER TYPE

Q1 Fishes like swordfish and king mackerel are tertiary consumers. Fishes like tilapia and salmon are secondary consumers. The habitat of these fishes is usually contaminated with heavy metals like mercury. Scientists suggest consuming these fishes according to the table given below: What phenomenon is likely to have led the scientists to give such an advisory to the people who consume fish?

Best to avoid (1 serving/ month)	Good to eat (2-3 servings/week)
King mackerel	Tilapia
Swordfish	Pollock

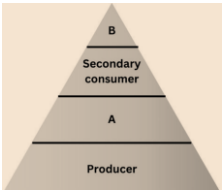
Q2. If there is no water, can anything grow or survive? If not why?

Q3. Where is the Ozone layer present in the atmosphere?

Q4. As per the recent survey microplastics have been found in the human blood. How do you think these have entered the human body?

Q5. Which industries emitted CFC?

Q6. Write the appropriate names of trophic levels A and B in the following figure:



Q7. Arrange the following given wastes in the increasing order of their degradation in the environment. (Hint: fast to slow degradation)

Bone wastes, paper sheet, plastic bottle

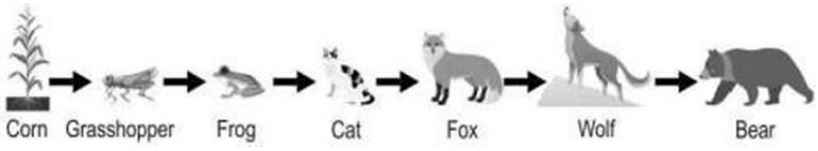
Q8. Lions have no known natural oredators. Based on energy transfer in a food chain, what could be the most likely reason for the given statement.

Q9. In a pond ecosystem where should the frog be placed in a food chain?

Q10. What is the term given to the accumulation of non-biodegradable substances increasing in a food chain?

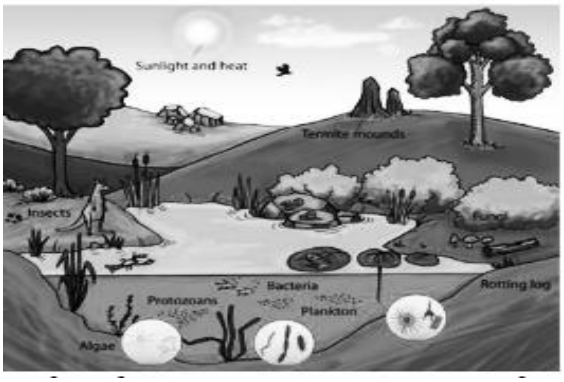
SHORT ANSWER TYPE

Q1. Observe the food chain shown below.



Is such a food chain likely to exist in nature? Justify your answer.

Q2. Look at the image and identify biotic and abiotic components of this ecosystem.



Q3. Complete the following

(i) Air: Abiotic. — Plants: —---------?

(ii) Plant: Producer – Deer: —---------?

Q4. Why is aquarium called as a manmade ecosystem?

Q5. The number of trophic levels in a food chain is limited." Give reasons to justify the statement.

Q6. Now a days farmers are making indiscriminate use of fungicides to protect their crops from microbes. This act kills many useful microbes.

Suggest two eco-friendly methods to save useful microbes.

Q7. Match the following.

A	B
i. producer	a) Ozone
ii. Soil	b) herbivore
iii. Goat	c) abiotic
iv. UV radiations	d) chlorophyll
v. vegetable peel	e) pesticide
vi. DDT	f) biodegradable

LONG ANSWER TYPE

1. Explain producers, consumers and decomposers of the biotic environment with examples of each.

Q2**.** Define food chain. Write Significance of Food Chain.

Q3. Explain 10 percent law with the help of an example.

CASE STUDY BASED

Q1. Read the passage and answer the given questions.

The stratosphere is very dry and rarely allows clouds to form. In the extreme cold of the polar winter, however, stratospheric clouds of different types may form. These clouds are called Polar Stratospheric Clouds (PSCs).

Scientists recently discovered that polar stratospheric clouds, long known to play an important role in Antarctic ozone destruction, are occurring with increasing frequency in the Arctic. These high-altitude clouds form only at very low temperatures help destroy ozone in two ways: (1) They provide a surface which converts benign forms of chlorine into reactive, ozone-destroying forms, and (2) they remove nitrogen compounds that moderate the destructive impact of chlorine. In recent years, the atmosphere above the Arctic has been colder than usual, and polar stratospheric clouds have lasted into the spring. As a result, ozone levels have been decreasing.

(Information credit: NASA)

Q1.1 How is Ozone formed in the outer atmosphere?
Q1.2 Give any one damage caused to plants due to UV leakage.
Q1.3 Suggests some ways of protection from UV radiation when we are in outside our house in open.

Q2. Read the following information and answer the questions
In Kunjpura village, located in Karnal district, Haryana, Aditya Aggarwal and his older brother Amit Aggarwal run Tee Cee Industries, a steel plant set up by their ancestors in 1984. Along with this, they also run a gaushala that houses 1,200 cows that can no longer produce milk. The cow shelter was manageable but running the steel plant was turning out to be expensive because they spent a whopping Rs 5 lakh every month on electricity. The brothers struck upon an idea. Why not run the factory with the biogas produced from cow dung from the shelter and other gaushalas, along with bio and agri led Aditya and Amit to start Amrit Fertilizers, a biogas project, in 2014, without any government support.
Q2.1 Name any two raw materials used in bio gas plant.
Q2.2 Which Type of microbes are involved in conversion of cow dung to bio gas?
Q2.3 Biogas is a better fuel than cow dung cake in terms of waste management. Justify

Q3. Read the passage given below and answer the questions
Food chains are very important for the survival of most species. When only one element is removed from the food chain it can result in extinction of a species in some cases. The foundation of the food chain consists of primary producers. Primary producers, or autotrophs, can use either solar energy or chemical energy to create complex organic compounds, whereas species at higher trophic levels cannot and so must consume producers or other life that itself consumes producers. Because the sun's light is necessary for photosynthesis, most life could not exist if the sun disappeared. Even so, it has recently been discovered that there are some forms of life, chemotrophs, that appear to gain all their metabolic energy from chemosynthesis driven by hydrothermal vents, thus showing that some life may not require solar energy to thrive.

3.1 If 10,000 J solar energy falls on green plants in a terrestrial ecosystem, what percentage of solar energy will be converted into food energy?
3.2 If Ria is eating curd/yogurt. For this food intake, which level in the food chain she should be considered to be occupying?
3.3 What is actually limiting the number of trophic levels in a food chain?

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6) https://docs.google.com/document/d/1dxM5Hg5taXARjDbPKE6rtfXctFo1uFbk/edit#heading=h.gjdgxs
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CHAPTER 13
OUR ENVIRONMENT
ANSWER KEY

MULTIPLE CHOICE QUESTIONS
Q1. (b) Only rock and sunlight
Q2) (d) Only primary, secondary and tertiary consumers
Q3.(c)

Biotic Component	Abiotic Component
Grass, bacteria, fungi, butterfly	Water, rain, sunlight, air

Q4. (c) An earthworm making a burrow in the soil.
Q5. (d) Salamander feeds on pine borer to obtain energy
Q6.(d) This will reduce the release of CFCs that reacts with ozone molecules
Q7. (b) by splitting of a molecular oxygen into free oxygen atoms in presence of high energy UV radiations
Q8.(b) polythene bags, plastic toys
Q9. (b)
Q10.(d)10:1

Biodegradable	Non-biodegradable
Vegetable peels, empty carton	Plastic box, bubble wrap

ASSERTION AND REASON TYPE QUESTIONS

Q1. (d)
Q2. (c)
Q3. (a)
Q4. (c)
Q5. (b)
Q6. (b)
Q7. (a)

VERY SHORT ANSWER TYPE

Q1 biomagnification of toxic substances in higher trophic levels

Q2. No, living things cannot grow or survive without water. Water is essential for life as it is needed for:(i) chemical reactions to take place in the body of living organisms.

(ii) Transport of materials in and out of a living body.

(iii) Water is a major component of cells and tissues and helps in maintaining their shape and function.

Q3. Ozone is present in the stratosphere which extends from about 10 kilometers to 50 kilometers above Earth's surface.

Q4.(i)Through seafood that has ingested microplastics in the water.

(ii)We can inhale these tiny particles, which may then enter the bloodstream through the lungs as some microplastics are air borne.

(iii)The microplastics present in certain personal care products or cosmetics can get absorbed through the skin. (any valid response)

Q5. Refrigeration, fire extinguishers, aerosol products industries.

Q6. A- Primary consumer B- tertiary consumer

Q7. Paper sheet < Bone wastes< Plastic bottle

Q8. Lions sit at the top of the food chain in their ecosystem**.** They primarily prey on herbivores and are not typically hunted by other predators for food. They die off old age, starvation, diseases human hunting etc.

Q9. Being a secondary consumer, the frog should be placed at third trophic level in a food chain.

Q10. Biomagnification/ biological magnification

SHORT ANSWER TYPE

Q1. Such a food chain is not likely to exist in nature. The food chain shown has too many trophic levels. Due to the loss of energy at each level, there will not be enough energy available at the higher trophic levels.

Q2.

Biotic	Abiotic
plankton, Protozoans, Algae,Termites mounds,bacteria, rotten log	Sunlight, air, land, water(on surface & under ground)

Q3. (i) Biotic (ii) Primary consumer

Q4. Aquariums are designed and built by humans. We select the plants, fish, and other organisms that live in the tank, as well as control factors like water quality, temperature, and lighting. So aquariums are artificially **c**reated and controlled by man**.**

Q5. Based on 10% law energy transfer reduces at each level and the amount of usable energy for existence of an organism at higher level there by act as natural limitations on the number of trophic levels in a food chain. So, most ecosystems can typically support 4-5 trophic levels.
Q6. (i) Use bio pesticides. (ii) Encourage growth of more friendly microbes by techniques of farming like composting, vermicomposting, organic farming, crop rotation etc. (any valid answer)
Q7. Correct Matches

A	B
i. producer	d) chlorophyll
ii. Soil	c) abiotic
iii.Goat	b) herbivore
iv.UV radiations	a) Ozone
v. vegetable peel	f) biodegradable
vi. DDT	e) pesticide

LONG ANSWER TYPE
Q1. (i) Producers: Those organisms which produce food by photosynthesis(autotrophs). Producers are considered as a source of energy for those above it in a food chain and take up the first trophic level of the food chain. Examples: All green plants also called autotrophs and certain blue-green algae.
(ii)Consumers: Those organisms which depend upon the producers for food, either directly or indirectly by feeding on other consumers those below it in a food chain(heterotrophs). These can further be classified into primary consumers(herbivores) secondary consumers(carnivores), omnivores. e.g. cows, humans. Examples of consumers: Herbivores are the animals that consume or eat vegetation or plants, e.g. cows, horses. Carnivores are the animals that eat flesh of other animals, e.g. tigers, wolves
(iii)Decomposers- Decomposers are the cleaning agents of the ecosystem**.** They break down dead organic matter, recycle nutrients and keep the system functioning. They are not a direct part of the food chain themselves, but form a vital link in the food web, ensuring the continued flow of energy and nutrients.
Omnivores are the animals that eat both plants and animals, e.g. humans, cockroaches.
Q2**.** The sequence of one organism consuming another organism to transfer food energy, is called a food chain.
Significance of Food Chains
(i) Helps in understanding food relationships among the organisms in an ecosystem.
(ii) Helps in understanding type of interactions among the organisms in an ecosystem.
(iii) Helps in understanding the direction and amount of transfer energy between various components in an ecosystem.

(iv) Helps in analysing the movement of toxic substances like pesticides, weedicides, etc. through food chains.

Q3. (i) The green plants in a terrestrial ecosystem capture about 1% of the energy of sunlight that falls on their leaves and convert it into food energy.

(ii) An average of 10% of the food eaten is turned into its own body and made available for the next level of consumers. Therefore, 10% can be taken as the average value for the amount of organic matter that is present at each step and reaches the next level of consumers.
(iii) Around 90% of energy in the form of heat is lost to the surroundings at each trophic level.
For example, suppose 1000 J of solar energy is received by green plants, then only 1% of solar energy available on earth is utilized by plants. So only 10 J (1% of 1000 J) is trapped by plants and the rest 990 J of energy is lost to the environment. So, plants utilize only 10 J of energy. Next, only 10% of the 10 J energy of plant, that is, 1 J, is available to the herbivore animal while 9 J is lost to the environment. Again, just 10% of the 1 J of energy of herbivore animals is utilized by carnivore animals. Thus, carnivore animals have only 0.1 J of energy while 0.9 J is lost to the environment.

Solar energy→ Plants→ Primary consumer→ Secondary consumer
1000J 10J 1J 0.1J

CASE STUDY BASED QUESTIONS

Q1.1 Ozone at the higher levels of the atmosphere is a product of UV radiation acting on oxygen (O2) molecule. The higher energy UV radiations split apart some molecular oxygen (O2) into free oxygen (O) atoms. These atoms then combine with the molecular oxygen to form ozone as shown—

$$O_2 \xrightarrow{UV} O + O$$

$$O + O_2 \rightarrow O_3$$
(Ozone)

Q1.2 DNA Damage, reduced Photosynthesis, impaired growth and development, suppress plant immune systems, changes in plant pigmentation (any valid response)
Q1.3 (i) Seek shade during peak sun hours (ii) Wear protective clothing, including hats and long sleeves. (iii) Apply sunscreen with an SPF (iv) Wear UV-protective sunglasses and clothing's. (any two valid responses)

Q2.1 Animal dung, crop residue, Food waste (any two)
Q2.2 Anaerobic bacteria
Q2.3 (i) Burning of cow dung cakes releases harmful pollutants like smoke and particulate matter into the air, contributing to respiratory problems and air pollution. On the other hand, biogas plants convert a larger portion of the organic matter in cow dung into usable biogas. This results in a more efficient use of the waste material and generation of a cleaner burning fuel.
(ii) Cow Dung burning results in formation of ash as residue which is difficult to manage, whereas on biogas production a smaller amount of residual solid waste generated can be used as fertilizer.

Q3.1 1% of 10000J = 100 J
Q3.2 Third trophic level as she is consuming the animal product of second trophic level animal.

Q3.3 Decrease in energy at higher trophic levels because based on per 10% law only 10 % of usable energy will be available to the next level and in longer food chain as energy reduces, it may not be sufficient for the existence of an organism in nature.

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5) https://ncert.nic.in/textbook.php?jesc1=13-13
6) https://docs.google.com/document/d/1dxM5Hg5taXARjDbPKE6rtfXctFo1uFbk/edit#heading=h.gjdgxs
7) https://docs.google.com/document/d/1HjNasNYpKHpHaB8d1zrt2gZKAiVwrq18/edit

Question Papers For Practice

KENDRIYA VIDYALAYA SANGATHAN

PRACTICE QUESTION PAPER - 1

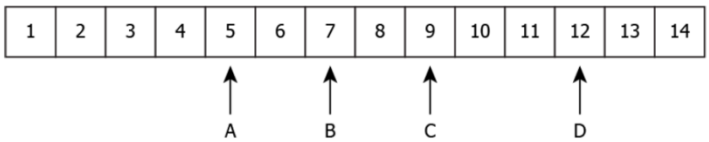
CLASS- X

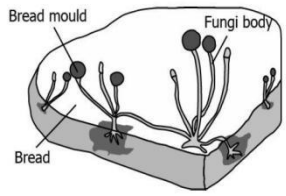
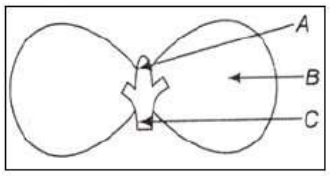
SUBJECT – SCIENCE (086)

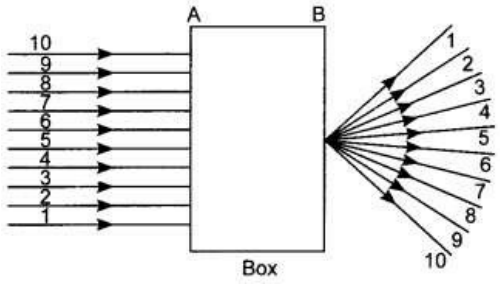
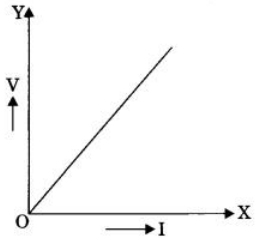
Max. Marks: 80 **Time Allowed: 3 hours**

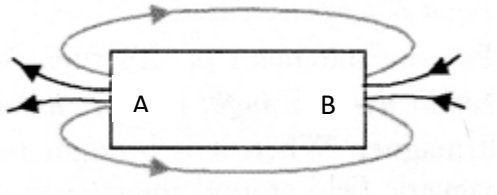
GENERAL INSTRUCTIONS:

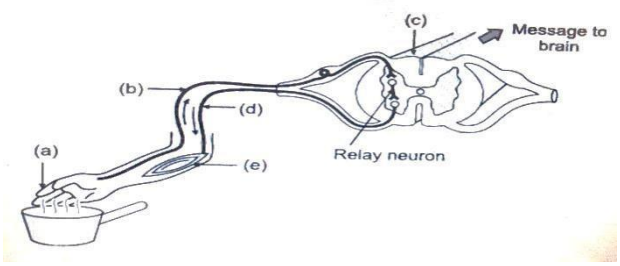
1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 objective type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

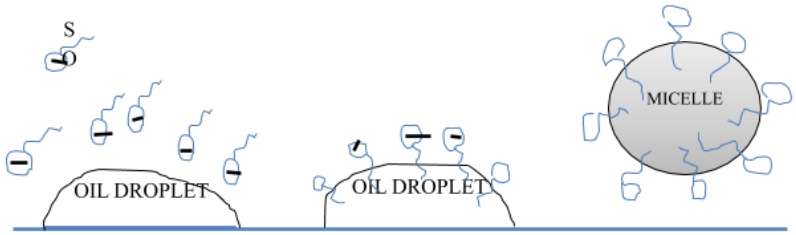
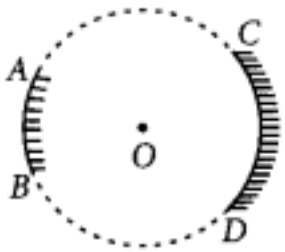
Section-A Select and write the most appropriate option out of the four options given for each of the questions 1 - 20. There is no negative mark for incorrect response.		
Q. Nos.	**Questions**	**Marks**
1	$Pb + CuCl_2 \rightarrow PbCl_2 + Cu$ The above reaction is an example of: a) Combination (c) double displacement b) Decomposition (d) displacement	1
2	The image shows the pH values of four solutions on a pH scale.  Identify the solutions that are alkaline in nature? (a) A and B (b) B and C (c) C and D (d) A and D	1
3	Identify the non-metal which is lustrous.	1

	(a) Sulphur (b) Oxygen (c) Nitrogen (d) Iodine	
4	The complete oxidation of ethanol gives (a) Acetic acid/ethanoic acid (b) CO_2 and water (c) Ethanal (d) Acetone/Ethanone	1
5	The image shows the bread moulds on a bread How do these fungi obtain nutrition?  (a) by eating the bread on which it is growing (b) by using nutrients from the bread to prepare their own food (c) by breaking down the nutrients of bread and then absorbing them (d) by allowing other organisms to grow on the bread and then consuming them	1
6	The brain is responsible for: (a) thinking (b) regulating the heart beat (c) balancing the body (d) all of the above	1
7	In the below figure the parts A, B and C are sequentially  (a) Cotyledon, plumule and radicle (b) Plumule, radicle and cotyledon (c) Plumule, cotyledon and radicle (d) Radicle, cotyledon and plumule	1
8	Identify the totally impossible outcome of Mendel's Experiment (cross breeding pure bred tall and short pea plants) (a) 3 tall 1 short plant (b) 24 tall and 8 short plants (c) 8 tall and 0 short plants (d) 4 tall plants and 1 medium-height plant	1
9	Who have a perfect pair of sex chromosomes? (a) Girls only (b) Boys only (c) Both girls and boys (d) It depends on many other factors	1
10	A beam of light is incident through the holes on side A and emerges out of the holes on the other side B as shown in the figure	1

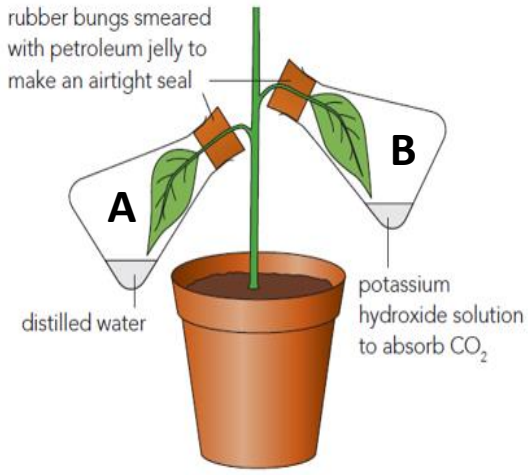
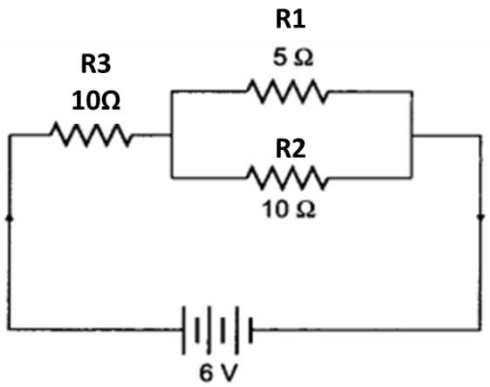
	below:  Which of the following could be inside the box? a) Concave lens b) Rectangular glass slab c) Prism d) Convex lens	
11	The refractive index of flint glass is 1.65 and that for alcohol is 1.36 with respect to air. What is the refractive index of the flint glass with respect to alcohol? a) 0.82 b) 1.21 c) 1.11 d) 1.01	1
12	The least distance of distinct vision for a young adult with normal vision is about (a) 25m (b) 2.5cm (c) 25cm (d) 2.5m	1
13	The slope of voltage (V) versus current (I) is called  (a) Resistance (b) Conductance (c) Resistivity (d) Conductivity	1
14	**Inside** the magnet, the field lines move— a) from north to south b) from south to north c) away from south pole d) away from north pole	1
15	Every food chain in the ecosystem begins with……. which is the original source of food. (a) Saprophytes (b) Parasites (c) Producers	1

	(d) Herbivores	
16	Sulphur dioxide affects (a) haemoglobin of blood (b) Arteries (c) Alveoli of lungs (d) Nerves	1
	Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, and R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	
17	**Assertion (A):** Impurities of electrolytic refining of copper is also known as anode mud. **Reason (R):** The electrolyte is a solution of acidify copper sulphate. The anode is impure copper. On passing electric current, pure copper is deposited on the cathode and impurities is deposited on the anode side bottom of the the electrolytic container.	1
18	**Assertion (A):** The purpose of making urine is to filter out undigested food from intestine **Reason (R):** Kidneys filter the waste and produce urine	1
19	**Assertion (A):** When pea plants (pureline) having round yellow seeds are crossed with pureline plants having wrinkled green seeds, then all pea plants obtained in F, generation bear wrinkled green seeds. **Reason (R):** Round and yellow seeds are dominant to wrinkled and green seeds.	1
20	**Assertion (A):** Accumulation of harmful chemicals is higher in case of organisms at higher trophic level. **Reason (B):** Food chain normally can't reduce beyond 3 or 4 trophic level.	1
	Section-B Question No. 21 to 26 are very short answer questions	
21	Identify the reducing agent in the following reaction: $3MnO_2 + 4Al$ ———— > $3Mn + 2Al_2O_3$	2
22	Write two differences between real and virtual image.	2
23	Why red colour is selected for danger signal lights? Or Give reason-The sky appears dark instead of blue to an astronaut.	2
24	Identify the poles of a magnet in the figure. 	2
25	Consider the following food chain which occurs in a forest: Grass → Deer → Lion If 10000 J of solar energy is available to the grass, how much energy would be available to the deer to transfer it to the lion?	2

	Or Give an example to illustrate that indiscriminate use of pesticides may result in the degradation of the environment.	
26	A bulb is rated at 5.0 V, 100 mA. Calculate its resistance.	2
	Section-C Question No. 27 to 33 are short answer questions	
27	Take 3 g of barium hydroxide in a test tube, now add about 2 g of ammonium chloride and mix the contents with the help of a glass rod. Now touch the test tube from outside. (i) What do you feel on touching the test tube? (ii) State the inference about the type of reaction occurred. (iii) Write the balanced chemical equation of the reaction involved.	1+1+1
28	(i) A milk man adds a very small amount of baking soda to fresh milk. Why? (ii) Write an equation to show the reaction between Plaster of Paris and water. Or When electricity is passed through a common salt solution, sodium hydroxide is produced along with the liberation of two gases 'X' and T. The gas 'X' burns with a pop sound whereas T is used for disinfecting drinking water. a. Identify X and Y. b. Give the chemical equation for the reaction stated above. c. State the reaction of Y with dry slaked lime.	3
29	Suggest a method of reduction for the following metals during their metallurgical processes: (i) Metal 'A' which is one of the last, second or third position in the reactivity. (ii) Metal 'B' which gives vigorous reaction even with water and air. (iii) Metal 'C' which is kept in the middle of activity series.	1+1+1
30	Rohan joined the gym and after the first day exercise he felt pain and cramps in muscles. Explain the cause of cramps after excessive physical exercise.	3
31	The figure given below represents certain phenomenon pertaining to the nervous system.  (i) What does the figure represent? (ii) Name the parts labeled a, b, c, d and e. (iii) Give the function of parts labeled a, b, d.	1+1+1
32	In a monohybrid cross of tall Pea plants denoted by TT and short pea plants denoted by tt, Rahul obtained only tall plants (denoted	3

	by Tt) in F1 generation. However, in F2 generation she obtained both tall and short plants. Using the above information, explain the law of dominance.	
33	What is overloading? State the causes of overloading.	3
	Section-D Question No. 34 to 36 are long answer questions.	
34	(i) What is a homologous series? Explain with an example. (ii) What will be the formula and electron dot structure for cyclopentane? Or (i) Compound x is reacting with y and give compound z which is sweet in smell. Identify the x, y and z and name the reaction.  (ii) Identify the mechanism showing in the following diagram and explain the steps.	2+3
35	Give a reason to explain why a. Adrenaline helps in dealing emergency situations? b. A man becomes unconscious due to head injury. A pin is pricked on his foot, he withdraws his foot. Why? Draw diagram. Or	1+2+2
36	AB and CD, two spherical mirrors, from parts of a hollow spherical ball with its centre at O as shown in the diagram. If arc AB = 12 arc CD, find out the ratio of their focal lengths? State which of the two mirrors will always form virtual image of an object placed in front of it and why?  Or Draw ray diagrams for the following cases when a ray of light: (i) passing through center of curvature of a concave mirror is incident on it. (ii) Parallel to principal axis is incident on convex mirror.	2+1+2

	(iii) is passing through focus of a concave mirror incident on it.	
SECTION - E Question No. 37 to 39 are case-based/data -based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.		
37	❖ Silver articles become black after some time when exposed to air. This is because it reacts with sulphur in the air to form a coating of silver sulphide. ❖ Copper reacts with moist carbon dioxide in the air and slowly loses its shiny brown surface and gains a green coat. This green substance is copper carbonate. ❖ Iron when exposed to moist air for a long time acquires a coating of a brown flaky substance called rust. Let us find out the conditions under which iron rusts. 1. Select the correct balanced chemical reaction occurs during the rusting of iron. (a). $2Fe(s) + 2O_2(g) + 2H_2O(l) \longrightarrow Fe_2O_3.X\ 3H_2O$ (b). $2Fe(s) + 2O_2(g) + 2H_2O(l) \longrightarrow 2Fe_2O_3.X\ 2H_2O$ (c). $Fe(s) + 3O_2(g) + 2H_2O(l) \longrightarrow Fe_2O_3.X\ 3H_2O$ (d). $2Fe(s) + 2O_2(g) + 3H_2O(l) \longrightarrow 2Fe_2O_3.X\ 2H_2O$ 2. Select the method which is not useful to prevent the corrosion of metals. (i) Galvanization (ii) Painting & oiling (iii) Anodizing or making alloys (a) Only i (b) Only ii (c) i and iii both (d) i, ii, and iii all 3. Amalgam is belongs to metal- (a) Gold (b) Platinum (c) Mercury (d) Zinc Or Galvanization belongs to metal (a) Gold (b) Platinum (c) Mercury (d) Zinc	2+1+1
38	The following diagram explains the CO2 gas required for photosynthesis in plant. Answer the following questions	1+1+2

	 1. Which leaf will show black purple colour when reacting with iodine solution. (a) Leaf A (b) Leaf B (c) Leaf A and B both (d) None of Leaf A and B 2. Presence of KOH results into the absence of which gas (a) CO_2 (b) O_2 (c) NO_2 (d) SO_2 3. Leaf B turned pale yellow soon after the experiment start, Give the reason. Or Only flask A shows small water droplets inside. Give the reason.	
39	Observe the given line diagram of electric circuit and answer the following questions.  1. What is the total resistance of R1 and R2 only. (a) 10/3Ω (b) 3/10Ω (a) 15Ω (b) 2Ω	1+1+2

	2. What will be total resistance if all the resistance readjust to joint in a series form. (a) 15Ω (b) 12Ω (a) 17Ω (b) 25Ω 3. Calculate the total resistance of the circuit if resistance R1 and R3 exchanged to each other. Or Calculate the total resistance of the circuit if resistance R2 and R3 exchanged to each other.	

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MARKING SCHEME OF

PRACTICE QUESTION PAPER - 1

CLASS- X

SUBJECT – SCIENCE (086)

Max. Marks: 80 **Time Allowed: 3 hours**

GENERAL INSTRUCTIONS:

8. This question paper consists of 39 questions in 5 sections.
9. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
10. Section A consists of 20 objective type questions carrying 1 mark each.
11. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
12. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
13. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
14. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

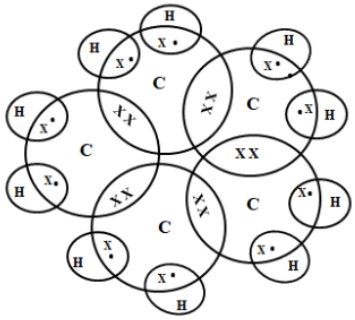
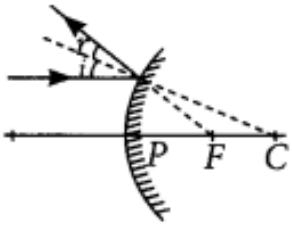
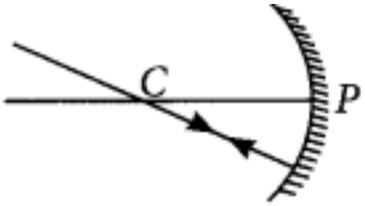
Section-A Select and write the most appropriate option out of the four options given for each of the questions 1 - 20. There is no negative mark for incorrect response.		
Q. Nos.	**Questions**	**Marks**
1	(d) Displacement	1
2	(c) C and D	1
3	(d) Iodine	1
4	(b) CO_2 and water	1
5	(c) by breaking down the nutrients of bread and then absorbing them	1
6	(d) all of the above	1
7	(a) Cotyledon, plumule and radicle	1
8	(d) 4 tall plants and 1 medium-height plant	1
9	(a) Girls only	1
10	(d) Convex lens	1
11	(b) 1.21	1
12	(a) 25m	1
13	(a) Resistance	1
14	b) from south to north	1
15	(c) Producers	1
16	(c) Alveoli of lungs	1

<table>
<tr><td></td><td>Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
a) Both A and R are true, and R is the correct explanation of A.
b) Both A and R are true, and R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.</td><td></td></tr>
<tr><td>17</td><td>a) Both A and R are true, and R is the correct explanation of A.</td><td>1</td></tr>
<tr><td>18</td><td>d) A is false but R is true.</td><td>1</td></tr>
<tr><td>19</td><td>d) A is false but R is true.</td><td>1</td></tr>
<tr><td>20</td><td>b) Both A and R are true, and R is not the correct explanation of A.</td><td>1</td></tr>
<tr><td colspan="3">Section-B Question No. 21 to 26 are very short answer questions</td></tr>
<tr><td>21</td><td>Al is reducing agent.</td><td>2</td></tr>
<tr><td>22</td><td>The differences between real and virtual images are,<table><tr><td>Real image</td><td>Virtual image</td></tr><tr><td>1. The image can be captured in a screen.</td><td>1. The image cannot be captured in a screen.</td></tr><tr><td>2. The image is always inverted.</td><td>2. The image is always erect.</td></tr><tr><td>3. Light rays actually meet to form a real image.</td><td>3. Light rays do not actually meet to form a v image.</td></tr></table></td><td>2</td></tr>
<tr><td>23</td><td>Wavelength of red colour is more and so, it is least scattered. It can be easily seen through a large distance.
Or
The sky appears dark to the astronaut as scattering does not take place at very high altitude due to the absence of atmosphere.</td><td>2</td></tr>
<tr><td>24</td><td>A=North Pole and B=South Pole</td><td>2</td></tr>
<tr><td>25</td><td>According to ten percent law, 10% of the energy of producer will be available to primary consumer, and 10% of this energy will be available to secondary consumer and so on.
Producer 10,000 J $\xrightarrow{10\%}$ Primary consumer 1,000 J $\xrightarrow{10\%}$ Secondary consumer 100 J

Hence, 100 J of energy will be available to the secondary consumer to transfer it to tertiary consumer.

Or
Pesticides are the chemicals used to kill plant and animal pests. They are non-biodegradable and toxicants. For example, excessive use of DDT resulted in reduced population of fish-eating birds. DDT accumulated in such birds through the food chain. It interfered with the egg shell formation. The shell being thin broke due to weight of the bird during incubation. Hence, their population declined.</td><td>2</td></tr>
<tr><td>26</td><td>Rating of bulb,
V = 5 0. Volt.
I = 100 mA
I $100x10^{-3}$
I = 0.1 A
V = IR,</td><td>2</td></tr>
</table>

	R=V/I 5.0/0.1= 50Ω	
Section-C Question No. 27 to 33 are short answer questions		
27	(i) When barium hydroxide is added into ammonium chloride, the bottom of test tube is found to be cooler. (ii) It is an endothermic reaction. (iii) $Ba(OH)_2 + 2NH_4Cl \rightarrow BaCl_2 + 2NH_4OH$	1+1+1
28	(i) It is done to prevent the formation of lactic acid which spoils the milk. (ii) $CaSO_4.\ ½H_2O + 1½\ H_2O \rightarrow CaSO_4.2H_2O$ (Plaster of Paris: $CaSO_4.\ ½H_2O$ and Gypsum: $CaSO_4.2H_2O$) Or	3
29	(i) 'A' can be obtained by chemical reduction using carbon or carbon monoxide as reducing agent. (ii) 'B' can be obtained by electrolytic reduction. (iii) 'C' can be reduced by reducing agent like 'Al'.	1+1+1
30	During excessive physical exercise, aerobic respiration produces energy in our muscles. Anaerobic respiration provides muscles with some extra energy required under excessive physical activity. Glucose is broken down into lactic acid due to anaerobic respiration. The accumulation of lactic acid causes muscle cramps.	3
31	(i) The figure represents reflex arc. (ii) a – Receptor, b – Sensory neuron, c – Spinal cord, d – Motor neuron and e – Effector. (iii) Receptor is a group of cells or organ that receives the stimuli and converts it to an impulse. Sensory neuron carries the impulses from receptors to the central nervous system i.e., brain or spinal cord. Motor neuron carries impulses from central nervous system to the effector organs.	1+1+1
32	Appearance of trait of shortness in F2 generation shows that the trait was present in F1 generation but was not expressed while the trait of tallness expressed itself. The trait which expresses itself in the presence of its contrasting form is called dominant. The other trait which is unable to express its effect in the presence of its contrasting trait is known as recessive.	3
33	If more electrical appliances of high-power rating like electric iron box, electric cooker, electric heater, air conditioner etc., are switched on at the same time, they draw an extremely large current from the circuit is called overloading.	3
Section-D Question No. 34 to 36 are long answer questions.		
34	(i) A sequence of compounds with the same functional group substitutes for hydrogen in a carbon chain is called homologous series. The difference between the formulae of any two successive members is $-CH_2$ and the difference between the molecular formula is14 u. (ii) Formula of cyclopentane is C_5H_{10}.	2+3

	The electron dot structure cyclopentane is:  Or (i) x= Alcohol, y=Ethanoic acid, z=Ester and Reaction= Esterification (ii) The reaction is soapification. Soaps are sodium or potassium salt of fatty acids. Soap molecules have two ends. One end is hydrophilic and another end is hydrophobic. Two molecular ends behave differently. This ionic end is hydrophilic and is oriented towards the water. The other hydrocarbon end is hydrophobic and is oriented towards dirt which is oily in nature. A micelle formation around the oily dirt takes place. The cleaning of clothes etc takes place when flushed with excess water; the micelle containing the dirt is removed.	
35	or	5
36	Focal length of a mirror is given by Focal length = radius of curvature/2 Since both the mirrors have same radius of curvature, therefore focal length of the two mirrors will be same, i.e. F1/F2=1 Since virtual image is always formed by convex mirror. The mirror AB will always form virtual image. Or (i) Ray of light passing through center of curvature of concave mirror, after reflection  (ii) Ray of light parallel to the principal axis is incident on a convex mirror after reflection appear to diverge from the principal focus of a convex mirror.  	2+1+ 2
SECTION - E Question No. 37 to 39 are case-based/data -based questions with 2 to 3		

	short sub-parts. Internal choice is provided in one of these sub-parts.	
37	1. (a). $2Fe(s) + 2O_2(g) + 2H_2O(l) \longrightarrow Fe_2O_3. X\ 3H_2O$ 2. (d) i, ii, and iii all 3. (c) Mercury	2+1+1
38	1. (a) Leaf A 2. (a) CO_2 3. In absence of Co2 the leaf cannot perform photosynthesis and the chlorophyll start to decay and the leaf turned into pale yellow. Or The flask A shows small water drops is actual result of transpiration from the stomata.	1+1+2
39	1. (a) 10/3Ω 2. (b) 25Ω 3. Calculate the resistance after put the value R1=10Ω and R3=5Ω The calculated answer is 10Ω Or Calculate the resistance after put the value R2=10Ω and R3=10Ω The calculated answer is 25/3Ω	1+1+2

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KENDRIYA VIDYALAYA SANGATHAN

PRACTICE QUESTION PAPER - 2

CLASS- X

SUBJECT – SCIENCE (086)

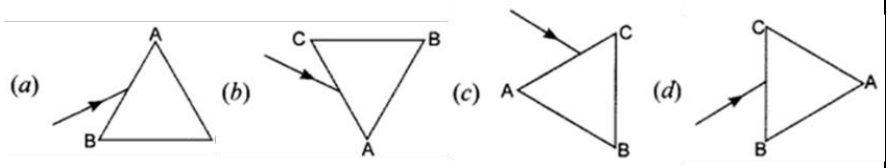
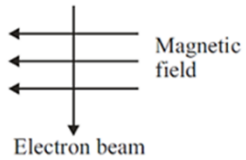
Max. Marks: 80 **Time Allowed: 3hours**

GENERAL INSTRUCTIONS:

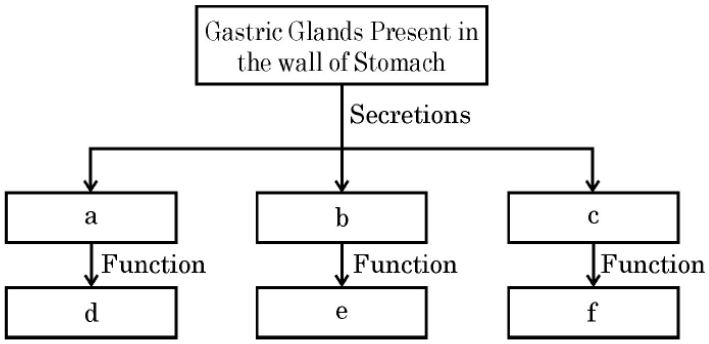
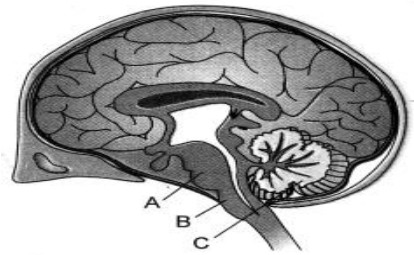
1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 objective type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

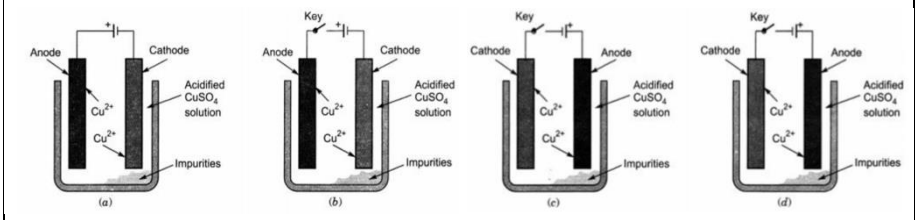
Section-A Select and write the most appropriate option out of the four options given for each of the questions 1 - 20. There is no negative mark for incorrect response.		
Q. No.	**Questions**	**Marks**
1	Which of the following is not a chemical reaction? (a) Souring of milk (c) Rusting of iron (b) Dissolution of sugar in water (d) Digestion of food	1
2	In terms of acidic strength, which one of the following is in the correct increasing order? (a) Water < Acetic acid < Hydrochloric acid (b) Water < Hydrochloric acid < Acetic acid (c) Acetic acid < Water < Hydrochloric acid (d) Hydrochloric acid < Water < Acetic acid	1
3	Which property of metals is used for making bells and strings of musical instruments like Sitar and Violin? (a) Sonorousness (b) Malleability (c) Ductility (d) Conductivity	1
4	The number of isomers of pentane is	1

	(a) 2 (b) 3 (c) 4 (d) 5	
5	Name the substances whose build up in the muscles during vigorous physical exercise may cause cramps? (a) Ethanol + Carbon dioxide + Energy (b) Lactic acid + Energy (c) Carbon dioxide + Water + Energy (d) Pyruvate	1
6	The longest fiber on the cell body of a neuron is called (a) sheath (b) cytoplasm (c) axon (d) dendrites	1
7	Vegetative propagation refers to formation of new plants from (a) stem, flowers and fruits (b) stem, leaves and flowers (c) stem, roots and flowers (d) stem, roots and leaves	1
8	A section of DNA providing information for one protein is called— (a) Nucleus (b) Chromosomes (c) Trait (d) Gene	1
9	The nature of image formed by a convex mirror when the object distance from the mirror is less than the distance between pole and focal point (F) of the mirror would be (a) real, inverted and diminished in size (b) real, inverted and enlarged in size (c) virtual, upright and diminished in size (d) virtual, upright and enlarged in size	1
10	If a man's face is 25 cm in front of concave shaving mirror producing erect image 1.5 times the size of face, focal length of the mirror would be (a) 75 cm (b) 25 cm (c) 15 cm (d) 60 cm	1
11	A couple has two son and three daughters. What is the possibility of their having a girl as sixth child? (a) 10 % (b) 50 % (c) 90 % (d) 100 %	1
12	What is the order of the waste management hierarchy, from most to least favored? a) Prevention-Recycle-Reuse-Disposal b) Prevention-Reuse-Disposal-Recycle c) Prevention-Disposal-Reuse-Recycle	1

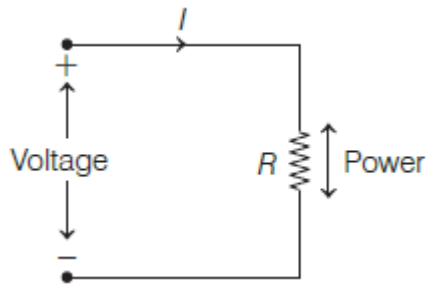
	d) Prevention-Reuse-Recycle-Disposal	
13	A prism ABC (with BC as base) is placed in different orientations. A narrow beam of white light is incident on the prism as shown in figure. In which of the following cases, after dispersion, the third colour from the top corresponds to the colour of the sky?  	1
14	Two heater wires of equal length are first connected in series and then in parallel with a battery. The ratio of heat produced in the two cases is: (a) 2 : 1 (b) 1 : 2 (c) 4 : 1 (d) 1 : 4	1
15	An electron beam enters a magnetic field at right angles to it as shown in the  The direction of force acting on the electron beam will be: (a) to the left (b) to the right (c) into the page (d) out of the page	1
16	What amount of energy will be received by omnivorous if herbivorous is receiving 200KJ from the producer. (a) 2KJ (b) 20KJ (c) 50KJ (d) 100KJ	1
	Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, and R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	
17	**Assertion (A):** Zinc carbonate is heated strongly in presence of air to form zinc oxide and carbon dioxide. **Reason (R):** Calcination is the process in which a carbonate ore is heated strongly in the absence of air to convert into metal oxide.	1
18	**Assertion (A):** Pyruvate is a six-carbon molecule	1

	Reason (R): It is prepared in the cytoplasm as the first step to cellular respiration.	
19	**Assertion:** Accumulation of variation in a species increases the chances of its survival in changing environment. **Reason:** Accumulation of heat resistance in some bacteria ensure their survival even when temperature in environment rises too much.	1
20	**Assertion:** The crown fires are most destructive as they burn the tree top. **Reason:** Due to crown fire the temperature of that area may rise up to 700 degree Celsius.	1
Section-B Question No. 21 to 26 are very short answer questions		
21	Identify the substance oxidized and reduced in the reaction. $CuO(s)+Zn(s)\rightarrow ZnO(s)+Cu(s)$	2
22	A spherical mirror's radius of curvature is 20 cm. Calculate the focal length.	2
23	For dispersion of light through a prism which colour has a maximum deviation? Or What is the least distance of distinct vision of a normal human eye?	2
24	A charge of 6 C is moved between two points P and Q having, potential 10 V and 5 V respectively. Find the amount of work done.	2
25	Rahul has only one fuse of 5A and he used it in wire carrying 15 A current, is it as right decision, give reason? Or If the frequency of A.C. is 50 Hz. Then how many times it is changing its direction in 1 second	2
26	Using Kulhads as disposable cups to serve tea in trains, proved to be a bad idea. Why?	2
Section-C Question No. 27 to 33 are short answer questions		
27	A class 10 student took a pale green substance A in a test tube. And heated it over the flame of a burner. A brown coloured residue B was formed along with evolution of two gases with burning smell of sulphur. Identify A & B. Write the chemical reaction involved.	3
28	Dry ammonia has no action on litmus paper but a solution of ammonia in water turns red litmus paper blue. Why is it so? Or Bleaching powder forms a milky solution in water. Explain.	3
29	What are amphoteric oxides? Give examples?	3

30	Complete the following flow chart as per the given instructions:  	3
31	Name the parts labelled A, B and C in the diagram given below. Write one function of each part.  	1+1+1
32	A Mendelian experiment consisted of breeding pea plants bearing violet flowers with pea plants bearing white flowers. What will be the result of the F1 progeny?	2+1
33	(i) Two circular coils P and Q are kept close to each other, of which coil P carries a current. If coil P is moved towards Q, will some current be induced in coil Q? Give reason for your answer and name the phenomenon involved. (ii) What happens if coil P is moved away from Q? (iii) State any two methods of inducing current in a coil.	2+1
	Section-D Question No. 34 to 36 are long answer questions.	
34	An aldehyde as well as a ketone can be represented by the same molecular formula, say C_3H_6O. (i) Write their name and draw the structures. (ii) State the relation between the two in the language of science. Or What is meant by isomers? Draw the structures of two isomers of butane (C_4H_{10}). Name three alkanes with molecular formula which cannot shows isomers.	2+3=5 1+2+2=5
35	(i) Mention the names of flower parts which serve the same function as the following do in the animals. (a) Testis (b) Sperm (c) Ovary (ii) State the importance of Sepal/Calyx in the flower. (iii) Which function is not interrupted if we cut the stigma of a flower?	3+1+1=5

	Or (i) Write any three functions of testes in the human male reproductive system? (ii) Why are these located outside the abdominal cavity? Who is responsible for bringing about changes in appearance seen in boys at the time of puberty?	3+2=5
36	(i) An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focused image can be obtained? Find the size and the nature of the image? (ii) Radha needs a erect image from concave mirror, Where do she needs to place the objects, Draw the Ray diagram of possible situation? Or A convex lens has a focal length of 10cm. At what distance from the lens should the object be placed so that it forms a real and inverted image 20cm away from the lens? What would be the size of the image formed if the object is 2cm high? With the help of a ray, the diagram shows the formation of the image by the lens in this case?	2+1+2
SECTION - E Question No. 37 to 39 are case-based/data -based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.		
37	Electrolytic refining is a technique that is used for extraction and purification of metals that are obtained by refining methods. The impure metal is used as an anode and the pure metal is used as a cathode. Soluble salt from the same metal is used as an electrolyte. When electric current is passed, pure metal is obtained at cathode and impure under anode as anode mud. 1.Which one of the following figures describes electrolytic refining:  2.In electrolytic refining, the cathode is made up of a) Pure metal b) Impure metal c) Alloy d) Metallic salt 3. Which of the following represent the correct order of decreasing reactivity? a) Mg > Al > Zn > Fe b) Mg > Zn > Al > Fe c) Al > Zn > Fe > Mg	1+1+1+1

	d) Mg > Fe > Zn > Al 4. Metals are refined by using different methods. Which of the following metals are refined by electrolytic refining? (a) Au (b) Cu (c) Na (d) K A. (A) & (B) B. (A) & (C) C. (B) & (C) D. (C) & (D)	
38	The food that we eat gets broken down into simpler compounds for absorption. There are various enzymes and hormones secreted by various glands and cells of the digestive system, which facilitate the digestion of food. The undigested food is expelled out of the body through the anus. The main organs of the digestive system include the mouth, pharynx, oesophagus, stomach, small and large intestine, rectum and anus. There are various types of digestive glands present, e.g. salivary glands, pancreas, liver, etc. 1. The enzymes present in pancreatic juice are (a) Amylase, Trypsinogen, Peptidase, Rennin (b) Trypsinogen, Lipase, Amylase, Pro-carboxypeptidase (c) Peptidase, Pepsin, Amylase, Rennin (d) Maltase, Amylase, Trypsinogen, Pepsin 2. Which gland produces bicarbonate ions and Trypsin: (a) Stomach and liver (b) Liver and Pancreas (c) Intestine and Liver (d) Salivary gland and Intestine 3. Infants' gastric juice contains (a) nuclease, pepsinogen, lipase (b) maltase, pepsinogen, rennin (c) amylase, rennin, pepsinogen (d) pepsinogen, lipase, rennin 4. The absorption of fructose by intestinal mucosa is (a) co-transport mechanism (b) simple diffusion (c) facilitated transport (d) active transport	1+1+1+1
39	The electrical energy consumed by an electrical appliance is given by the product of its power rating and the time for which it is used. The given figure is showing joule.	1+1+1+1



Actually, Joule represents a very small quantity of energy and therefore it is inconvenient to use where a large quantity of energy is involved.

1. The SI unit of electric energy per unit time is
(a) joule
(b) joule-second
(c) watt
(d) watt-second

2. Kilowatt-hour is equal to
(a) 3.6×10^4 J
(b) 3.6×10^6 J
(c) 36×10^6 J
(d) 36×10^4 J

3. The energy dissipated by the heater is E. When the time of operating the heater is doubled, the energy dissipated is
(a) doubled
(b) half
(c) remains same
(d) four times

4. The power of a lamp is 60 W. The energy consumed in 1 minute is
(a) 360 J
(b) 36 J
(c) 3600 J
(d) 3.6 J

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MARKING SCHEME OF

PRACTICE QUESTION PAPER - 2

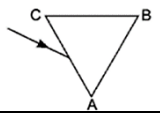
CLASS- X

SUBJECT – SCIENCE (086)

Max. Marks: 80 **Time Allowed: 3 hours**

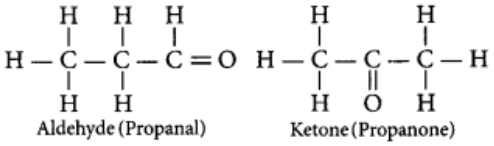
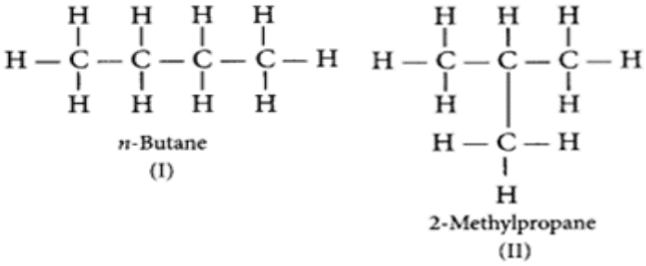
GENERAL INSTRUCTIONS:

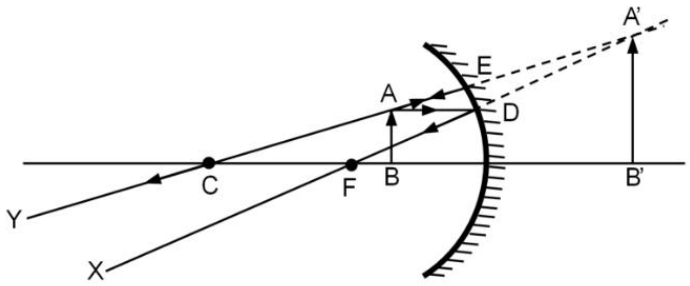
1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 objective type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

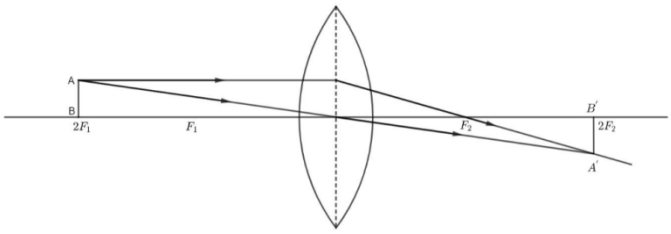
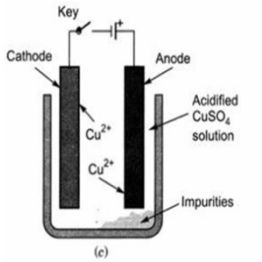
Section-A Select and write the most appropriate option out of the four options given for each of the questions 1 - 20. There is no negative mark for incorrect response.		
Q. Nos.	**Questions**	**Marks**
1	(b) Dissolution of sugar in water	1
2	(a) Water < Acetic acid < Hydrochloric acid	1
3	(a) Sonorousness	1
4	(b) 3	1
5	(b) Lactic acid + Energy	1
6	(c) axon	1
7	(d) stem, roots and leaves	1
8	(d) Gene	1
9	(c) virtual, upright and diminished in size	1
10	(a) 75 cm	1
11	(b) 50 %	1
12	d) Prevention-Reuse-Recycle-Disposal	1
13	(b) 	1
14	(d) 1 : 4	1
15	(d) out of the page	1

16	(a) 2KJ	1
	Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, and R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	
17	d) A is false but R is true.	1
18	d) A is false but R is true.	1
19	b) Both A and R are true, and R is not the correct explanation of A.	1
20	a) Both A and R are true, and R is the correct explanation of A.	1
	Section-B Question No. 21 to 26 are very short answer questions	
21	The substance oxidized is Zinc and the substance reduced is copper oxide.	2
22	Curvature Center is C f = C/2 = 20/2 = 10 cm.	2
23	Violet has the maximum deviation for dispersion of light through a prism. Or The least distance of distinct vision of a normal human eye is 25 cm.	2
24	The amount of work done, W=q(V2−V1) = 6(10−5) = 30 joules	2
25	Yes, because fuse always should be equal or low than the flowing current as they'd both be useless at managing the quantity of current flowing. Or 100 Times will be changing its direction in a second.	2
26	Yes, it is a bad idea because making Kulhads on large scales leads to the loss of top soil.	2
	Section-C Question No. 27 to 33 are short answer questions	
27	In the given situation, A=FeSO4, B=Fe2O3. The chemical reaction involved is: 2FeSO4(s)→Fe2O3(s)+SO2(g)+SO3(g)	3
28	Dry ammonia has no action on the litmus paper because it contains no hydroxyl ions in the absence of water. On dissolving in water, it forms ammonium hydroxide (NH4OH), which is basic in nature because it dissociates to give NH4+	3

	and OH- ions. Thus, red litmus paper turns blue. $NH_3(g)+H_2O \rightarrow NH_4OH\ (aq)$ $NH_4OH\ (aq) \rightarrow NH_4^+(aq)+OH^-(aq)$ Or Bleaching powder reacts with water to form $Ca(OH)_2$, which has a milky appearance. The reaction is given by, $CaOCl_2 + H_2O \rightarrow Ca(OH)_2+2HCl$	
29	Amphoteric oxides are oxides that behave as both acidic and basic oxides. They can neutralize both acids and bases. They undergo neutralization reaction to form water and salt when reacting with acid and form complex salts and water when reacting with base. Examples – Aluminium oxide (Al_2O_3) and Zinc Oxide (ZnO)	3
30	a) cardiac gastric glands b) tree gastric gland c) pyloric gland d) secrete mucus e) secrete the digestive substance f) secrete mucus	3
31	**A-Pons Function:** Relay centre, pneumotaxic area of respiratory centre. **B-Medulla Function:** Reflex centre, cardiac centre, respiratory centre. **C-Cerebellum Function:** Maintains equilibrium and coordinates muscular activities	1+1+1
32	The Mendelian experiment indicates that white colour (ww) is a recessive trait and violet colour (VV) is a dominant trait. Consequently, the F1 progeny's blossom will be violet in colour (Vw).	2+1
33	(i) When coil P is moved towards Q, current will be induced in coil Question This is because on moving P the magnetic field associated with Q increases and so a current is induced. The phenoemenon is electromagnetic induction. (ii) If P is moved away from Q, the field associated with Q will decrease and a current will be induced but in the opposite direction. (iii) Current can be induced in a coil by (a) moving a magnet towards or away from the coil, (b) moving a coil towards or away from a magnet (c) rotating a coil witin a magnetic field.	2+1
Section-D Question No. 34 to 36 are long answer questions.		
34	(i) The aldehyde and ketone represented by the Molecular formula, C_3H_6O.	2+3=5

	 Aldehyde (Propanal) Ketone (Propanone) (ii) In the language of science, they are called as isomers because both have same molecular formula but different structural formulae (having different functional groups.) Or Isomers are those molecules which have the same molecular formula but different structural formula *i.e.*, shows different properties. The structures of possible isomers of butane (C_4H_{10}) are:  *n*-Butane (I) 2-Methylpropane (II) The first three members of alkane series are : (i) CH_4 (methane) (ii) C_2H_6 (ethane) (iii) C_3H_8 (propane)	1+2+2=5
35	(i) (a) Testis – anther, (b) Sperms – pollen grains, (c) Ovary – Ovary, (elaborate the function of mentioned part in the flower.) (ii) Sepal/Calyx protects the flower in bud stage. (iii) Pollination and Pollen germination cannot occur if we cut the stigma of flower. Or (i) Functions of testes are: 1. To make male sex cells (or male gametes) called sperms. 2. To make the male sex hormone called testosterone. 3. The testes of a man lie in a small muscular pouch called scrotum outside the abdominal cavity of the body. This is because the sperm formation requires a lower temperature than the normal body temperature. (ii) Being outside the abdominal cavity, the temperature of scrotum is about 3°C lower than the temperature inside the body and thus the testes are provided an optimal temperature for the formation of sperms. The male sex hormone testosterone is responsible for bringing about changes in	3+1+1=5 3+2=5

	appearance seen in boys at the time of puberty.	
36	(i) u = – 27 cm, f = – 18 cm. ho= 7.0 cm 1/v = 1/f- 1/u 1/v = -1/18 + 1/27 = -1/54 V = – 54 cm. Screen must be placed at a distance of 54 cm from the mirror in front of it. h_i/h_0= v/u h_i/h_0= v/u h_i/7 = +54/-27 h_i = -2 x 7 = -14 cm. Thus, the image is of 14 cm length and is inverted image. (ii) Radha needs to place object between F (focus) and O (Center of curvature).  Or Given, the focal length of the convex lens, f=+10cm Also, given the image formed is real and inverted with the image distance as 20cm. v=+20cm From the lens formula, we have: 1f=1/v−1/u 1/10=1/20−1/u 1/u=1/20−1/10 1/u= −1/20 u=−20cm ∴The object is placed at a distance of 20cm. Magnification is given as, m= −v/u m= −20/(−20) m= +1 Also, magnification is given by, m=Height of the image Height of the object. ∴m=Height of the image/2 1=Height of the image/2 Height of the image=2cm	3+2=5

	Thus, the image is of the same size as that of the object and it is real and inverted. The ray diagram representing the formation of the image by the lens in this case is:  It is observed that the image is formed at 2F2 with the object placed at 2F1.	
SECTION - E Question No. 37 to 39 are case-based/data -based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.		
37	1. (c)  2. a) Pure metal 3. a) Mg > Al > Zn > Fe 4. D. (C) & (D)	1+1+1+1
38	1. (b) Trypsinogen, Lipase, Amylase, Pro-carboxypeptidase 2. (b) Liver and Pancreas 3. (d) pepsinogen, lipase, rennin 4. (c) facilitated transport	1+1+1+1
39	1. (a) joule 2. (b) 3.6×10^6 J 3. (a) doubled 4. (c) 3600 J Total power, P=60W Total Time=1min=60s As, Power=Energy / Time Energy=Power×Time=60×60=3600Ws=3600 J	1+1+1+1

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