



SESSION: 2020-21

KENDRIYA VIDYALAYA SANGATHAN
AHMEDABAD CLUSTER
AHMEDABAD REGION

SUPPORT MATERIAL
CLASS X SCIENCE

STUDENT SUPPORT MATERIAL

INSPIRATION

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SCIENCE

CLASS-10

CHAPTER-1 CHEMICAL REACTIONS AND EQUATIONS

Chemical Reaction:-

Any process that involves the rearrangement of structure of the substance or conversion of reactants into products is defined as **Chemical Reaction**.

For a Chemical Reaction to occur, the change can be observed in the form of -

- **Change in State:** Melting of ice into water.
- **Change in Colour:** Iron rusting which has colour change from silver to reddish brown.
- **Change in Temperature:** There are two types of reaction i.e Exothermic and Endothermic Reaction.

Exothermic Reactions: Those reactions in which energy is released in the form of heat are called **Exothermic Reactions**.

Examples -

(1) All combustion reactions e.g.



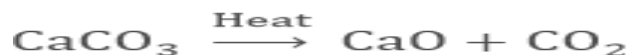
(2) Thermite reactions e.g.



Combinations are generally exothermic in nature. The decomposition of organic matters into compost is an example of exothermic reaction.

Endothermic Reactions: Those reactions in which energy is absorbed are called **Endothermic Reactions**.

Examples -



also, the reaction of photosynthesis -



Change in State

Some chemical reactions are characterized by a change in state.

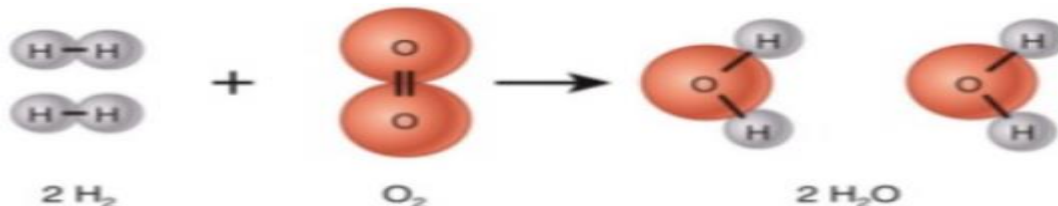
- When wax is burned (in the form of wax candle,) then water and carbon dioxide are formed.
- Now, wax is a liquid whereas carbon dioxide is a gas. This means that during the combustion reaction of wax, the physical state changes from solid to liquid and gas.

Physical Change

- In this change identity of the substance remains same.
- For Example, Melting, Boiling etc.

Chemical Change

- The identity of the substances change
- Reactants are converted into substance due to formation or broken down of older bonds



Chemical Equation

The symbolic representation of chemical reaction using symbols and formulae is known as **Chemical Equation**. For this, reactants are written in left hand side whereas products are written on the right.

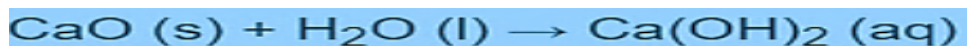
Balanced Chemical Equation

A balanced chemical equation is the one where the number of atoms involved in reactants side is equal to number of atoms on product side.



Types of Chemical Reaction

Combination Reaction is reaction when single product is formed from the combination of two or more reactants. **For Example-**



Reactions can be exothermic as well as endothermic. Exothermic reaction release heats and raises the temperature of the surroundings. **For Example**, Respiration is an example of exothermic reaction.



Endothermic reaction involved the absorption of the heat and thus it cools the surrounding. The decomposition of dead organic material is an endothermic reaction.

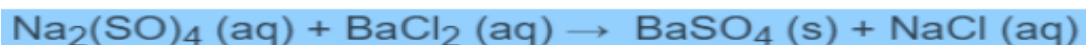
Decomposition Reaction is type of reaction which involves breakdown of single reactant into simpler products. Decomposition of silver chloride into silver and chlorine in presence of sunlight is an example of decomposition reaction.



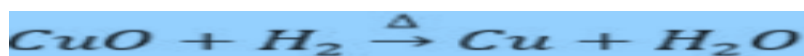
Displacement Reaction is a reaction in which more reactive element will displaces the less reactive element.



Double Displacement Reaction is a type of reaction in which cations and anions in the reactants switch the places to form new products.



Redox Reaction is also known as **Oxidation-reduction Reaction**. In this type of reaction transfer of electrons occurs between the two species. Oxidation is defined as addition of oxygen or removal of hydrogen. Reduction is defined as removal of oxygen or addition of hydrogen. Oxidizing agent is the one which gains the electrons and is reduced in a chemical reaction. Reducing agent is oxidized in a chemical reaction and it loses the electrons. Fluorine is the strongest oxidizing agent. Formic acid is a reducing agent



Corrosion

Metals are prone to corrosion. It is a slow conversion of metals into some undesirable compounds. This occur may be due to reaction with oxygen, gases, acids etc. When irons reacts with atmospheric oxygen and moisture, a red layer is formed on the surface of the iron, this process is known as **Rusting**.



Rancidity

When food containing fats and oils are exposed to the atmosphere, the oxidation of fat and oil occurs, this is known as **Rancidity**.



Identify the substance oxidized in the above equation.

- (a) MnCl_2
- (b) HCl
- (c) H_2O
- (d) MnO_2

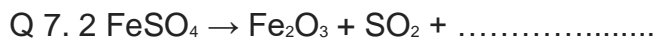
Ans(d) MnO_2

Explanation: Reason: In this reaction HCl is oxidised to Cl_2 , whereas MnO_2 is reduced to MnCl_2 .

Fill in the Blanks

Q 6. The addition of oxygen to a substance is called whereas removal of oxygen is called

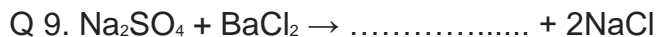
Ans. oxidation, reduction



Ans. SO_3

Q 8. Precipitation reactions produce insoluble

Ans. salts



Ans. BaSO_4

Q 10. is the process in which metals are eaten up gradually by the action of air, moisture or a chemical on their surface.

Ans. Corrosion.

Directions (Q. Nos. 11-13) *In the following questions a statement of Assertion is followed by a statement of Reason. Mark the correct choice as*

- (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 Assertion.
- (c) If Assertion is true but Reason is false.
- (d) If Reason is true but Assertion is false.
- (e) If both Assertion and Reason are false.

Q11. **Assertion:** Chemical reaction changes the physical and chemical state of a substance.

Reason: When electric current is passed through water (liquid), it decomposes to produce hydrogen and oxygen gases.

Ans:

Q12. **Assertion:** In a balanced chemical equation, total mass of the each element towards reactant side = total mass of the same element towards product side.

Reason: Mass can neither be created nor destroyed during a chemical change.

Ans:

Q13. **Assertion:** When calcium carbonate is heated, it decomposes to give calcium oxide and carbon dioxide.

Reason: The decomposition reaction takes place on application of heat, therefore, it is an endothermic reaction.

Ans:

Q14. **Assertion:** Chips manufacturers usually flush bags of chips with gas such as nitrogen to prevent the chips from getting oxidised.

Reason: This increases the taste of the chips and helps in their digestion.

Ans:

Q15. **Assertion:** Rusting of iron metal is the most common form of corrosion.

Reason: The effect of rusting of iron can be reversed if they are left open in sunlight.

Ans:

Q16. (a) Name and state the law which is kept in mind while we balance a chemical equation.

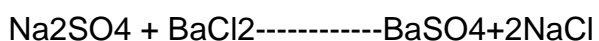
Ans: law of conservation

(b) What are the coefficients of the correctly balanced equation?
 $?Fe_2O_3 + ?CO \rightarrow ?Fe + ?CO_2$

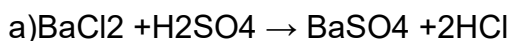
Ans: 1, 3, 2, 3

Q17. What is a precipitation reaction? Give an example.

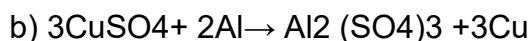
Ans. Reaction in which an insoluble substance or precipitate is formed



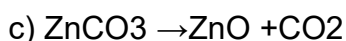
Q18. Classify the following reaction as combination, decomposition, displacement and double displacement reaction:-



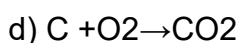
Ans: Double displacement reaction.



Ans: Displacement reaction.



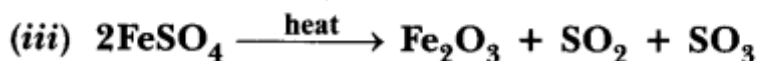
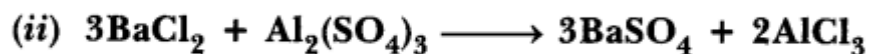
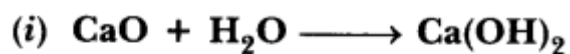
Ans: Decomposition reaction



Ans: Combination reaction

Questions [3 Marks]

Q19. Name the type of chemical reaction represented by the following equation:



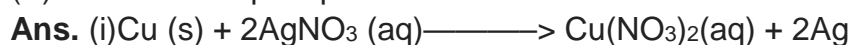
Ans: (i) Combination reaction.
(ii) Double displacement reaction (Precipitation reaction)
(iii) Decomposition reaction.

Q20. Write the chemical equation of the reaction in which the following changes have taken place with an example of each:

(i) Change in colour

(ii) Change in temperature

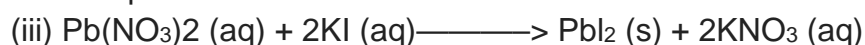
(iii) Formation of precipitate



The solution will become blue in colour and shiny silver metal will be deposited.



The temperature will increase because heat will be evolved.



Yellow ppt

Yellow precipitate of PbI_2 will be formed.

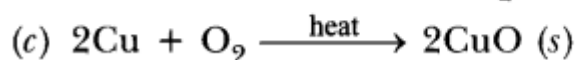
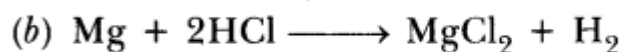
Q21. Write chemical equation reactions taking place when carried out with the help of

(a) Iron reacts with steam

(b) Magnesium reacts with dil HCl

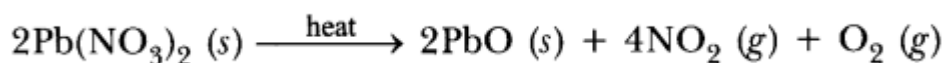
(c) Copper is heated in air.

Ans.



Q22. Which products will be obtained when lead nitrate is heated simply. Write balanced chemical equation for the reaction? State the type of chemical reaction that occur in the change.

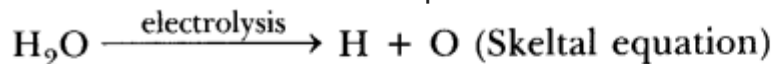
Ans: Lead monoxide, nitrogen dioxide and oxygen gas will be liberated.



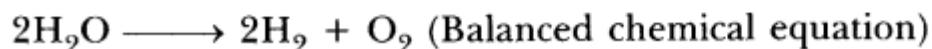
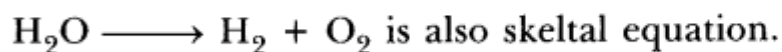
It is thermal decomposition reaction.

Q23. What is meant by skeletal type chemical equation? What does it represent? Using the equation for electrolytic decomposition of water, differentiate between a skeletal chemical equation and a balanced chemical equation.

Ans: The equations in which gaseous are written in atomic form instead of molecular form and equation is not balanced, are called skeletal type equation. They represent gaseous elements formed in atomic state and equation is not balanced



Hydrogen and oxygen are written in atomic forms and equation is not balanced.



Questions [5 Marks]

Q24. (a) Define a balanced chemical equation. Why should an equation be balanced?

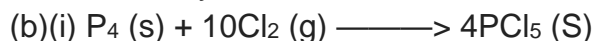
(b) Write the balanced chemical equation for the following reaction:

(i) Phosphorus burns in presence of chlorine to form phosphorus penta chloride.

(ii) Burning of natural gas.

(iii) The process of respiration.

Ans: (a) Balanced chemical equation has an equal number of atoms of different elements in the reactants and products. According to law of conservation of mass, matter can neither be created nor be destroyed in a chemical reaction.



Q25. (a) Explain two ways by which food industries prevent rancidity.

(b) Discuss the importance of decomposition reaction in metal industry with three points.

Ans: (a) (i) Rancidity can be prevented by adding antioxidants to food containing fat and oil, e.g. butylated hydroxy anisole is added to butter as antioxidant.

(ii) It can be prevented by packaging fat and oil containing foods in nitrogen gas.

(b) (i) Molten NaCl is electrolytically decomposed to form sodium metal.

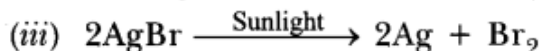
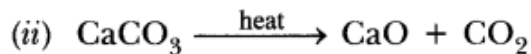
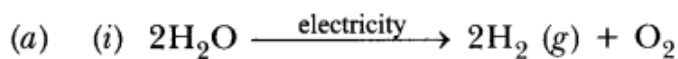
(ii) Aluminium metal is obtained by electric decomposition of bauxite ore mixed with cryolite.

(iii) Carbonate ores are thermally decomposed to give metal oxide which on reduction give metal.

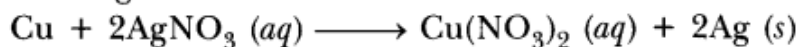
Q26. (a) Write one example for each of decomposing reaction carried out with help of (i) Electricity (ii) Heat (iii) Light

(b) Which of the following statements is correct and why copper can displace silver from silver nitrate and silver can displace copper from copper sulphate solution.

Ans:

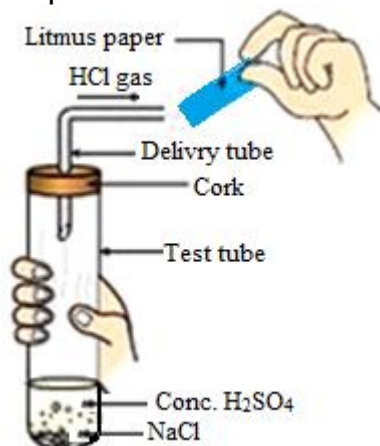


(b) Copper can displace silver from AgNO_3 because copper is more reactive than Ag



CHAPTER: 2 ACID, BASE AND SALT

1. The figure given below represents the experiment carried out between conc. sulphuric acid and sodium chloride, which react with each other to form HCl gas.



Blue litmus paper is brought near the mouth of the delivery tube to check the presence of HCl acid but no change is observed in the color of litmus paper because:

- The litmus paper used is dry
- The litmus paper used is moist
- Blue litmus paper does not change its color with an acid
- The litmus paper is kept very close to the mouth of the delivery tube

Answer. a. The litmus paper used is dry

2. Which of the following phenomena occur, when a small amount of acid is added to water?

- Ionisation
- Neutralisation
- Dilution
- Salt formation

- (i) and (ii)
- (i) and (iii)

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

Answer. b. (i) and (iii)

3. Which of the following indicators turn red in an acidic solution?

- i. Phenolphthalein
- ii. Litmus
- iii. Turmeric
- iv. Methyl orange

Choose the correct option:

- a. (i) and (ii)
- b. (ii) and (iii)
- c. Only (ii)
- d. (ii) and (iv)

Answer. d. (ii) and (iv)

4. Dilute acid does not produce carbon dioxide on being treated with:

- a. Marble
- b. Lime
- c. Baking soda
- d. Limestone

Answer. b. Lime

5. The sample of soil from a particular place was tested for its pH value. It came out to be 5. Which one of the following should be added to the soil to make it suitable for the plant growth?

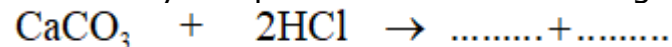
- i. Calcium chloride
- ii. Calcium Hydroxide
- iii. Calcium oxide

Choose the correct option:

- a. Both (i) and (ii)
- b. Both (ii) and (iii)
- c. Only (i)
- d. Only (iii)

Answer. b. Both (ii) and (iii)

6. Identify the products of the following reaction:



- a. Calcium hydrogencarbonate and chlorine gas
- b. Calcium chloride and water
- c. Calcium oxide, carbon dioxide and water
- d. Calcium chloride, carbon dioxide and water

Answer. d. Calcium chloride, carbon dioxide and water

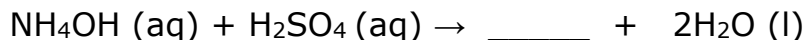
7. An ant's sting can be treated withwhich will neutralise the effect of the chemical injected by the ant's sting into our skin.

Choose the correct option from the following to be filled in the blank space:

- a. Methanoic acid
- b. formic acid
- c. Baking soda
- d. Caustic soda

Answer. c. Baking soda

8. In the following reaction, identify the salt formed



- a. NH_4NO_3
- b. $(\text{NH}_4)_2\text{SO}_4$
- c. $(\text{NH}_4)_3\text{PO}_4$
- d. $(\text{NH}_4)_2\text{S}$

Answer. b. $(\text{NH}_4)_2\text{SO}_4$

9. Which of the following salt will give acidic solution when dissolved in water?

- a. NH_4Cl
- b. NaCl
- c. Na_2CO_3
- d. CH_3COONa

Answer. a. NH_4Cl

10. Bleaching powder is used as a disinfectant for water to:

- a. Make water tastier
- b. Remove all the dirt from water
- c. Make water germ-free
- d. Make water clear

Answer. c. Make water germ-free

11. Which among the following represents the chemical formula for 'Plaster of Paris'?

- a. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- b. $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$
- c. $\text{CaSO}_4 \cdot \text{H}_2\text{O}$
- d. $\text{CaSO}_4 \cdot 10\text{H}_2\text{O}$

Answer. b. $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

12. Which one of the following salts will dissolve in water to form an alkaline solution?

- a. Potassium carbonate
- b. Sodium chloride
- c. Sodium carbonate
- d. Potassium sulphate

Answer. a. Potassium carbonate

13. Copper sulphate crystals when heated strongly, lose their water of crystallization to give anhydrous copper sulphate accompanied by a change in color from:

- a. Blue to green
- b. Blue to white
- c. Blue to sky blue
- d. Blue to grey

Answer. b. Blue to white

Very Short Answer Type Questions[II] [1 Marks]

14 .What would be the colour of red litmus in a solution of sodium carbonate?

Answer. The red litmus will change to blue in sodium carbonate solution.

15.Which gas is evolved when sodium hydrogencarbonate reacts with dilute hydrochloric acid?

Answer.Carbon dioxide gas is evolved.

16.Curd is not kept in copper and brass utensils. Why?

Answer.Curd and sour substances contain acids which react with brass and copper vessels to form poisonous salts which are harmful for our health.

17.Name the gas usually liberated when a dilute acid reacts with a metal. What happens when a burning candle is brought near this gas?

Answer. H₂ gas is liberated. It burns with pop sound when burning candle is brought near the gas.

18.What effect does an increase in concentration of H⁺(aq.) in a solution have on the pH of solution?

Answer.Higher the concentration, lower will be pH of the solution.

19.Which one of these has a higher concentration of H⁺ ions ? 1 M HCl or 1 M CH₃COOH

Answer.1 M HCl has higher concentration of H⁺ ions.

20.Why does 1 M HCl solution have a higher concentration of H⁺ ions than 1 M CH₃COOH solution?

Answer.1 M HCl has higher conc. of (H⁺) because it ionises completely in aqueous solution whereas CH₃COOH does not as it is weak acid.

21.Which gas is generally liberated when a dilute solution of hydrochloric acid reacts with an active metal?

Answer.Hydrogen gas is liberated when active metal reacts with dilute hydrochloric acid



22.What is the colour of litmus in a solution of ammonium hydroxide?

Answer.Red litmus will turn blue in ammonium hydroxide.

Short Answer Type Questions[II] [2 Marks]

1. Name the acid present in the following:

(i) Tomato (ii) Vinegar (iii) Tamarind

Answer. (i) Oxalic acid (ii) Acetic acid (iii) Tartaric acid

2. 15 mL of water and 10 mL of sulphuric acid are to be mixed in a beaker

(i) State the method that should be followed with reason.

(ii) What is this process called?

Answer.

(i) The acid is to be added slowly in water to prevent the mixture to be splashed. The reaction is highly exothermic, therefore, constant cooling should be done.

(ii) The process is called dilution.

3. Explain how antacid works.

Answer. Hyperacidity is caused by excess of hydrochloric acid in stomach. Antacid is basic in nature. It neutralizes excess of acid and gives relief from pain caused by hyperacidity.

4.(a) Define olfactory indicators. Name two substances which can be used as olfactory indicator.

(b) Choose strong acids from the following:

CH_3COOH , H_2SO_4 , H_2CO_3 , HNO_3

Answer.

(a) Those substances whose smell (odour) changes in acidic or basic solution are called olfactory indicators, e.g. onion and vanilla.

(b) H_2SO_4 and HNO_3 are strong acids.

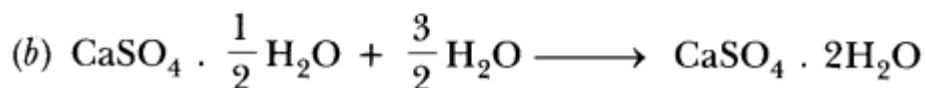
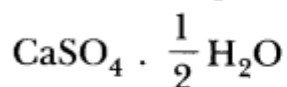
5. A white coloured powder is used by doctors for supporting fractured bones.

(a) Write chemical name and formula of the powder.

(b) When this white powder is mixed with water a hard solid mass is obtained. Write balanced chemical equation for the change.

Answer.

(a) Calcium sulphate hemihydrate



6. Explain the action of dilute hydrochloric acid on the following with chemical equation:

(i) Magnesium ribbon (ii) Sodium hydroxide (iii) Crushed egg shells

Answer.

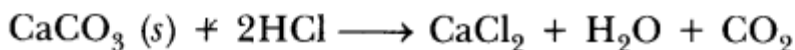
(i) Hydrogen gas will be formed



(ii) Sodium chloride and water will be formed



(iii) Crushed egg shells are made up of CaCO_3 which reacts with dil HCl to give brisk effervescence due to CO_2



7. State reason for the following statements:

(i) Tap water conducts electricity whereas distilled water does not.

(ii) Dry hydrogen chloride gas does not turn blue litmus red whereas dilute hydrochloric acid does.

(iii) During summer season, a milk man usually adds a very small amount of baking soda to fresh milk.

(iv) For a dilution of acid, acid is added into water and not water into acid.

(v) Ammonia is a base but does not contain hydroxyl group.

Answer.

(i) Tap water contains ions which conduct electricity, distilled water does not contain ions.

(ii) Dry HCl does not form ions but HCl gives H^+ and Cl^- .

(iii) Baking soda does not allow milk to change to lactic acid which makes milk sour.

(iv) Adding water to acid is highly exothermic. Therefore water is added to acid very slowly with cooling.

(v) Ammonia dissolves in water and forms H^- . Therefore, it is basic in nature.

8.(a) Write the chemical formula of hydrated copper sulphate and anhydrous copper sulphate. Giving an activity illustrate how these are inter convertible.

(b) Write chemical names and formula of plaster of paris and gypsum.

Answer.

(a) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is hydrated copper sulphate. CuSO_4 is anhydrous copper sulphate.

Aim: To show crystalline salts contain water of crystallization.

Material Required: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (Blue vitriol), boiling tube, burner, cork, delivery tube, test tube, clamp stand.

Procedure: 1. Take 2g of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in a boiling tube fitted in a clamp stand.

2. Observe its colour. Fit it with cork and delivery tube bent at two right angles which dips into a test tube.

3. Heat crystals in boiling tube.

4. Observe vapours being condensed in test tube.

5. Cool the crystals and add few drops of water into it.

Observation: Water vapours get condensed in a test tube and colour

of blue crystals changes into white. On adding water to anhydrous copper sulphate it changes into blue again.

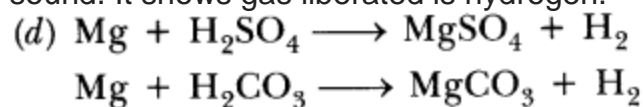
Chemical Reaction :

13. Equal length of magnesium ribbon are taken in two test tubes 'A' and 'B'. H_2SO_4 is added to test tube 'A' and H_2CO_3 in the test tube 'B' in equal amounts:

- Identify the test tube showing vigorous reaction.
- Give reason to support your answer.
- Name the gas liberated in both the tubes. How will you prove its liberation?
- Write chemical equations for both reactions.
- Out of the two acids taken above
 - which one will have lower pH value.
 - lower H^+ concentration respectively.

Answer.

- A will show vigorous reaction.
- It is because H_2SO_4 is strong acid.
- Hydrogen gas will be formed. Bring a burning splinter near the gas. It will burn with 'pop' sound. It shows gas liberated is hydrogen.



(e) 'A' (H_2SO_4) will have lower pH.

'B' (H_2CO_3) will have lower concentration of H^+

14. How will you test for the gas which is liberated when hydrochloric acid reacts with an active metal?

Answer. Bring a burning matchstick near the gas. It burns with 'pop' sound showing that it is hydrogen.

15.(a) Write the name given to bases that are highly soluble in water. Give an example.

(b) How is tooth decay related to pH? How can it be prevented?

(c) Why does bee sting cause pain and irritation? Rubbing of baking soda on the sting area gives relief. How?

Answer.(a) Alkali, e.g. NaOH (Sodium hydroxide).

(b) Lower the pH, more will be tooth decay. Acid reacts with $\text{Ca}_3(\text{PO}_4)_2$ and cause tooth decay. It can be prevented by brushing teeth after every meal.

(c) It is due to formic acid. Sodium hydrogencarbonate (Baking soda) neutralises formic acid giving relief.

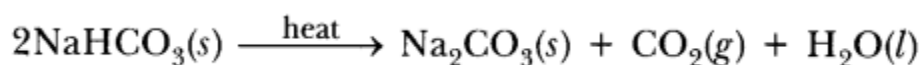
16. A white powder is added while baking breads and cakes to make them soft and fluffy.

Write the name of the powder. Name its main ingredients. Explain the function of each ingredient. Write the chemical reaction taking place when the powder is heated during baking.

Answer. Baking powder.

It consist of sodium hydrogencarbonate and tartaric acid.

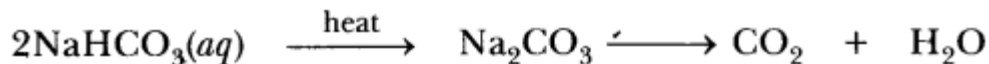
Sodium hydrogencarbonate gives CO_2 which makes cake soft and fluffy. Tartaric acid neutralizes the bitterness due to sodium carbonate produced.



17 “Sodium hydrogencarbonate is a basic salt”. Justify the statement. How is it converted into washing soda? Explain.

Answer. Sodium hydrogencarbonate is a salt of sodium hydroxide (strong base) and carbonic acid (weak acid).

It is basic salt. It is converted into washing soda by heating followed by crystallization.



18. Describe an activity with diagram to illustrate that the reaction of metal carbonates and metal bicarbonates with acids produces carbon dioxide. Write the relevant equations of all the reactions that take place. Name any two forms in which calcium carbonate is found in nature.

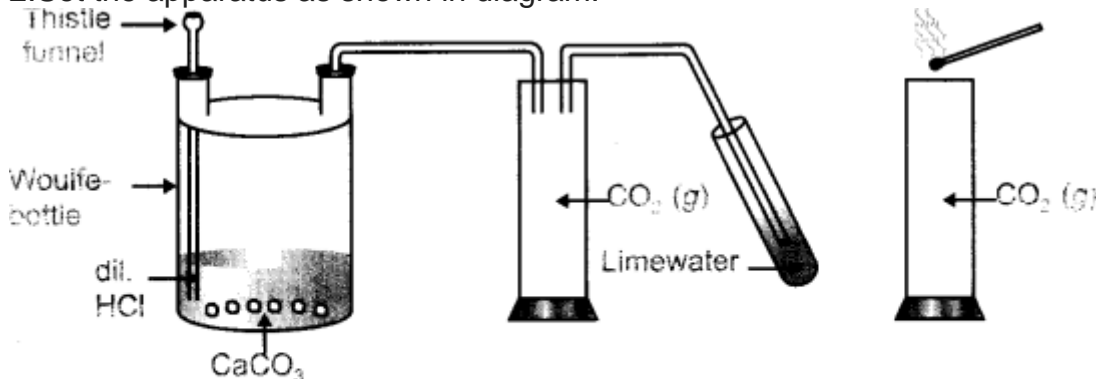
Answer.

Aim: To show acid reacts with metal carbonate to liberate carbon dioxide,

Material Required: CaCO_3 (marble chips), Woulfe-bottle, thistle funnel, dil. HCl, gas jar, matchbox, delivery tube bent at two right angles, lime water.

Procedure:

1. Take marble chips in a Woulfe-bottle.
2. Set the apparatus as shown in diagram.



Reaction of calcium carbonate with dilute hydrochloric acid to liberate carbon dioxide gas which turns lime water milky and extinguishes burning matchstick

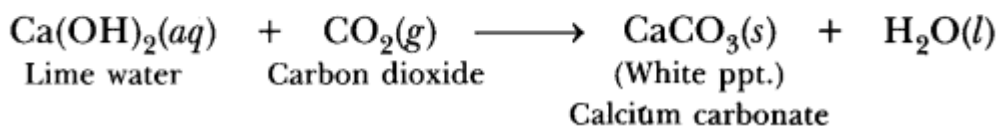
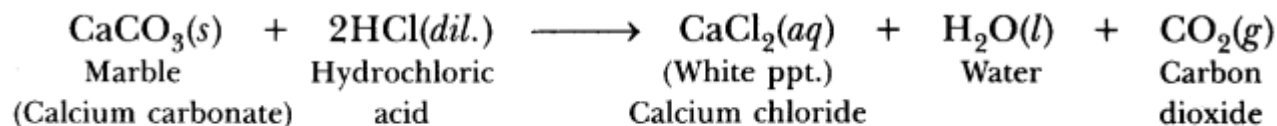
3. Add dil. HCl with the help of thistle funnel.

4. Collect the gas in gas jar by upward displacement of air.

5. Bring a burning matchstick near the gas jar and record your observations.

6. Pass the gas evolved through lime water and note down your observations. Observations:

The burning matchstick will get extinguished because carbon dioxide is neither combustible nor supporter of combustion. Lime water will turn milky due to formation of insoluble calcium carbonate. It can be used as test for CO_2 . The chemical reactions taking place are as follows:



Conclusion: Metal carbonates react with dilute acids to liberate carbon dioxide. Limestone,

chalk, marble are different forms of calcium carbonate. All metal carbonates and hydrogen carbonates react with acids to form corresponding salts, water and carbon dioxide.

19.(a) Identify the acid and the base whose combination forms the common salt that you use in your food. Write its formula and chemical name of this salt. Name the source from where it is obtained.

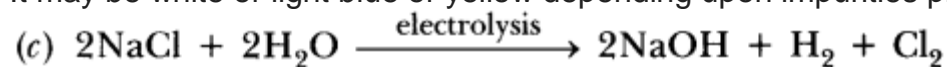
(b) What is rock salt? Mention its colour and the reason due to which it has this colour.

(c) What happens when electricity is passed through brine? Write the chemical equation for it.

Answer.

(a) HCl is acid and NaOH is base whose combination forms the common salt. Its formula is NaCl (Sodium chloride). It is obtained from sea water.

(b) Rock salt is the common name for the mineral "halite". Its chemical formula is NaCl. It may be white or light blue or yellow depending upon impurities present in it.



20.(i) Explain why is hydrochloric acid a strong acid and acetic acid, a weak acid. How can it be verified?

(ii) Explain why aqueous solution of an acid conducts electricity.

(iii) You have four solutions A, B, C and D. The pH of solution A is 6, B is 9, C is 12 and D is 7,

(a) Identify the most acidic and most basic solutions.

(b) Arrange the above four solutions in the increasing order of H⁺ ion concentration.

(c) State the change in colour of pH paper on dipping in solution C and D.

Answer.

(i) HCl is completely ionised in aqueous solution whereas acetic acid is partially ionised in aqueous solution. HCl gives dark red colour with pH paper whereas CH₃COOH gives orange colour

(ii) It is because acid ionises in aqueous solution and these ions conduct electricity. (Hi) (a) 'A' is most acidic and 'C' is most basic.

(b) C (10⁻¹²) < B (10⁻⁹) < D (10⁻⁷) < A (10⁻⁶)

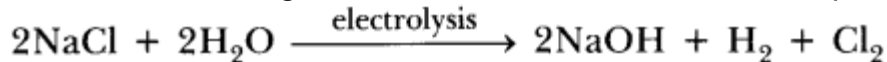
(c) pH paper will become blue in 'C' and green in 'D'.

21.(i) Dry pellets of a base 'X' when kept in open absorbs moisture and turns sticky. The compound is also formed by chlor-alkali process. Write chemical name and formula of X. Describe chlor-alkali process with balanced chemical equation. Name the type of reaction occurs when X is treated with dilute hydrochloric acid. Write the chemical equation. (ii) While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

Answer.

(i) X is sodium hydroxide, NaOH.

When sodium chloride solution (brine solution) is electrolysed, sodium hydroxide solution is formed. H₂ and Cl₂ gases are liberated. This is chlor-alkali process.



The above reaction is neutralization reaction.

(ii) It is because process is highly exothermic. If water is added to acid, bottle of acid will break.

22. 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? What will happen if excess of gas is passed through lime water? With the help of balanced chemical equations for all the changes explain the observations.

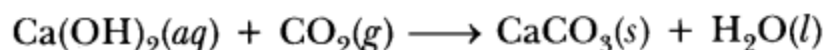
Answer.



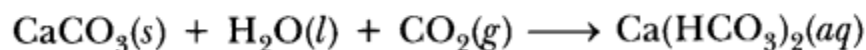
Marble

Calcium chloride

Lime water will turn milky due to liberation of CO_2 .



If excess of CO_2 gas is passed through lime water, milkiness will disappear due to the formation of $\text{Ca}(\text{HCO}_3)_2(\text{aq})$ which is soluble in water.



23. (a) Identify the compound of calcium which is yellowish white powder and is used for disinfecting drinking water. Write its chemical name and formula. How is it manufactured? Write the chemical equation for the reaction involved. Also list two other uses of the compound.

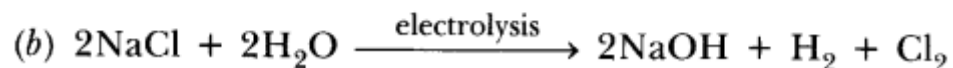
(b) Write the balanced chemical equation of chlor-alkali process.

Answer. (a) The compound is bleaching powder (CaOCl_2). Its chemical name is calcium oxychloride. It is manufactured by reaction of solid slaked lime with dry chlorine gas.



(i) It is used as disinfectant.

(ii) It is used for preparation of chloroform.



24. (a) Mention the pH range within which our body works. Explain how antacids give relief from acidity. Write the name of one such antacid.

(b) Fresh milk has a pH of 6. How does the pH will change as it turns to curd? Explain your answer.

(c) A milkman adds a very small amount of baking soda to fresh milk. Why does this milk take a longer time to set as curd?

(d) Mention the nature of toothpastes. How do they prevent tooth decay?

Answer.

(a) Our stomach has pH equal to 2. Antacids neutralizes excess of acid in our body and gives relief from hyperacidity. Sodium hydrogencarbonate is one of such antacid.

(b) pH will decrease as it turns to curd because curd is acidic due to the presence of lactic acid.

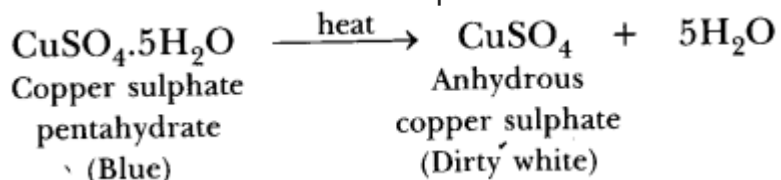
(c) It takes longer time to set as curd as bacteria do not work well in presence of sodium hydrogencarbonate, i.e. fermentation will take place slowly.

(d) Toothpastes are basic in nature. They neutralize the acid formed in mouth which causes tooth decay.

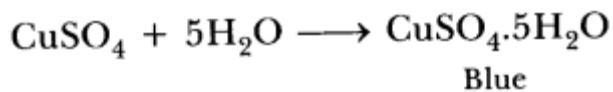
25. (a) Crystals of a substance changed their colour on heating in a closed test tube but regained it after sometime when they were allowed to cool down. Name the substance and write its formula and explain the phenomenon involved.

(b) Name the compound whose one formula unit is associated with 10 water molecules. How is it prepared? Give equations of related reactions. Give two uses of the compound.
Answer.

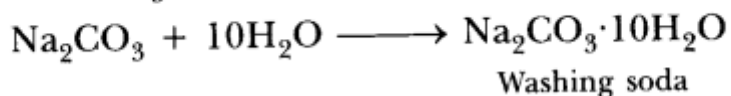
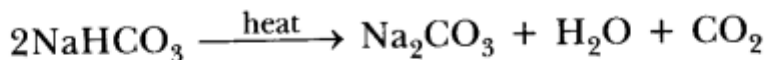
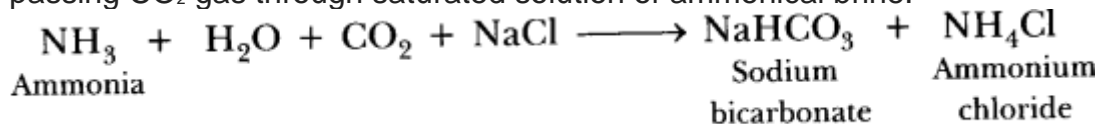
(a) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is a blue crystalline solid. It becomes dirty white on heating due to loss of water molecules and it becomes amorphous.



It regains its colour by absorbing water from atmosphere and becomes blue in colour.



(b) $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$. It is called sodium carbonate decahydrate or washing soda. It is prepared by passing CO_2 gas through saturated solution of ammonical brine.



Uses:

- (i) It is used in the production of washing powder.
- (ii) It is used for the manufacture of glass.

26. (a) Explain the following [chemical properties of acids](#) with the help of balanced chemical equations only.

(i) When an acid reacts with a metal carbonate.

(ii) When an acid reacts with a metal bicarbonate.

(iii) When an acid reacts with a metal oxide.

(b) You are given three solutions A, B and C with pH values 2, 10 and 13 respectively.

Write which solution has more hydrogen ion concentration among the three and state the nature 'acidic or basic' of each solution.

Answer.

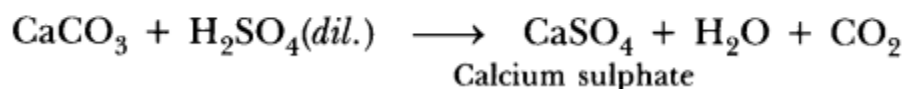
- (a) (i) $\text{CaCO}_3 + 2\text{HCl} \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$
(ii) $\text{NaHCO}_3 + \text{HCl} \longrightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$
(iii) $\text{Al}_2\text{O}_3 + 6\text{HCl} \longrightarrow 2\text{AlCl}_3 + 3\text{H}_2\text{O}$
- (b) 'A' has maximum $[\text{H}_3\text{O}^+]$ equal $10^{-2} \text{ mol L}^{-1}$
'A' is acidic whereas B and C are basic in nature.

27.(a) A metal compound 'X' reacts with dil. H_2SO_4 to produce effervescence, The gas evolved extinguishes a burning candle. If one of the compound formed is calcium sulphate, then what is 'X' and the gas evolved? Also, write a balanced chemical equation for the reaction which 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 soil? Why does the farmer treat the soil with quicklime?

Answer.

- (a) 'X' is CaCO_3 (calcium carbonate). The gas evolved is CO_2 .



- (b) (i) NaHCO_3 is antacid. It neutralizes excess of acid formed in the stomach.
(ii) The soil is acidic in nature. The farmer wants to make it neutral by adding quicklime which is good for crops.

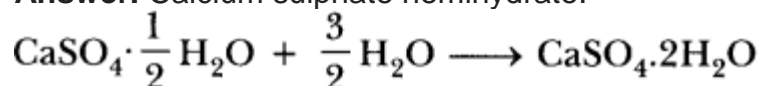
28. What are strong and weak acids? In the following list of acids, separate strong acids from weak acids.

Hydrochloric acid, citric acid, acetic acid, nitric acid, formic acid, sulphuric acid.

Answer. Strong acids are those acids which are completely ionised in aqueous solution. Weak acids are those which do not ionise completely in aqueous solution. Strong acid: HCl , HNO_3 , H_2SO_4 Weak acid: Citric acid, acetic acid, formic acid.

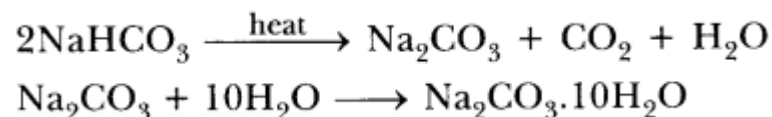
29. State the chemical name of Plaster of Paris. Write a chemical equation to show the reaction between Plaster of Paris and water.

Answer. Calcium sulphate hemihydrate.



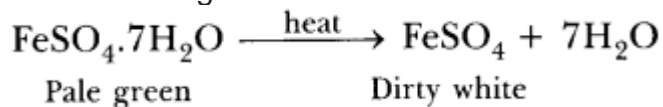
30. State in brief the preparation of washing soda from baking soda. Write balanced chemical equation of the reaction involved.

Answer. Sodium hydrogencarbonate (baking soda) on heating gives sodium carbonate which on recrystallisation gives washing soda



31, What is the colour of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ crystals? How does this colour change upon heating? Give balanced chemical equation for the changes.

Answer. Pale green is the colour of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ crystals. It becomes dirty white on heating.



CH 3 METALS AND NON METALS

Physical Properties

Physical Properties of Metals

- Hard and have a high tensile strength
- Solids at room temperature
- Sonorous
- Good conductors of heat and electricity
- Malleable, i.e., can be beaten into thin sheets
- Ductile, i.e., can be drawn into thin wires
- High melting and boiling points (except Caesium (Cs) and Gallium (Ga))
- Dense, (except alkali metals). Osmium - highest density and lithium - least density
- Lustrous
- Silver-grey in colour, (except gold and copper)

Non-Metals

Non metals are those elements which do not exhibit the properties of metals.

Physical Properties of Non metals

Occur as solids, liquids and gases at room temperature

- Brittle
- Non-malleable
- Non-ductile
- Non-sonorous
- Bad conductors of heat and electricity

Exceptions in Physical Properties

- Alkali metals (Na, K, Li) can be cut using a knife.
- Mercury is a liquid metal.
- Lead and mercury are poor conductors of heat.
- Mercury expands significantly for the slightest change in temperature.
- Gallium and caesium have a very low melting point.
- Iodine is non-metal but it has lustre.
- Graphite conducts electricity.
- Diamond conducts heat and has a very high melting point.

Chemical Properties

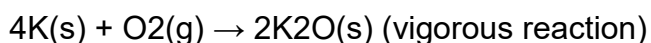
Chemical Properties of Metals

- Alkali metals (Li, Na, K, etc) react vigorously with water and oxygen or air.
- Mg reacts with hot water.
- Al, Fe and Zn react with steam.
- Cu, Ag, Pt, Au do not react with water or dilute acids.

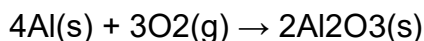
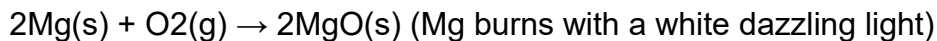
Reaction of Metals with Oxygen (Burnt in Air)

Metal + Oxygen → Metal oxide (basic)

- Na and K are kept immersed in kerosene oil as they react vigorously with air and catch fire.



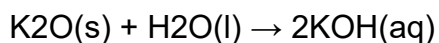
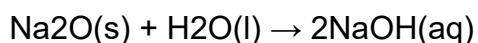
- Mg, Al, Zn, Pb react slowly with air and form a protective layer that prevents corrosion.



- Silver, platinum and gold don't burn or react with air.

Basic Oxides of Metals

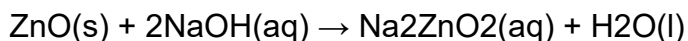
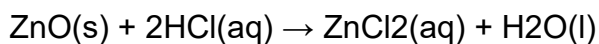
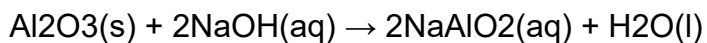
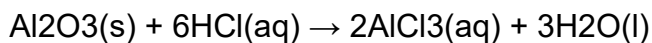
Some metallic oxides get dissolved in water and form alkalis. Their aqueous solution turns red litmus blue.



Amphoteric Oxides of Metals

Amphoteric oxides are metal oxides which react with both acids as well as bases to form salt and water.

For example - Al_2O_3 , ZnO , PbO , SnO



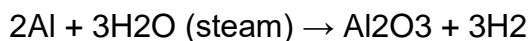
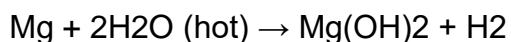
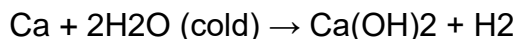
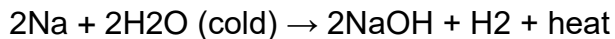
Reactivity Series

The below table illustrates the reactivity of metals from high order to low order.

Symbol	Element
K	Potassium (Highly Active Metal)
Ba	Barium
Ca	Calcium
Na	Sodium
Mg	Magnesium
Al	Aluminium
Zn	Zinc
Fe	Iron
Ni	Nickel
Sn	Tin
Pb	Lead
H	Hydrogen
Cu	Copper
Hg	Mercury
Ag	Silver
Au	Gold
Pt	Platinum

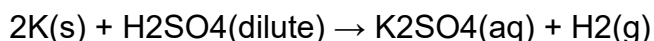
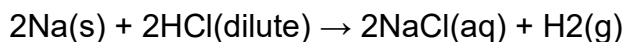
Reaction of Metals with Water or Steam

Metal + Water → Metal hydroxide or Metal oxide + Hydrogen

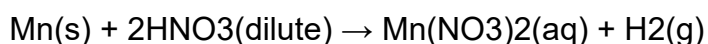
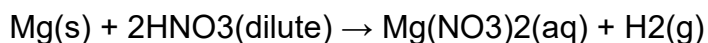


Reaction of Metals with Acid

Metal + dilute acid → Salt + Hydrogen gas



Only Mg and Mn, react with very dilute nitric acid to liberate hydrogen gas.

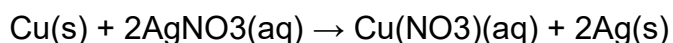
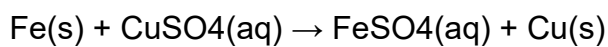


Displacement Reaction

A more reactive element displaces a less reactive element from its compound or solution.

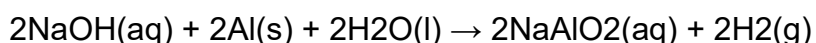
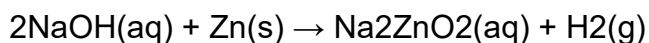
How Do Metal React with Solution of Other Metal Salts

Metal A + Salt of metal B → Salt of metal A + Metal B



Reaction of Metals with Bases

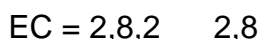
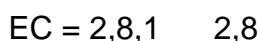
Base + metal → salt + hydrogen



How do metals and non-metals react ?

Metals lose electrons and become positive ions. So, they are called electropositive elements. E.g.

- The atomic number of sodium is 11, its electronic configuration is 2,8,1. It has 1 valence electron. It loses 1 electron and forms a sodium ion i.e. Na^+



Non-metals gain electrons and become negative ions. So, they are called electro-negative elements. Eg- The atomic number of chlorine is 17, its electronic configuration is 2,8,7. It has 7 valence electrons. It gains 1 electron and forms a chloride ion i.e. Cl^-



Formation of sodium chloride molecule : The atomic number of Na is 11, its electronic configuration is 2,8,1. It has 1 valence electron, it loses 1 electron to form Na^+ ion. The atomic number of Cl is 17, its electronic configuration is 2,8,7. It has 7 valence electrons, it gains 1 electron to form Cl^- ion.

Then the attraction between the Na^+ ion and Cl^- ion results in the formation of sodium chloride (NaCl) molecule.

Formation of Magnesium chloride molecule : The atomic number of Mg is 12, its electronic configuration is 2,8,2. It has 2 valence electrons, it loses 2 electrons to form Mg^{2+} ion. The atomic number of Cl is 17, its electronic configuration is 2,8,7. It has 7 valence electrons, it gains 1 electron to form Cl^- ion.

Then the attraction between Mg^{2+} ion and 2 Cl^- ions results in the formation of Magnesium chloride (MgCl_2) molecule.

Ionic compounds (Electrovalent compounds): Ionic compounds are compounds formed by the transfer of electrons from a metal to a non-metal.

Properties of ionic compounds :

- They are formed by the transfer of electrons and are made up of ions.
- They are crystalline solids.
- They have high melting points and boiling points.
- They are soluble in water but insoluble in organic solvents like petrol, kerosene.
- They conduct electricity in molten state or in solution.

1 marks questions (very short answer type question)

Q.1:- Name a metal which can be cut with a knife?

Ans:- Sodium

Q.2:- Which metal is the best conductor of electricity?

Ans:- Silver

Q.3 Which metal is poorest conductor of electricity?

Ans:- Iron

Q.4 Which metal is most ductile?

Ans.:- Gold

Q.5 Which metal is best conductor of heat ?

Ans:- Silver(and copper)

Q.6:- Which metal other than mercury is liquid at room temperature?

Ans:- Gallium

Q.7:- Which metal is poorest conductor of heat?

Ans:- Lead (and mercury)

Q.8:- What is the nature of oxides of metal?

Ans:- Basic

Q.9:- What is the nature of oxides of non- metal?

Ans:-Acidic

Q10:-Which non-metal conduct electricity?

Ans:-Graphite, allotrope of carbon conduct electricity.

Q.11:- Which non-metal is lusturous?

Ans:- Iodine

Q.12:- Why metals are hard and have high melting point?

Ans:- because of their crystalline structure metals are hard.

Q.13:- What is an amalgam?

Ans:- An alloy of two metals in which one is mercury is called amalgam.

Q.14:- What are the constituents of solder?

Ans:- Tin and lead

Q.15:- Name the green coloured compound which appears on the surface of copper utensils?

Ans:- Basic copper carbonate

Q.16:- Why the item made of silver turns black when exposed to air?

Ans:- Due to formation of silver sulphide

2 marks questions (short answer type question)

Q.1:- What are amphoteric oxides? Give an example.

Ans:- Oxides which react with both acids as well as bases to produce salt and water are called amphoteric oxides .for example:- Al_2O_3 , ZnO

Q.2:- Name two metals that react with dil. HNO_3 to evolve H_2 gas ?

Ans:- magnesium and manganese

Q.3:- Why metals like potassium and sodium catch fire when treated with water?

Ans:- The reaction between sodium and water is so violent that the H_2 gas released catches fire

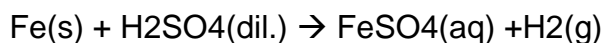
Reaction:- $2\text{Na}(s) + 2\text{H}_2\text{O}(l) \rightarrow 2\text{NaOH}(aq) + \text{H}_2(s) + \text{heat energy}$

Q.4:- Why sodium is kept immersed in kerosene oil?

Ans:- because sodium react with air to form Na_2O (sodium oxide).

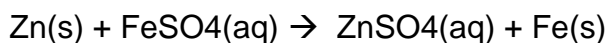
Q.5:- Which gas is produced when dil. HCl is added to a reactive metal? Write the chemical reaction when iron reacts with dil. H_2SO_4 ?

Ans:- hydrogen gas is produced when dil. HCl is added to a reactive metal.



Q.6:- What would you observe when zinc is added to a solution of iron(II) sulphate? Write the chemical reaction that takes place.

Ans:- The solution of iron(II) sulphate slowly turns to colourless and grey coloured layer of Fe is deposited on the surface of zinc metal.



Q. 8:- Why ionic compounds have high melting points?

Ans:- Ionic solids have crystalline structure in which there is strong interionic attraction. So large amount of energy is needed to overcome this force of attraction.

Q.14:- Name the conditions which are essential for corrosion.

Ans:- (i) Presence of moisture, (ii) Presence of air.

Q.15:- What is Galvanisation? Write its use.

Ans:- Galvanisation is a method of protecting steel and iron from rusting by coating them with a thin layer of Zinc.

Q.16. What is anodizing? What is its use?

Ans. The process of forming a thick oxide layer of aluminium oxide that makes it resistant to further corrosion.

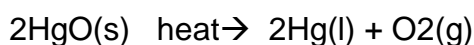
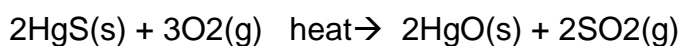
Q.17. What is aqua regia? What is its use?

Ans. Aqua regia is a mixture of conc. HCl and conc. HNO₃ in the ratio 3:1. It can dissolve gold and platinum.

Short Answer Type Questions:- (3 marks)

Q.1:- Write suitable example, explain how a metal low in the activity series can be extracted?

Ans:- Metals low in the activity series are less reactive. The oxides of these metals can be reduced to metals by heating alone. For example, extraction of Mercury (Hg) from Cinnabar (HgO).



Q.2:- Write three properties of ionic compounds.

Ans:- (i) Ionic compounds have high melting points. (ii) Ionic compounds are soluble in water. (iii) Ionic compounds conduct electricity in aqueous and molten state.

MCQ for practical skills

1. An iron nail is dipped in copper sulphate solution. It is observed that

- I. The colour Of the solution remain unchanged .
- II. The colour Of the solution becomes red .
- III. The colour Of the solution turns to light green .
- IV. None of these

Ans:- (III)

2. SO₂

- I. turns dry blue litmus paper red
- II. turns moist blue litmus paper red
- III. turns moist red litmus paper blue
- IV. none of these

Ans:- (II)

3. Metal A when dipped in solution of salt of metal B ,then metal B is displaced . this shows that

- I. Metal A is more reactive than metal B
- II. Metal B is more reactive than metal A
- III. Metal A and metal B are equally reactive
- IV. None of these

Ans:- (I)

4. When iron nail is dipped in aqueous solution of copper sulphate , it is observed that

- I. Brown coloured layer is formed on the surface of iron nail
- II. Blue coloured layer is formed on the surface of iron nail
- III. green coloured layer is formed on the surface of iron nail
- IV. none of these

Ans:- (i)

5. Which of of the following metals will not react with oxygen, even when heated very strongly in air?

(a) Zn (b) Al (c) Ag (d) Fe

Ans- (c) Ag

6. Which of the following elements occurs free in nature

(a) Co (b) Fe (c) Ni (d) Pt

7. Which of the following pairs will give displacement reaction

(a) NaCl solution and copper metal

(b) MgCl₂ solution and aluminium metal

(c) FeSO₄ solution and silver metal

(d) AgNO₃ solution and copper metal

Ans- (d) AgNO₃ solution and copper metal

8. A non-metallic oxide which is neutral in nature is

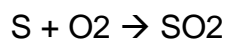
(a) CO₂ (b) CO (c) P₂O₅ (d) none of these

Ans- (b) CO

HOTS:

1. A yellow coloured powder X is soluble in carbon disulphide. It burns with a blue flame forming suffocating smelling gas which turns moist blue litmus red. Identify X and give its chemical reaction. State whether it is a metal or a non-metal.

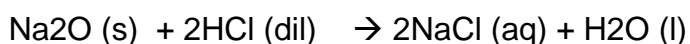
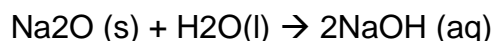
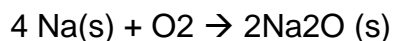
Ans: X is sulphur.



It is a non metal.

2. An element reacts with oxygen to form an oxide which dissolves in dilute hydrochloric acid. The oxide formed also turns a solution of red litmus blue. Is the element a metal or non-metal? Explain with the help of a suitable example.

Ans: It is a metal.



3. Royal water is prepared by mixing two acids A and B. What is the ratio in which A and B are mixed ?

Ans: $3\text{HCl} + \text{HNO}_3$

4. Ritika was given Mg, Zn, Fe and Cu metals. He put each of them in dil.HCl contained in different test tubes . Identify which of them:

(i) will not displace H_2 from dil.HCl

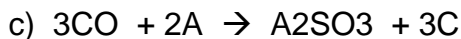
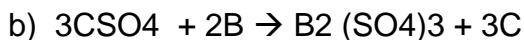
(ii) forms a pale green substance

(iii) will give H_2 with 5% HNO_3

(iv) will be displaced from its salt solution by all other metals.

Ans: (i) Cu (ii) Fe (iii) Cu (iv) Cu

5. A , B and C are three elements which undergo chemical reactions according to following equations:



Answer the following:

i) Which element is most reactive ?

ii) Which element is least reactive ?

Ans: i) Most reactive element is B as it has replaced both A and C from their compounds.

ii) Element C is least reactive as it has been replaced both by A and B.

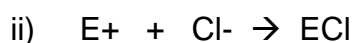
6. An element E combines with O_2 to form an oxide E_2O , which is a good conductor of electricity.

Answer the following:

i) How many electrons will be present in the outer most shell of E?

ii) Write the formula of the compound formed when it combines with Chlorine?

Ans: i) Valency of the element E is 1. This means that it has only one electron in the valence shell.



Valency of Cl is 1 and valency of E is also 1. Therefore the formula will be ECl.

TEST PAPER

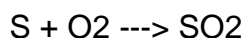
Questions with Answers:

1: Carbon can reduce copper oxide to copper but not calcium oxide to calcium. Why?

Ans: Carbon is a strong reducing agent so it can reduce copper oxide but calcium is much more reactive than copper and has greater affinity for oxygen than carbon has. So it cannot reduce calcium oxide to calcium.

2. A yellow coloured powder `X` is soluble in carbon disulfide. It burns with a blue flame forming suffocating smelling gas which turns moist blue litmus red. Identify `X` and gives chemical reaction. Identify it is metal or nonmetal.

Ans 2: `X` is sulphur



It is non metal.

3. Nikita took Zn, Al, Cu, Fe, Mg, Na metals & put each metal in cold water and then hot water. She reacted the metal with steam

- (i) Name the metal which reacts with cold water.
- (ii) Which of the above metals react with steam?
- (iii) Name the metal which reacts with hot water.
- (iv) Arrange these metals in order of increasing reactivity.

Ans.3 (i) Na (ii) Al, Zn, Fe (iii) Mg (iv) Na>Mg> Al > Zn > Fe > Cu

4. A student was given Mg, Zn, Fe, and Cu metals. He put each of them in dil HCl contained in different test tubes. Identify which of them

- (i) will not displace H₂ from dil HCl
- (ii) forms a pale green substance
- (iii) will give H₂ with 5% HNO₃
- (iv) will be displaced from its salt solution by all other metals.

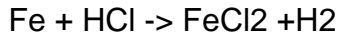
Ans4: (i) Cu (ii) Fe (iii) Cu (iv) Cu

5. A metal `X` is found in the form of filings which burns vigorously when sprinkle on flame. When these filings are treated with sulphur a black coloured compound `Y` is formed which is not attracted

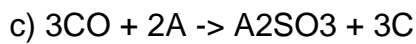
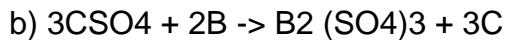
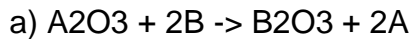
by magnet. `X` reacts with dil HCl to liberate hydrogen gas. Identify `X`, `Y`. Write the reaction involved.

Ans5 : $\text{Fe} + \text{S} \rightarrow \text{FeS}$

`X` is Iron `Y` is Ferrous sulphide



6. A, B and C are 3 elements which undergo chemical reactions according to following equations:



Answer the following:

i) Which element is most reactive? ii) Which element is least reactive?

Ans.6 i) Most reactive element is B as it has replaced both A and C from their compounds

ii) Element C is least reactive as it has been replaced both by A and B.

7: Give reasons

i) Sodium, Potassium and Lithium are stored under oil.

ii) Addition of some silver to pure gold for making ornaments.

iii) Metals are good conductors of heat.

Ans7 i) These metals are very reactive so they can combine with moist air and oxygen vigorously with liberation of large amount of heat that is why they are kept in oil.

ii) Pure gold is very soft it is therefore not suitable for making jewelry . It is alloyed with either silver or copper to make it hard.

iii) When a metal is heated, its atom gain energy and vibrate more vigorously. This energy is transferred to the electrons, which can move through the metal. They transfer their energy to other electrons and atoms.

In this way they conduct heat and are good conductors.

8 : Why does aluminum not react with water under ordinary condition?

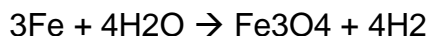
Ans: Aluminum forms a thin tough layer of oxide on its surface. this oxide layer forms a protective coating on the metal and prevents it from further attack of water.

9 Metal sulphides occur mainly in rocks and the metal halides occur mostly in seas and lakes. What could be the reason for this?

Ans: Most of the metal sulphides are insoluble in water where as metal halides are generally soluble. The metal halides(NaCl , MgCl₂ etc) are washed away with rain or river water in dissolved state and so the halide ores occur in lakes and seas.

10 Give the reason why copper is used to make hot water tanks but steel is not?

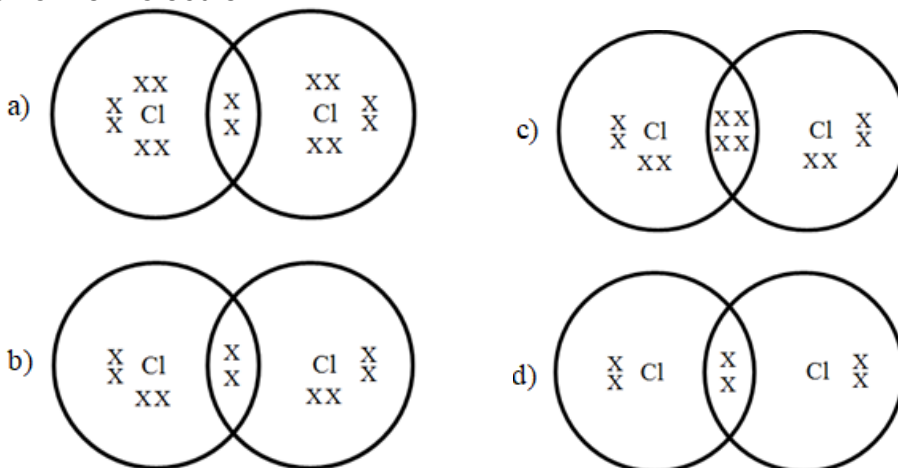
Ans: This is because iron present in steel reacts with steam to form ferric oxide whereas copper has no action with water. As a result of it , the body of steel tank becomes weaker and weaker in case of iron and not in case of copper.



Ch 4 CARBON AND ITS COMPOUNDS

MCQ Questions for Class 10 Science Carbon and Its Compounds with Answers:

1. Which of the following structures correctly represents the electron dot structure of a chlorine molecule?



Answer: (a)

Explanation: In an electron dot structure of a molecule there must be shown eight electrons (in the form of dots or crosses) around each element of the molecule, to represent the complete octet of the element.

2. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that:

- The food is not cooked completely
- The fuel is not burning completely
- The fuel is wet
- The fuel is burning completely

Answer: (b) The fuel is not burning completely

Explanation: In case the fuel doesn't burn completely, i.e., there is not enough oxygen to react with the carbon to produce carbon dioxide, then the unburnt carbon particles are left behind in the form of black particles known as soot. These soot particles stick to the bottom of the vessel making it black.

3. Cation is formed when:

- a) Atom gains electrons
- b) Atom loses electrons
- c) Proton is lost by the atom
- d) Atom shares electrons

Answer: (b) Atom loses electrons

Explanation: A cation is formed by loss electrons from the atom of an element which acquires positive charge due to the presence of greater number of protons as compared to that of electrons.

4. Which of the following compounds of carbon does not consist of ions?

- a) CHCl_3
- b) CaCO_3
- c) NaHCO_3
- d) Ca_2C

Answer: (a) CHCl_3

Explanation: Carbon always forms covalent compounds by sharing its electrons with other atoms. Now, in covalent bonding, the two electrons shared by the atoms are attracted to the nucleus of both atoms and neither atom completely loses or gains electrons as in ionic bonding. So the compounds in which all the atoms are directly attached to C-atom, contain covalent bonding and no ionic bond.

In CHCl_3 , all the three chlorine atoms are bonded covalently to the carbon atom, not to the hydrogen atom. So CHCl_3 is a covalent compound and does not consist of ions.

5. The property of self-linkage among identical atoms to form long chain compounds is known as:

- a) Catenation
- b) Isomerisation
- c) Superposition
- d) Halogenation

Answer: (a) Catenation

Explanation: Catenation is the property of self-linking of an element by which an atom combines with the other atoms of the same element to form long chains.

6. Which of the following statements about graphite and diamond is true?

- a) They have the same crystal structure

- b) They have the same degree of hardness
- c) They have the same electrical conductivity
- d) They can undergo the same chemical reactions

Answer: (d) They can undergo the same chemical reactions

Explanation: Both Graphite and diamond being the allotropes of the same element, carbon, have similar chemical properties. So they undergo the same chemical reactions.

7. How many number of carbon atoms are joined in a spherical molecule of buckminsterfullerene?

- a) 30
- b) 60
- c) 90
- d) 120

Answer: (b) 60

Explanation: Buckminsterfullerene is a molecule of carbon in the form of a hollow sphere consisting of 60 C-atoms and is having the formula C_{60} .

8. Which of the followings is the major constituent of the liquefied petroleum gas?

- a) Methane
- b) Ethane
- c) Propane
- d) Butane

Answer: (d) Butane

Explanation: The major constituent of the liquefied petroleum gas is butane.

9. The organic compounds having functional group are known as:

- a) Aldehyde
- b) Ketone
- c) Carboxylic acids
- d) Alcohol

Answer: (c) Carboxylic acids

Explanation: Carboxylic acids are compounds which contain a group also known as carboxyl group.

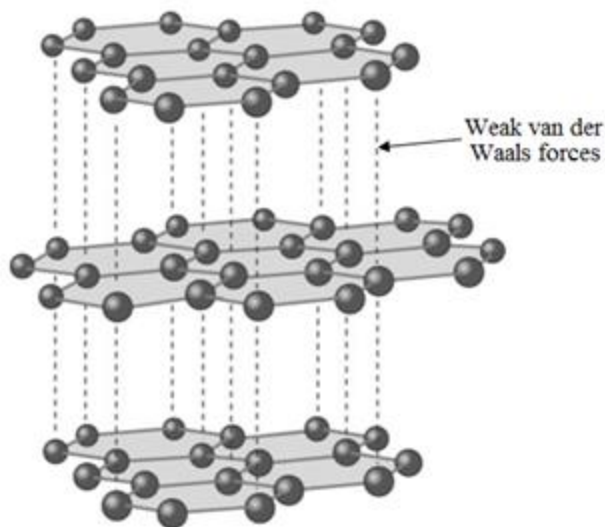
10. From which of the following substance pencil lead is formed?

- a) Charcoal

- b) Wood
- c) Lead
- d) Graphite

Answer: (d) Graphite

Explanation: Pencil lead is formed of graphite. Graphite is an allotropic form of carbon in which each carbon atom is joined to three others, forming layers:



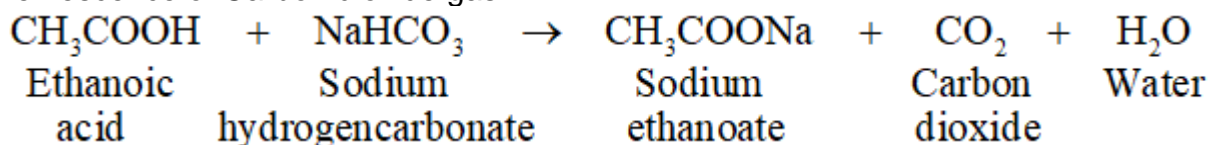
These layers are put together by weak van der Waals forces which enable the layers to slide over each other, making graphite soft and slippery. So graphite is used as pencil 'lead'. As the pencil moves across the paper, layers of graphite rub off leaving the dark marks on paper.

11. Which of the following substance produces brisk effervescence with baking soda solution?

- a) Ethanoic acid
- b) Table salt
- c) Vinegar
- d) Sunflower oil

Answer: (a) Ethanoic acid

Explanation: Ethanoic acid when treated with baking soda (Sodium hydrogencarbonate) gives brisk effervescence of Carbon dioxide gas.



12. Which of the following statements are correct for carbon compounds?

- (i) Most carbon compounds are good conductors of electricity.
 - (ii) Most carbon compounds are poor conductors of electricity.
 - (iii) Force of attraction between molecules of carbon compounds is not very strong.
 - (iv) Force of attraction between molecules of carbon compounds is very strong.
- (a) (ii) and (iv)
 - (b) (ii) and (iii)
 - (c) (i) and (iv)
 - (d) (i) and (iii)

Answer

Answer: b

13. C_3H_8 belongs to the homologous series of

- (a) Alkynes
- (b) Alkenes
- (c) Alkanes
- (d) Cyclo alkanes

Answer

Answer: c

14. The number of isomers of pentane is

- (a) 2
- (b) 3
- (c) 4
- (d) 5

Answer

Answer: b

15. Why does carbon form compounds mainly by covalent bonding?

- (a) There are four electrons in the outermost shell of carbon.
- (b) It requires large amount of energy to form C^{4+} or C^{4-} .
- (c) It shares its valence electrons to complete its octet.
- (d) All the above.

Answer

Answer: d

16. Identify 'A' in the following reaction:



- (a) CH_3COONa
- (b) $\text{CH}_2(\text{Na})\text{COOH}$
- (c) NaOH
- (d) NaHCO_3

Answer

Answer: a

17. Which of the following belongs to homologous series of alkynes?

C_6H_6 , C_2H_6 , C_2H_4 , C_3H_4 .

- (a) C_6H_6
- (b) C_2H_4
- (c) C_2H_6
- (d) C_3H_4

Answer

Answer: d

18. A hydrocarbon has four carbon atoms. Give its molecular formula if it is an alkene.

- (a) C_4H_{10}
- (b) C_4H_8
- (c) C_4H_6
- (d) C_4H_4

Answer

Answer: b

Fill in the Blanks

1. is a versatile element that forms the basis for all living organisms and many of the things we use.

2. Covalent bonds are formed by the of electrons between two atoms so that both can achieve a completely filled outermost shell.

3. The unsaturated hydrocarbons which contain one or more double bonds are called

4. The general formula of alkynes is

5. A group of organic compounds having similar structures and similar chemical properties in which the successive compounds differ by CH_2 group is called a

6. are sweet-smelling substances which are used in making perfumes.

ANSWERS

1. Carbon
2. sharing
3. alkenes
4. $\text{C}_n\text{H}_{2n-2}$
5. homologous series
6. Esters

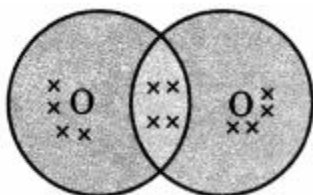
Extra Questions for Class 10 Science Chapter 4 Carbon and its Compounds with Answers Solutions

Extra Questions for Class 10 Science Chapter 4 Very Short Answer Type

Question 1.

Draw the electron dot notation of O_2 molecule.

Answer:



Question 2.

Name a molecule that has triple bond.

Answer:

Nitrogen (N_2).

Question 3.

Name the hardest substance which is an allotrope of carbon.

Answer:

Diamond.

Question 4.

Name the allotrope of carbon which have the structure of C-60.

Answer:

Fullerenes.

5. Name the unique ability of carbon to form bonds with other atoms of carbon.

Answer:

Catenation.

Question 6.

Mention the two characteristic features seen in carbon.

Answer:

Tetravalency and catenation.

Question 7.

Name the first organic compound synthesised by Wohler.

Answer:

Urea.

Question 8.

Write the general molecular formula of alkane series.

Answer:

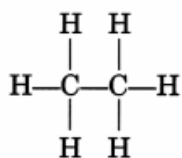
C_nH_{2n+2}

Question 9.

How many covalent bonds are there in a molecule of ethane, C_2H_6 ?

Answer:

Seven (7)



Question 10.

Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n} .

Answer:

C_nH_{2n} : Alkene

2nd member = C_3H_6 (propene)

Question 11.

Write the molecular formula of an alkyne containing 10 atoms of hydrogen.

Answer:

C_6H_{10} .

Question 12.

Which two of the following compounds could belong to the same homologous series?

$C_2H_6O_2$, C_2H_6O , C_3H_8 , CH_4O

Answer:

CH_4O and C_2H_6O (General formula $C_nH_{2n+1}.OH$)

Question 13.

Which of the following molecule is called buckminsterfullerene?

C_{90} , C_{60} , C_{70} , C_{120}

Answer:

C_{60} .

Question 14.

Name the gas evolved when sodium carbonate and bicarbonate is added to ethanoic acid.

Answer:

Carbon dioxide (CO_2)

Question 15.

Among CH_4 , C_2H_6 and C_4H_{10} which is expected to show isomerism?

Answer:

C_4H_{10} .

Question 16.

Write the formula and name of next homologue of CH_3COCH_3 .

Answer:

$CH_3CH_2COCH_3$, Butanone.

Question 17.

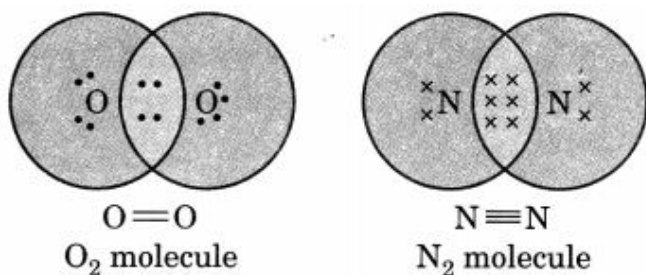
Why do alkanes burn with a blue flame?

Answer:

Question 18.

Draw the electron dot structure of O_2 and N_2 molecules.

Answer:



Question 19.

Give the general formula of alkanes. Write the name, structural formula and physical state of the compound containing:

(i) 3-carbon atoms

(ii) 8-carbon atoms.

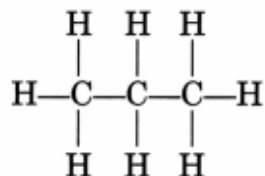
Answer:

(a) General formula of alkanes is C_nH_{2n+2}

$n = 1, 2, 3, \dots$

(i) Propane, $CH_3-CH_2-CH_3$

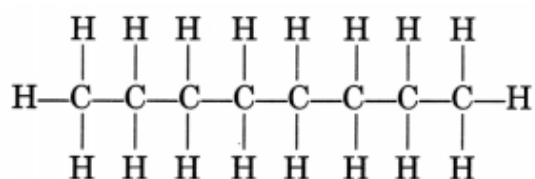
or



Propane is a gas.

(ii) $CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$

or



Octane is a liquid

Question 20.

Why does carbon form compounds mainly by covalent bonding?

Answer:

Carbon atoms have 4 valence electrons in their valence shell, it needs to gain or lose 4 electrons to attain the noble gas configuration.

(i) It could gain four electrons forming C^{4-} anion. But it would be difficult for the nucleus with six protons to hold on to ten electrons.

(ii) It could lose four electrons forming C^{4+} cation. But it would require a large amount of energy to remove four electrons from its outermost shell.

Therefore, carbon shares its valence electrons to complete its octet with other atoms to form covalent bonds.

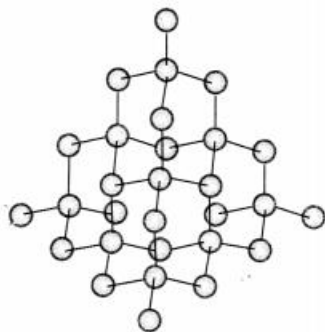
Question 21.

Draw the structures of diamond and graphite.

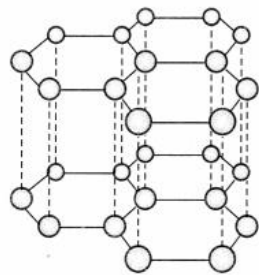
Answer:

In diamond, each carbon atom is bonded to four other carbon atoms forming a rigid three dimensional structure.

In graphite, each carbon atom is bonded to three other carbon atoms in the same plane giving a hexagonal array. One of these bonds is a double bond.



Structure of diamond



Structure of graphite

Ch 5 Periodic Classification of Elements

MCQ Questions for Class 10 Science Periodic Classification of Elements with Answers

1. Newlands relation is called

- (a) Musical Law
- (b) Law of Octaves
- (c) Periodic Law
- (d) Atomic Mass Law

Answer

Answer: b

2. Upto which element, the Law of Octaves was found applicable?

- (a) Oxygen
- (b) Calcium
- (c) Cobalt
- (d) Potassium

Answer

Answer: b

3. In Mendeleev's Periodic Table, gaps were left for the elements to be discovered later. Which of the following elements found a place in the Periodic Table later?

- (a) Chlorine
- (b) Silicon
- (c) Oxygen
- (d) Germanium

Answer

Answer: d

4. At the time of Mendeleev, the number of elements known was

- (a) 63
- (b) 65
- (c) 62
- (d) 64

Answer

Answer: a

5. The properties of eka-aluminium predicted by Mendeleev are the same as the properties of later discovered element:

- (a) Scandium
- (b) Germanium
- (c) Gallium
- (d) Aluminium

Answer

Answer: c

6. An atom of an element has the electronic configuration 2,8,2. To which group does it belong?

- (a) 4th group
- (b) 6th group
- (c) 3rd group
- (d) 2nd group

Answer

Answer: d

7. The arrangement of elements in the Modern Periodic Table is based on their

- (a) increasing atomic mass in the period
- (b) increasing atomic number in the horizontal rows
- (c) increasing atomic number in the vertical columns
- (d) increasing atomic mass in the group

Answer

Answer: b

8. Where would you locate the element with electronic configuration 2, 8 in the Modern Periodic Table?

- (a) Group 8
- (b) Group 2
- (c) Group 18
- (d) Group 10

Answer

Answer: c

9. Element 'X' forms a chloride with the formula XCl_2 , which is a solid with high melting point. X would most likely be in the same group of the periodic table as:

- (a) Si
- (b) Mg
- (c) Al
- (d) Na

Answer

Answer: b

10. Which of these belong to the same period?

Element	A	B	C

Atomic number	2	10	5
---------------	---	----	---

- (a) A, B
- (b) B, C
- (c) C, A
- (d) A, B and C

Answer/ Explanation

Answer: b

Explanation: Reason. B= 10 (2, 8), C = 5 (2, 3) Both have 2 periods.

11. Carbon belongs to the second period and Group 14. Silicon belongs to the third period and Group 14. If atomic number of carbon is 6, the atomic number of silicon is

- (a) 7
- (b) 14
- (c) 24
- (d) 16

Answer

Answer: b

12. Pick out the chemically most reactive elements from the given triads.

Li, Na, K F, Cl, Br

- (a) Li and F
- (b) Li and Br
- (c) K and F
- (d) K and Br

Answer

Answer: c

13. What is the atomic number of element of period 3 and group 17 of the Periodic Table?

- (a) 10
- (b) 4
- (c) 17
- (d) 21

Answer

Answer: c

14. Which one of the following statements is not correct about the trends in the properties of the elements of a period on going from left to right?

- (a) The oxides become more acidic
- (b) The elements become less metallic
- (c) There is an increase in the number of valence electrons
- (d) The atoms lose their electrons more easily

Answer

Answer: d

15. The elements A, B and C belong to groups 1, 14 and 17 respectively of the Periodic Table. Which two elements will form ionic compounds?

- (a) A and B
- (b) A and C
- (c) B and C
- (d) None

Answer

Answer: b

16. An element X from group 2 of the Periodic Table reacts with Y from group 17 to form a compound. Give the formula of the compound.

- (a) XY_2
- (b) XY
- (c) X_2Y
- (d) $(XY)_2$

Answer

Answer: a

17. A metal 'M' is in the first group of the Periodic Table. What will be the formula of its oxide?

- (a) MO
- (b) M_2O

- (C) M_2O_3
- (d) MO_2

Answer

Answer: b

18. Name the neutral atom in the Periodic Table which has the same number of electrons as K^+ and Cl^- .

- (a) Helium
- (b) Argon
- (c) Neon
- (d) Krypton

Answer

Answer: b

19. An element X combines with oxygen to form an oxide XO . This oxide is electrically conducting. Write the formula of the compound formed when X reacts with chlorine.

- (a) XCl_3
- (b) XCl
- (c) XCl_2
- (d) XCl_5

Answer

Answer: c

20. An element X has mass number 40 and contains 21 neutrons in its atom. To which group of the Periodic Table does it belong?

- (a) Group 1
- (b) Group 4
- (c) Group 2
- (d) Group 3

Answer/ Explanation

Answer: a

Explanation: Reason. $e = 19$ (2, 8, 8,1)

21. Consider the following elements

${}_{20}\text{Ca}$, ${}_{8}\text{O}$, ${}_{18}\text{Ar}$, ${}_{16}\text{S}$, ${}_{4}\text{Be}$, ${}_{2}\text{He}$

Which of the above elements would you expect to be in group 16 of the Periodic Table?

- (a) ${}_{20}\text{Ca}$ and ${}_{16}\text{S}$
- (b) ${}_{20}\text{Ca}$ and ${}_{8}\text{O}$
- (c) ${}_{18}\text{Ar}$ and ${}_{16}\text{S}$
- (d) ${}_{8}\text{O}$ and ${}_{16}\text{S}$

Answer

Answer: d

22. An element 'A' belongs to the third period and group 16 of the Periodic Table. Find out the valency of A.

- (a) Valency = 6
- (b) Valency = 2
- (c) Valency = 1
- (d) Valency = 3

Answer

Answer: b

23. Which one of the following statements is not correct about the trends in the properties of the elements of a group on going down in a group?

- (a) The chemical reactivity of metals increases.
- (b) The metallic character of elements increases.
- (c) The size of the atom increases.
- (d) The valence electrons increase.

Answer

Answer: d

24. Which of the following set of elements is written in order of their increasing metallic character?

- (a) Na Li K
- (b) C Q N
- (c) Mg Al Si
- (d) Be Mg Ca

Answer

Answer: d

25. The atom of an element has electronic configuration 2, 8, 7. To which of the following elements would it be chemically similar?

- (a) N(7)
- (b) P(15)
- (c) Na(11)
- (d) F (9)

Answer/ Explanation

Answer: d

Explanation: Reason. Both have same number of valence electrons

Fill in the blanks

1. The concept of grouping elements into triads was given by
2. Mendeleev's basis for the Periodic Table is
3. The basis for Modern Periodic Table is
4. (a) Metallic character down the group.
(b) Atomic size along the period.
(c) Electronegative character down the group.
5. Isotopes belong to the same in the Periodic Table.
6. Halogens belong to group of the Periodic Table.
7. An element having electronic configuration (2, 8, 2) belongs to the group.
8. Atoms of different elements with the same number of occupied shells are placed in the same
9. Valency of elements and then as we move across the period while it remains the same down the group.
10. Non-metals are located on the side of the Periodic Table.

Answers

1. Dobereiner
2. atomic mass
3. atomic no.
4. (a) increases
(b) decreases
(c) decreases
5. position
6. 17
7. 12th
8. Period
9. increases, decreases
10. right

Extra Questions for Class 10 Science Chapter 5 Periodic Classification of Elements with Answers:

VERY SHORT ANSWER TYPE QUESTIONS [1 Mark] – Year 2009

Question.1 Lithium, sodium and potassium form a Dobereiner's triad. The atomic masses of lithium and potassium are 7 and 39 respectively. Predict the atomic mass of sodium.

Answer.

$$\text{Atomic mass of Na} = \frac{7 + 39}{2} = \frac{46}{2} = 23$$

Question.2 Chlorine, bromine and iodine form a Dobereiner's triad. The atomic masses of chlorine and iodine are 35.5 and 126.9 respectively. Predict the atomic mass of bromine.

Answer.

$$\begin{aligned} \text{Atomic mass of Br} &= \frac{35.5 + 126.9}{2} \\ &= \frac{162.4}{2} = 81.2 \end{aligned}$$

Question.3 Why was the system of classification of elements into triads not found suitable?

Answer. It is because all the elements discovered at that time could not be classified into triads.

SHORT ANSWER TYPE QUESTIONS [I] [2 Marks] –

Question.4 An element 'X' has atomic number 13.

- Write its electronic configuration.
- State the group to which 'X' belongs.
- Is 'X' a metal or a non-metal?
- Write the formula of its bromide.

Answer.

(a) 2, 8, 3

(b) Group 13

(c) 'X' is a metal.

(d) $X^{3+} Br^{1-}$, XBr_3 is formula of its



bromide.

Question.5 State the Modern Periodic Law for classification of elements. How many (a) groups and (b) periods are there in the Modern Periodic Table?

Answer. 'Properties of elements are the periodic function of their atomic number.'

- (a) There are 18 groups and
- (b) 7 periods in the Modern Periodic Table.

Question.6 An element 'M' has atomic number 11.

- (a) Write its electronic configuration.
- (b) State the group to which 'M' belongs.
- (c) Is 'M' a metal or a non-metal?
- (d) Write the formula of its chloride.

Answer.

- (a) 2, 8, 1
- (b) Group 1
- (c) 'M' is a metal.
- (d) $M^+ Cl^-$



MCl is formula of its chloride.

Question.7 the formula of its oxide An element 'M' has atomic number 12.

- (a) Write its electronic configuration.
- (b) State the group to which 'M' belongs.
- (c) Is 'M' a metal or a non-metal?
- (d) Write.

Answer.

- (a) 2, 8, 2
- (b) Group 2
- (c) 'M' is a metal.
- (d) $M^{2+} O^{2-}$, MO is formula of its oxide.



Question.8 Choose from the following:

$6C, 8O, 10Ne, 11Na, 14Si$

- (a) Elements that should be in the same period.
- (b) Elements that should be in the same group.

State reason for your selection in each case.

Answer.

- (a) $6C, 8O, 10Ne$ are in same period, 2nd period as they have two shells. $11Na$ and $14Si$ are in same period, i.e. 3rd period as they have three shells.
- (b) $6C, 14Si$ are in same group because they have same number of valence electrons, i.e. four.

Question.9 An element 'X' belongs to 3rd period and group 17 of the periodic table. State its (a) electronic configuration, (b) valency. Justify your answer with reasoning.

Answer.

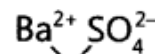
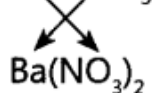
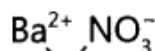
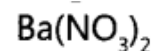
(a) X(17) : 2, 8, 7

(b) Valency : 1

It has atomic number 17 and therefore, electronic configuration will be 2, 8, 7. It can gain one electron to become stable therefore, its valency is equal to 1. It belongs to third period, as it has three shells. It belongs to group 17 because it has 7 valence electrons.

Question.10 The formula of magnesium oxide is MgO. State the formula of barium nitrate and barium sulphate, if barium belongs to the same group as magnesium.

Answer.



Question.11 Choose from the following:

^{20}Ca , ^3Li , ^{11}Na , ^{10}Ne

(a) An element having two shells completely filled with electrons.

(b) Two elements belonging to the same group of the periodic table.

Answer.

(a) ^{10}Ne has electronic configuration 2, 8. Its both shells are completely filled.

(b) ^3Li and ^{11}Na belong to same group of periodic table, ie. 1st group.

Question.12 Why do all the elements of the (a) same group have similar properties, (b) same period have different properties?

Answer.

(a) Elements of same group have similar properties due to same number of valence electrons, therefore, they have same valency.

(b) Elements of same period have different properties as they differ in number of valence electrons.

Question.42 An element 'E' has following electronic configuration:

K	L	M
2	8	6

(a) To which group of the periodic table does element 'E' belong?

(b) To which period of the periodic table does element 'E' belong?

(c) State the number of valence electrons present in element 'E'.

(d) State the valency of the element 'E'.

Answer.

(a) 'E' belongs to group 16.

(b) It belongs to 3rd period.

- (c) It has 6 valence electrons.
 (d) Its valency is equal to 2.

Question.13 Choose from the following:

$4\text{Be}, 9\text{F}, 19\text{K}, 20\text{Ca}$

- (a) The element having one electron in the outermost shell.
 (b) Two elements of the same group.

Answer.

- (a) 19K has one valence electron.
 (b) 4Be and 20Ca belong to the same group.

Question.14 An element has atomic number 13.

- (a) What is the group and period number to which this element belongs?
 (b) Is this element a metal or a non-metal? Justify your answer.

Answer.

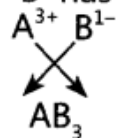
- (a) It belongs to group 13 and 3rd period.
 (b) It is a metal because it can lose 3 electrons to become stable.

Question.15 The electronic configuration of two elements 'A' and 'B' are 2, 8, 3 and 2, 8, 7 respectively. Find the atomic number of these elements. State the nature and formula of the compound formed by the union of these two elements.

Answer.

'A' has atomic number 13.

'B' has atomic number 17.



It is an ionic compound.

Question.16 The atomic number of three elements are given below:

Element (symbol)	A	B	C
Atomic number	5	7	10

Write the symbol of the element which belongs to (a) group 13, (b) group 15, of the periodic table. State the period of the periodic table to which these elements belong. Give reason for your answer.

Answer.

- (a) A belongs to group 13 because its electronic configuration is 2, 3, ie. it has 3 valence electrons.
 (b) 'B' belongs to group 15 because its electronic configuration is 2, 5, ie. it has 5 valence electrons.

They belong to 2nd period as they ' both have two shells.

Question.17 Write the atomic number of these elements. What will be formula of the compound formed and the nature of bond between them when these two elements chemically combine together?

Answer.

'A' has atomic number 17. Its electronic configuration is 2, 8, 7. Its valency is equal to 1. number 20. Its electronic configuration is 2, 8, 8, 2. Its 'B' has atomic valency is 2.



Ionic bond will be formed.

Question.18 The atomic numbers of three elements are given below:

Element (symbol)	A	B	C
Atomic number	3	6	9

Write the symbol of the element which belongs to (a) group 1, (b) group 14, of the periodic table. State the period of the periodic table to which these elements belong. State reason to support your answer.

Answer.

- (a) A belongs to group 1.
 (b) B belongs to group 14.

These elements belong to second period because these elements have two shells. A has electronic configuration 2, 1 and has one valence electron so, belongs to group 1. 'B' has electronic configuration 2, 4 and has four valence electrons so, belongs to group 14 and period 2. 'C' has electronic configuration 2, 7 and has one valence electron. All of them contain two shells and so belong to second period

Question.19 The elements of the second period of the Periodic Table are given below:
 Li Be B C N O F

- (a) Give reason to explain why atomic radii decrease from Li to F.
 (b) Identify the most
 (i) metallic and
 (ii) non-metallic element.

Answer.

- (a) It is because nuclear charge increases due to increase in atomic number, therefore, force of attraction between nucleus and valence electrons increases, i.e. effective nuclear charge increases, hence atomic radii decrease from Li to F.
 (b) (i) Most metallic element is 'Li' as it can lose electrons easily due to larger atomic size.
 (ii) Most non-metallic element is 'F' because it can gain electrons easily due to smallest atomic size.

Question.20 The elements of the third period of the Periodic Table are given below:

Group	I	II	III	IV	V	VI	VII
Period 3	Na	Mg	Al	Si	P	S	Cl

- (a) Which atom is bigger, Na or Mg? Why?

(6) Identify the most (i) metallic and (ii) non-metallic element in Period 3.

Answer. (a) Sodium is bigger than magnesium as it has lesser nuclear charge so there is less force of attraction between nucleus and valence electrons and less effective nuclear charge. It is, therefore, bigger in size.

(b) (i) Sodium is the most metallic as it can lose electrons easily due to its larger atomic size, (ii) Chlorine is the most non-metallic element because it can gain electrons easily due to its smallest atomic size.

Question.21 State Mendeleev's periodic law. Write two achievements of Mendeleev's periodic table

Answer. Mendeleev's Periodic Law: 'Properties of elements are the periodic function of their atomic masses.

Achievements:

1. It could classify all the elements discovered at that time.
2. It helped in discovery of new elements.
3. It helped in correction of atomic mass of some of the elements.

Question.22 How can the valency of an element be determined if its electronic configuration is known? What will be the valency of an element of atomic number 9 (nine)?

Answer. If the element has 1, 2, 3, 4 valence electrons, its valency will be 1, 2, 3, 4 respectively. If the element has 5, 6, 7, 8 valence electrons, its valency will be 3, 2, 1, 0. Element with atomic number 9 has electronic configuration 2, 7. So, its valency will be 1.

Question.23 How does the electronic configuration of an atom of an element relate to its position in the modern periodic table? Explain with one example.

Answer. The position of element depends upon number of valence electrons which depend upon electronic configuration. Those elements which have same valence electrons, occupy same group.

Those elements which have one valence electron belong to group 1.

Elements with two valence electrons belong to group 2.

Period number is equal to number of shells.

If valence electrons are equal to 1, it belongs to group 1. If it has 2 shells, it belongs to second period, e.g. if element 'X' has atomic number 11, its electronic configuration is 2, 8, 1. It has one valence electron, it belongs to group 1 and it has three shells therefore, it is in third period.

Question.24 The atomic numbers of three elements, X, Y and Z are 9, 11 and 17 respectively. Which two of these elements will show similar chemical properties? Why?

Answer. Electronic configuration of X, Y and Z will be:

X(9) : 2, 7

Y(11) : 2, 8, 1

Z(17) : 2, 8, 7

X and Z will show similar chemical properties due to same number of valence electrons.

Question.25 On the basis of electronic configuration, how will you identify the first and the last element of a period?

Answer. First element has 1 valence electron and last element has 8 valence electrons. Number of shells remain the same in the same period.

Question.26 In the modern periodic table, the element Calcium (atomic number = 20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these elements has physical and chemical properties resembling those of Calcium and why?

Answer. Elements with atomic number 12, 38 resemble calcium in physical and chemical properties because they have same number of valence electrons and belong to same group 2.

Mg(12) : 2, 8, 2

Ca(20) : 2, 8, 8, 2

Sr(38) : 2, 8, 18, 8, 2

Question.27. How does the metallic character of elements change along a period of the periodic table from the left to the right and why?

Answer. The metallic character goes on decreasing along a period from left to right because atomic size goes on decreasing therefore, tendency to lose electrons decreases.

Question.28 How does the valency of elements vary

(a) in going down a group, and

(b) in going from left to right in a period of the periodic table?

Answer. (a) Valency remains the same in a group.

(b) Valency first goes on increasing from left to right in a period till middle of period, then decreases.

Question.29 In the periodic table, how does the tendency of atoms to lose electrons change on going from

1. left to right across a period?
2. top to bottom in a group?

Answer.

1. Tendency to lose electrons decreases from left to right across a period.
2. Tendency to lose electrons increases from top to bottom in a group.

Question.30 Give reasons:

1. Elements in a group have similar chemical properties.
2. Elements of Group I form ions with a charge of +1.

Answer.

1. Elements in a group have same number of valence electrons and same valency therefore have similar chemical properties.
2. It is because elements of group 1 lose one electron to acquire +1 charge and become stable.

SHORT ANSWER TYPE QUESTIONS[II] [3 Marks]

Question.31 F, Cl and Br are the elements each having seven valence electrons. Which of these (a) has the largest atomic radius, (b) is most reactive? Justify your answer stating reason for each.

Answer.

- (a) Bromine has largest atomic radius because it has four shells: 2, 8, 18, 7.
- (b) Fluorine is most reactive because it is smallest in size and can gain electron easily.

Question.32 Na, Mg and Al are the elements having one, two and three valence electrons respectively. Which of these elements (a) has the largest atomic radius, (b) is least reactive? Justify your answer stating reason for each.

Answer. (a) Na has the largest atomic radius because it has 11 protons and 11 electrons, therefore least effective nuclear charge.

(b) Al is least reactive because it has smallest atomic size due to 13 protons and 13 electrons, it has greater effective nuclear charge, therefore, cannot lose electrons easily, hence it is least reactive.

Question.33 (a) How are the following related?

1. Number of valence electrons of different elements in the same group.
2. Number of shells of elements in the same period.

(b) How do the following change?

1. Number of shells of elements as we go down a group.
2. Number of valence electrons of elements on moving from , left to right in a period.
3. Atomic radius in moving from left to right along a period.
4. Atomic size down a group.

Answer.

(a)

1. Different elements in same group have same number of valence electrons.
2. Number of shells of elements in same period are equal.

(b)

1. Number of shells of elements goes on increasing down the group.
2. Number of valence electrons of elements goes on increasing on moving from left to right in a period, e.g. lithium has 1, beryllium has 2, boron has 3, carbon has 4, nitrogen has 5, oxygen has 6, fluorine has 7 and neon has 8 valence electrons.

3. Atomic radius goes on decreasing in moving from left to right along a period.
4. Atomic size goes on increasing down a group.

Question.34.(a) How many periods are there in the Modern Periodic Table of elements?

(b) How do atomic radius, valency and metallic character vary down a group?

(c) How do the atomic size and metallic character of elements vary as we move from left to right in a period?

Answer.

(a) There are 7 periods.

(b) Atomic radius goes on increasing down the group, valency remains same. Metallic character increases down the group.

(c) Atomic size decreases along a period from left to right. Metallic character decreases along a period from left to right.

Question.35 Two elements X and Y belong to group 1 and 2 respectively in the same period of periodic table. Compare them with respect to: periodic table from the left to the right and why?

1. the number of valence electrons in their atoms
2. their valencies
3. metallic character
4. the sizes of their atoms
5. formulae of their oxides
6. formulae of their chlorides

Answer.

1. 'X' has 1 valence electron, Y has 2 valence electrons.
2. 'X' has valency equal to 1, Y has valency equal to 2.
3. 'X' is more metallic than Y.
4. 'X' is bigger than Y.
5. X_2O and YO are formulae of their oxides.
6. XCl and YCl_2 are formulae of their chlorides.

Question.36 The atomic number of an element is 16. Predict

1. the number of valence electrons in its atom
2. its valency
3. its group number
4. whether it is a metal or a non-metal
5. the nature of oxide formed by it
6. the formula of its chloride

Answer. The electronic configuration of S(16) is 2, 8, 6.

1. 6
2. 2
3. 16
4. Non-metal
5. Acidic oxide
6. SCl_2 is a formula of its chloride.

Question.37 The positions of three elements A, B and C in the periodic table are indicated below:

Group 16	Group 17
—	— (First Period)
—	A (Second Period)
—	— (Third Period)
B	C (Fourth Period)

- (a) State whether element C would be a metal or a non-metal. Why?
- (b) Which is the more active element, A or C? Why?
- (c) Which type of ion (cation or anion) will be formed by the element C? Why?

Answer.

- (a) 'C' will be non-metal because it has 7 valence electrons, it can gain one electron easily.
- (b) 'A' is more active element than 'C' because 'A' can gain electron easily.
- (c) 'C' will gain electron to become negative ion, i.e. anion because it will have electrons more than protons.

Question.38 The position of three elements A, B and C in the Periodic Table is shown below:

Group 16	Group 17
—	—
—	A
—	—
B	C

Giving reasons, explain the following:

- (a) Element A is a non-metal.
- (b) Element B has a larger atomic size than element C.
- (c) Element C has a valency of 1

Answer. (a) 'A' is non-metal because it can gain electron easily as it has 7 valence electrons and forms negative ion with stable electronic configuration.

(b) It is because 'B' has lesser atomic number, less nuclear charge, less force of attraction between valence electrons and nucleus therefore, has larger atomic size.

(c) 'C' has 7 valence electrons. It can gain one electron to become stable. So, its valency is equal to one.

Question.39 The position of three elements A, B and C in the Periodic Table is shown below:

Group	1	2	13	14	15	16	17
Period							
1	B						
2							A
3						C	

Giving reasons, explain the following:

(a) Element A is non-metal.

(b) Atom of element C has a larger size ' than atom of element A.

(c) Element B has a valency of 1.

Answer. (a) It is because it has 7 valence electrons.

It can gain one electron to form negative ion. So, it is a non-metal.

(b)'C' has more number of shells than A. So, it is larger in size.

(c)'B' has one valence electron. It can lose one electron to become stable. So, its valency is equal to 1.

Question.40 What physical and chemical properties of elements were used by Mendeleev in creating his periodic table? List two observations which posed a challenge to Mendeleev's Periodic Law.

Answer. Atomic mass as a physical property and nature and formulae of oxide and hydride formed, and chemical property was used by Mendeleev.

Following are the two observations which posed a challenge to Mendeleev's Periodic Law.

(i) Increasing order of atomic weights could not be maintained while matching chemical properties. Chemical properties do not depend upon atomic mass.

(ii) Isotopes have different atomic mass but same chemical properties.

Question.41 Table given below shows a part of the Periodic Table.

H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar

(b) Atomic size of Mg is less than that of Na.

(c) Fluorine is more reactive than Chlorine.

Answer.

(a) They can lose electrons easily due to bigger size; energy required to remove electron is less.

(b) It is because of greater effective nuclear charge on Mg, i.e. more number of protons attract more number of electrons than Na.

(c) 'F' can form F^- more easily than Cl due to smaller atomic size. F^- is more stable than Cl^- . Therefore, fluorine is more reactive than chlorine.

Question.42(a) Why do we classify elements?

(b) What were the two criteria used by Mendeleev in creating his Periodic Table?

(c) Why did Mendeleev leave some gaps in his Periodic Table?

(d) In Mendeleev's Periodic Table, why was there no mention of Noble gases like Helium, Neon and Argon?

(e) Would you place the two isotopes ' of chlorine, Cl-35 and Cl-37 in different slots because of their different atomic masses or in the same slot because their chemical properties are the same? Justify your answer.

Answer.

(a) It is done so as to study the properties of elements conveniently.

(b) Increasing order of atomic mass and similarities in chemical properties (especially nature and formulae of oxide and hydride formed).

(c) These gaps were left for undiscovered elements.

(d) Noble gases were not invented at that time.

(e) They will be kept at same slot as they have same chemical properties.

Question.43 (a) What is meant by periodicity in properties of elements with reference to the periodic table?

(b) Why do all the elements of the same group have similar properties?

(c) How will the tendency to gain electrons change as we go from left to right across a period? Why?

Answer.

(a) The repetition of same properties after definite interval is called periodicity in properties.

(b) It is because they have same valence electrons therefore, have similar properties.

(c) Tendency to gain electrons increases from left to right in a period because atomic size goes on decreasing and effective nuclear charge increases.

Question.44 (a) What are 'groups' and 'periods' in the 'periodic table'?

(b) Two elements M and N belong to group I and II respectively and are in the same period of the periodic table. How do the following properties of M and N vary?

1. **Sizes of their atoms**
2. **Their metallic characters**
3. **Their valencies in forming oxides**
4. **Molecular formulae of their chlorides**

Answer.

(a) The vertical columns in the periodic table are called 'groups'. The horizontal rows in the periodic table are called 'periods'.

(b)

1. 'M' and 'N' belong to same period but group I and II. Therefore, 'N' will be smaller than 'M' as atomic size goes on decreasing from left to right.
2. 'M' is more metallic than 'N'. Metallic character goes on decreasing from left to right as tendency to lose electrons decreases due to decrease in atomic size.

3. Their valencies are 1 and 2 respectively in forming oxides.
Valency goes on increasing first and then decreases.
4. MCl , NCI_2 are molecular formulae of their chlorides.

Question.45 Atoms of seven elements A, B, C, D, E, F and G have a different number of electronic shells but have the same number of electrons in their outermost shells. The elements A and C combine with chlorine to form an acid and common salt respectively. The oxide of element A is liquid at room temperature and is a neutral substance, while the oxides of the remaining six elements are basic in nature. Based on the above information, answer the following questions: What could the element A be?

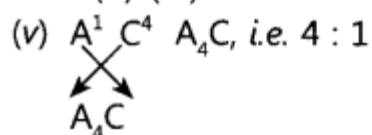
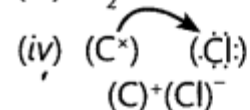
- (i) Will elements A to G belong to the same period or same group of the periodic table?
- (iii) Write the formula of the compound formed by the reaction of the element A with oxygen,
- (iv) Show the formation of the compound by a combination of element C with chlorine with the help of electronic structure.
- (v) What would be the ratio of number of combining atoms in a compound formed by the combination of element A with carbon?
- (vi) Which one of the given elements is likely to have the smallest atomic radius?

Answer.

(i) 'A' is hydrogen because its oxide H_2O is liquid at room temperature .

(ii) A to G belong to same group of the periodic table as these have same number of valence electrons.

(iii) A_2O



(vi) 'A' has smallest atomic size.

Question.46 In the following table, six elements A, B, C, D, E and F (here letters are not the usual symbols of the elements) of the Modern Periodic Table with atomic numbers 3 to 18 are given:

3	4	5	6	7	8	9	10
A					E		G
11	12	13	14	15	16	17	18
B	C		D			F	

- (a) Which of these halogen ? is (i) a noble gas, (ii) a halogen
- (b) If B combines with F, what would be the formula of the compound formed?
- (c) Write the electronic configurations of C and E.

(c) Why could no fixed position be given to hydrogen in Mendeleev's Periodic Table?

(i) Sizes of their atoms

(ii) Their metallic characters

(iii) Their valencies in forming oxides

(iv) Molecular formulae of their chlorides

(a) The vertical columns in the periodic table are called 'groups'. The horizontal rows in the periodic table are called 'periods'.

(b) (i) 'M' and 'N' belong to same

period but group I and II. Therefore, 'N' will be smaller than 'M' as atomic size goes on decreasing from left to right.

(ii) 'M' is more metallic than 'N'. Metallic character goes on decreasing from left to right as tendency to lose electrons decreases due to decrease in atomic size.

(iii) Their valencies are 1 and 2 respectively in forming oxides. Valency goes on increasing first and then decreases.

(iv) MCl, NCl₂ are molecular formulae of their chlorides.

(d) How and why does the atomic size vary as you go

(i) from left to right along a period?

(ii) down a group?

Answer.

(a) (i) Increasing order of atomic mass as physical property and similarities in chemical properties of elements.

(ii) The formulae and nature of hydrides and oxides formed by elements was treated as basic chemical property for its classification.

(b) Properties of elements are the periodic functions of their atomic masses.

(c) It is because it resembles both alkali metals as well as halogens.

(d) (i) Atomic size goes on decreasing

from left to right because one proton and one electron is being added successively therefore, force of attraction between . valence electrons and nucleus increases hence, the atomic size decreases.

(ii) The atomic size goes on increasing from top to bottom in a group because number of shells keep on increasing therefore, distance between nucleus and valence electrons increases.

Question.49 (a) did Mendeleev have gaps in his periodic table?

(b) any three limitations of Mendeleev's classification.

(c) does electronic configurations of atoms change in a period with increase in atomic number?

Answer.(a) Gaps were left for undiscovered elements in the Mendeleev's Periodic Table.

(b)(i) Position of hydrogen was not justified.

(ii) Increasing order of atomic mass could not be maintained.

(iii) Isotopes have similar chemical properties but different atomic masses, they cannot be given separate places.

(c) Number of shells remains the same, number of valence electrons goes on increasing from left to right in a period till octet is complete, e.g.

Li	Be	B	C	N	O	F	Ne
2, 1	2, 2	2, 3	2, 4	2, 5	2, 6	2, 7	2, 8

Question.50 Atoms of eight elements A, B, C, D, E, F, G and H have the same number of electronic shells but different number of electrons in their outermost shell. It was found that elements A and G combine to form an ionic compound. This compound is added in a small amount to almost all vegetable dishes during cooking. Oxides of elements A and B are basic in nature while those of E and F are acidic. The oxide of D is almost neutral. Based on the above information answer the following questions:

1. To which group or period of the Periodic Table do the listed elements belong?
2. What would be the nature of compound formed by a combination of elements B and F?
3. Which two of these elements could definitely be metals?
4. Which one of the eight elements is most likely to be found in gaseous state at room temperature?
5. If the number of electrons in the outermost shell of elements C and G be 3 and 7 respectively, write the formula of the compound formed by the combination of C and G.

Answer.

1. A and B belong to group 1 and 2 because they form basic oxides. C belongs to group 13 as it has 3 valence electrons. D belongs to group 14 as it forms almost neutral oxide. E and F belong to group 15 and 16 as they form acidic oxides, G belongs to group 17 as it has 7 valence electrons and H belongs to group 18. They belong to 3rd period of the Periodic Table because AG is NaCl, added in a small amount to almost all vegetable dishes during cooking and Na and Cl belong to 3rd period.
2. Ionic compounds will be formed because 'B' is metal and 'F' is non-metal. 'B' can lose two electrons and 'F' can gain two electrons.
3. A and B are definitely metals as they form basic oxides.
4. G and H are gaseous at room temperature.
5. CG₃ is the formula of the compound formed by combination of C and G.

Question.51 Atoms of eight elements A, B, C, D, E, F, G and H have the same number of electronic shells but different number of electrons in their outermost shells. It was found that elements A and G combine to form an ionic compound which can also be extracted from sea water. Oxides of the elements A and B are basic in nature while those of E and F are acidic. The oxide of element D is almost neutral. Answer the following questions based on the information given herein:

1. To which group or period of the periodic table do the listed elements belong?
2. Which one of the eight elements is likely to be a noble gas?
3. Which one of the eight elements would have the largest atomic radius?
4. Which two elements amongst these are likely to be non-metals?
5. Which one of these eight elements is likely to be a semi-metal or metalloid?

Answer.

1. A and B belong to group 1 and 2 because they form basic oxides. C belongs to group 13 as it has 3 valence electrons. D belongs to group 14 as it forms almost neutral oxide. E and F belong to group 15 – and 16 as they form acidic oxides, G belongs to group 17 as it

has 7 valence electrons and H belongs to group 18. They belong to 3rd period of Periodic Table because sodium belongs to 3rd period and AG is NaCl, ionic compound of sodium which can be obtained from sea water and A(Na) and G(Cl) belong to 3rd period.

2. H belongs to noble gas.
3. A has the largest atomic radius.
4. E and F are likely to be non-metals.
5. D is likely to be metalloid or semi-metal.

Ch-6 Life Processes

➤ **Life processes** – The processes that are necessary for an organism to stay alive.

Eg. Nutrition, respiration, etc.

➤ **Criteria of life-** (i) Growth (ii) Movement

➤ **Nutrition-** The process in which an organism takes in food, utilizes it to get energy, for growth, repair and maintenance, etc. and excretes the waste materials from the body

Types of nutrition

1. **Autotrophic nutrition** (Auto =self; trophos = nourishment) E.g. Plants, Algae, blue green bacteria.

o Process – Photosynthesis (Photo=light; Synthesis= to combine)

o Raw materials- (i) Carbon dioxide (ii) Water

o Equation-

o Energy conversion- Light/Solar energy to Chemical energy

o Role of Chlorophyll- To trap the sun's energy for photosynthesis

o Factors for Autotrophic nutrition -

(i) Carbon dioxide

(ii) Water

(iii) Light

(iv) Temperature

o Events/ Steps of photosynthesis-

(i) Absorption of light energy by chlorophyll

(ii) Conversion of light energy to chemical energy & Splitting of water molecule into Hydrogen & oxygen

(iii) Reduction of Carbon dioxide to Carbohydrate

o Gaseous exchange-

(i) Gas used- Carbon dioxide

(ii) By product - Oxygen

o Source of raw materials-

(i) Carbon dioxide –Land plants- Air, Aquatic plants- Water

(ii) Water & Minerals - Soil

2. **Heterotrophic nutrition** (Hetero =others: trophos =ourishment) Eg. Animals, plants lacking chlorophyll like fungi.

(a) Saprophytic nutrition: Organisms feeds on dead decaying plants or animals material. E.g.Fungi, Bacteri

(b) Parasitic nutrition: Organisms obtain food from the body of another living (host)

o Endoparasite : Parasite lives inside the body of the host e.g. tapeworm, roundworm.

o Exoparasite : Parasite lives on the body of the host. E.g. lice, leech.

Note- The parasite benefits while the host is usually harmed e.g. Cuscutta-plant parasite (amarbel), plasmodium (malarial parasite).

(c) Holozoic nutrition: Organism (mostly animals) take in whole food and then digest it into smaller particles with enzyme. Eg.Amoeba, Paramoecium. Animals, humanbeings.

o Steps in Holozoic nutrition

(i) Ingestion: taking in of food.

(ii) Digestion: breaking down of complex food into simpler, absorbable form.

(iii) Assimilation: Utilization of digested food from the body.

(iv)Egestion: Removing undigested food from the body

o **Nutrition in human beings**

◆ Alimentary canal-

Mouth Oesophagus Stomach Small intestine Large intestine

◆ Important gland/juices

(Refer to figure 6.6 page no.97 of N.C.E.R.T Text book)

Mouth includes teeth, salivary glands, and tongue. Teeth break down the food. They are of four types – molars (6), premolars (4), canines (2), and incisors (4) in each jaw.

- o Molars and premolars are for chewing and grinding food.
- o Canines are for piercing and tearing food.
- o Incisors are for cutting and biting food.

In total life span of humans, two sets of teeth grow – milk teeth and permanent teeth.

Saliva is secreted by salivary glands located under the tongue. It contains a digestive enzyme salivary amylase, which breaks down starch into sugar.

Tongue helps in chewing and swallowing of food.

The food from mouth passes down the oesophagus to the stomach, through the movement of walls of oesophagus (peristalsis)

Stomach mixes the food received from oesophagus with digestive juices.

Inner lining of stomach secretes:

- o Mucus – protects the lining of stomach against the action of the acid.
- o Hydrochloric acid – creates an acidic medium and helps in digestion of proteins.
- o Digestive juices – break down protein into simple substance.

Pepsin breaks proteins into polypeptides

Rennin changes soluble milk proteins into curd which is insoluble.

The food from stomach moves into the small intestine.

Digestion in small intestine

- o It is the longest part (about 7.5 m long) of the alimentary canal.
- o It is the site where complete digestion of carbohydrates, proteins, and fats takes place.
- o All the digested food is absorbed by the walls of intestine. This process is known as absorption.

- o Inner lining of small intestine has tiny finger-like projections called villi.
- o Villi increase the surface area for more efficient food absorption.
- o The absorbed food is delivered to each and every cell of the body where they are used to produce complex substances such as proteins, etc. This process is known as assimilation.
- o It receives intestinal juice from two glands – liver and pancreas that help in further digestion of food.
- o Liver - It is the largest gland of the body and secretes bile juice. Bile juice is stored in gall bladder and plays an important role in the digestion of fats.
- o Pancreas - Pancreas contains enzymes that help in complete digestion of all food components.

Amylase breaks starch into maltose

Lipase breaks complex fats into simple fats.

- o The functions of enzymes secreted in small intestine are :

Maltase changes maltose to glucose

Sucrase changes sucrose to glucose

Lactase changes lactose to glucose

Peptidase changes polypeptides to amino acids

Digestion in large intestine

- o The digested food from small intestine goes into blood stream and the undigested and unabsorbed material and water enters the large intestine.
- o The function of large intestine is absorption of water and some salts from undigested food.
- o From large intestine, the waste material is stored in rectum in the form of semi-solid faeces.
- o The undigested, stored waste is excreted out from the body as faeces via anus. This process is known as egestion.

Amoeba is a single-celled organism which feeds on algae, rotifers, protozoans, and even other small Amoeba.

Amoeba can constantly change its shape with the help of pseudopodia.

Pseudopodia (also called false feet) are the finger-like projections that help Amoeba in moving and capturing food.

When an Amoeba senses its prey, it pushes out its pseudopodia around it and engulfs it. The food thus eaten gets trapped in the food vacuole.

Digestive juices such as amylase and protease are secreted inside the food vacuole in an Amoeba. These juices act on the food and break it down into smaller components.

Amylase breaks down complex carbohydrates into simple sugars while protease breaks down proteins into simpler substances.

The digested food is later absorbed by Amoeba for growth, maintenance, and multiplication. Undigested food is egested using pseudopodia.

Respiration

Respiration is the process of taking in oxygen and releasing carbon dioxide. The process involves the consumption of oxygen and liberation of carbon dioxide and water.

Two types- aerobic and anaerobic

Aerobic respiration

Oxidation of food materials with the help of oxygen

Yields 38 ATP

Steps in cellular respiration

First step- Breakdown of glucose (6C) into pyruvate (3C). It takes place in the cytoplasm

Second step- Pyruvate is broken down into CO₂ and water. It takes place in mitochondria, energy is produced in the form of ATP.

Anaerobic respiration

Oxidation of nutrients without utilizing molecular oxygen Yields 2 ATP

First step- Glycolysis (occurs in the cytoplasm), 2 pyruvate produced

Second step- Break down of pyruvic acid into ethanol and water and energy (in yeast) and lactic acid and energy (in muscle cells)

Human respiration

Includes the nose, pharynx, trachea, bronchi, bronchioles and alveoli

Bronchioles divide to form many alveoli

Alveoli are sites of gas exchange

O₂ present in alveolar blood vessels transported to body cells

Haemoglobin is the respiratory pigment present in blood is mainly responsible for the transport of carbon dioxide and oxygen.

Transportation is a life process where substances synthesized or absorbed in one part of the body are carried to other parts of the body.

Transportation in plants

o The transportation system in plants moves the energy stored in leaves to different parts. It also helps in moving raw materials absorbed from the roots to various organs of the plant.

o Xylem conducts water and minerals obtained from soil (via roots) to the rest of the plant. Transport of water occurs due to transpiration pull, root pressure and difference in pressure gradient.

o Phloem transports food materials from the leaves to different parts of the plant body.

o Transport of food (translocation) through phloem requires energy.

Transportation

It is a life process where substances synthesised or absorbed in one part of the organism's body are carried to other parts of the body.

Translocation in plants

The translocation system in plants moves the synthesised food from leaves to remaining plant parts. It also helps in moving raw materials absorbed from the roots to various organs of the plant.

Phloem transports food materials from the leaves to different parts of the plant body.

The phloem consists of companion cells, sieve tubes, phloem parenchyma, and fibres.

Transport of food (translocation) through phloem requires energy, which is obtained from respiration in the form of ATP.

Transportation in humans

- o The system that transports nutrients and collects waste materials for disposal in the body is the circulatory system.
- o The circulatory system consists of the central organ i.e., the heart, blood vessels, and circulating fluid i.e., blood.
- o Another system, called the lymphatic system, transports immune cells.

Circulation in humans

- o Double circulation occurs in human i.e. the blood goes through the heart twice during each cardiac cycle.
- o Blood, lymph- involved in transportation
- o Components of blood- RBCs, WBCs, platelets, and plasma
- o Three types of blood vessels- arteries, veins and capillaries
- o Arteries carry oxygenated blood, except pulmonary artery
- o Veins carry deoxygenated blood, except pulmonary vein

Heart-

(Refer to figure 6.10 page no. 106 of N.C.E.R.T Text book)

- (i) It is a muscular organ, which works as a pump in the circulatory system.
- (ii) It is the size of our fist.
- (iii) It has two sides, which are separated by a partition so that the oxygenated and deoxygenated blood do not get mixed up.

Two upper chambers called Atria.

Two lower chambers called Ventricles.

◆ Working of heart- Left side-

- (i) Left atrium relaxes & the Oxygenated blood enters it from the lungs through the pulmonary vein.
- (ii) Left atrium contracts & the blood enters the left ventricle through the valve.
- (iii) Left Ventricle contracts and the blood is pumped into the

largest artery = 'Aorta' and is carried to all parts of the body.

◆ Working of heart-Right side-

(i) Right atrium relaxes & the deoxygenated blood from the body enters it through superior and inferior Vena cava.

(ii) Right atrium contracts & the blood enters the right Ventricle through the valve.

(iii) Right Ventricle contracts and the blood is pumped into the Pulmonary artery and is carried to lungs.

◆ Valves- Unidirectional to prevent the backward flow of blood.

◆ Pulmonary vein is the only vein that carries Oxygenated blood.

◆ Aorta is the only artery that carries Deoxygenated blood.

◆ Double circulation in man- because the blood passes through the heart twice in one complete cycle of the circulation.

◆ Capillaries-

(i) Form the connection between arteries & veins.

(ii) Walls are one cell thick only for easy exchange of blood.

◆ Platelets- Plug the leaks of arteries and veins by clotting the blood.

◆ Lymph- Extracellular fluid similar to plasma but colourless with lesser protein.

◆ Function of lymph-

(i) Transportation of digested & absorbed fats from the small intestine.

(ii) Drains excess fluid from the intercellular spaces back in the blood.

◆ Higher animals- E.g., birds, mammals.

(i) Oxygenated blood & Deoxygenated blood are completely separate for efficient Oxygen supply.

(ii) This is to fulfil higher energy needs and to maintain body temperature (warm blooded animals).

◆ Amphibians & reptiles- have 3 chambered heart where little mixing of Oxygenated blood &

Deoxygenated blood takes place. Therefore their body temperature varies with the temperature of

the environment. (cold blooded animals)

.

➤ **Excretion**- The biological process of removal of harmful metabolic wastes in living organisms.

➤ Excretion in human beings-

(Refer to figure 6.13 page no. 110 of N.C.E.R.T Text book)

Organs of excretory system

◆ Organs of excretory system-

(i) Kidneys (iii) Urinary bladder

(ii) Ureters (iv) Urethra

◆ **Kidneys**-

(i) Two in number

(ii) Bean shaped

(iii) Present in abdomen on either side of the backbone

(iv) Basic unit is nephron.

a) Glomerulus- Group of capillaries (cluster) present in Bowman's capsule to receive blood from renal artery and filters it.

b) Bowman's capsule- Cup shaped structure, which contains glomerulus.

c) Convoluted tubule- is long and reabsorbs vital nutrients like glucose, amino acids, salts, urea and water.

Note-Vital functions of kidneys-

(a) Filtration & removal of Nitrogenous wastes

(b) Reabsorption of vital nutrients

- ◆ Ureters- Transport the urine formed in the kidneys to the urinary bladder.
- ◆ Urinary bladder- Muscular bag like structure to store urine.
- ◆ Urethra- Helps in removal of urine when the Urinary bladder is full.
- ◆ Artificial kidney- Principle: Dialysis

➤ **Excretion in plants-**

- ◆ Gaseous wastes- CO₂ in respiration & O₂ in photosynthesis are removed by the process of diffusion.
- ◆ Excess water- is removed by transpiration.

- ◆ Other wastes-

- (i) Stored in cellular vacuoles or in leaves, which fall off or as gums, resins, etc. in old xylem.
- (ii) Excreted in soil.

➤ **Important diagrams-**

1. Open & close stomata
2. Steps of nutrition in Amoeba
3. Alimentary canal of human beings/ Digestive system of human beings
4. Respiratory system of human beings
5. Structure of heart.
6. Excretory system of human beings
7. Structure of nephron

➤ **Important activities-**

1. To prove that chlorophyll is necessary for photosynthesis.
2. To prove that Carbon dioxide is necessary for photosynthesis.
3. To prove that light is necessary for photosynthesis.
4. To prove that product of fermentation is Carbon dioxide.

5. To prove that leaves lose water by transpiration.
6. To study the action of salivary amylase on starch.
7. To demonstrate that Carbon dioxide is present in exhaled air.
8. To demonstrate the process of transpiration in plants.

TYPE 1 MULTIPLE CHOICE QUESTIONS

1. The kidneys in human beings are a part of the system for

- (a) nutrition.
- (b) respiration.
- (c) excretion.
- (d) transportation.

Solution 1: (c) In human beings, the kidneys are a part of the system for excretion.

2. The xylem in plants are responsible for

- (a) transport of water.
- (b) transport of food.
- (c) transport of amino acids.
- (d) transport of oxygen.

Solution 2: (a) In a plant, the xylem is responsible for transport of water.

3. The autotrophic mode of nutrition requires

- (a) carbon dioxide and water.
- (b) chlorophyll.
- (c) sunlight.
- (d) all of the above.

Solution 3: (d) The autotrophic mode of nutrition requires carbon dioxide, water, chlorophyll and sunlight.

4. The breakdown of pyruvate to give carbon dioxide, water and energy takes place in

- (a) cytoplasm.
- (b) mitochondria.
- (c) chloroplast.
- (d) nucleus.

Solution 4:(b) The breakdown of pyruvate to give carbon dioxide, water and energy takes place in mitochondria.

5. . Choose the function of the pancreatic juice from the following

- (a) trypsin digests proteins and lipase carbohydrates
- (b) trypsin digests emulsified fats and lipase proteins
- (c) trypsin and lipase digest fats
- (d) trypsin digests proteins and lipase emulsified fats

Solution 5: d

Very Short Answer Type Question [1 Mark]

Q1 Mention the raw materials required for photosynthesis.

Answer. The following raw materials are required for photosynthesis:

- (i) Carbon Dioxide: Plants get CO₂ from atmosphere through stomata.
- (ii) Water: Plants absorb water from soil through roots and transport to leaves.
- (iii) Sunlight: Sunlight, which is absorbed by the chlorophyll and other green parts of the plant.

Q2. What would be the consequences of deficiency of hemoglobin in your body?

Answer. The deficiency of hemoglobin in our body is called anemia. In anemia, the blood is unable

to carry the sufficient amount of oxygen required by the body. So, respiration would be less and less

energy will be available to the body. The hemoglobin deficient person will feel weak, pale, lethargic

and will be

unable to perform heavy physical work.

Q3 Name the green dot like structures in some cells observed by a student when a leaf peel was viewed under a microscope. What is this green colour due to?

Answer. The green dot-like structures in some cells observed by a student when a leaf peel is viewed under a microscope are chloroplasts. The green colour is due to the presence of green pigment, chlorophyll.

Q4 State any one difference between autotrophic and heterotrophic modes of nutrition.

Answer. In autotrophic nutrition, organisms obtain their food from inorganic substances. In heterotrophic nutrition, organisms derive their food from organic substances.

Q5.A Give one reason why multicellular organisms require special organs for exchange of gases between their body and their environment. :

Answer. In unicellular organisms the entire body of the organism is in contact with the environment

hence exchange of materials can take place but, in multicellular organisms the entire body of the organism is not in contact with the environment and hence simple diffusion is not helpful.

Q6 Name the process in plants where water is lost as water vapour. :

Answer. Transpiration is the process when plants lose water as vapour.

Q7. What is 'translocation' in plants?

Answer. Translocation is the movement of soluble materials, products of photosynthesis from leaves to other tissues throughout the plant.

In the experiment "Light is essential for photosynthesis", why does the uncovered part of the leaf turn blue-black after putting iodine solution?

Answer. Starch is produced in the uncovered part of the leaf because it is exposed to sunlight allowing it to photosynthesize, which turns blue-black in presence of iodine solution.

Q8. Name the component of blood that helps in the formation of blood clot in the event of a cut.

Answer. Platelets help in clotting of blood in the event of a cut.

Q9. Mention how organisms like bread moulds and mushrooms obtain their food.

Answer. Organisms like bread moulds and mushrooms breakdown the food materials outside the body and then absorb the nutrients of the bread.

Q10. What will happen to a plant if its xylem is removed?

Answer. Xylem in plant transports water and dissolved mineral nutrients from the roots to all parts

of the vascular plant. So, if xylem is removed from the plant, the water and mineral supply to the plant will stop and therefore, the plant will die.

Q11. Where does digestion of fat take place in our body?

Answer. Digestion of fat takes place in the small intestine of our body.

Q12. What is the mode of nutrition in human beings?

Answer. Holozoic nutrition.

Short Answer Type Questions [2 Marks]

Q1. What are enzymes? Name any one enzyme of our digestive system and write its function.

Answer. Enzymes are biological catalysts. Catalysts are proteins that increase the rate of chemical reactions without being used up. For example: Amylase catalyses the breakdown of starch into sugars in the mouth and small intestine

Q2. (i) Write the balanced chemical equation for the process of photosynthesis,

(ii) When do the desert plants take up carbon dioxide and perform photosynthesis ?

Answer.

(i) Photosynthesis can be represented using a chemical equation. The overall balanced equation is

(ii) Desert plants open up their stomata during night and take in CO₂. Stomata remains close during

the day time to prevent the loss of water by transpiration. They store the CO₂ in their cells until the

sun comes out and they can carry on with photosynthesis during the day time.

Q3. Why do herbivores have longer, small intestine than carnivores ?

Answer. Digestion of cellulose takes a longer time. Hence, herbivores eating grass need a longer small intestine to allow complete digestion of cellulose. Carnivorous animals cannot digest cellulose

due to the absence of enzyme CELLULASE, hence they have a shorter intestine.

Q4. Write correct sequence of four steps of method for the preparation of temporary mount of a stained leaf peel.

Answer.

1. Take a healthy leaf from the potted plant.
2. Remove a part of the peel from the lower surface of the leaf. You can do this by folding the leaf over and gently pulling the peel apart using forceps. Keeps the peel in a watch glass containing water.
3. Put a few drops of safranin stain in a watch glass.
4. After 2-3 minutes take out the peel and place it on a clean glass slide.
5. Put a drop of glycerin over the peel and place a clean covers lip gently over it with the help of a needle.
6. Remove the excess stain and glycerin with the help of blotting paper.
7. Observe the slide under magnifications of the compound microscope.

Q5. Why do the walls of the trachea not collapse'when there is less air in it?

Answer. Rings of cartilages are present in trachea. These rings support the trachea and do not allow

the trachea to collapse when there is less air in it.

Q6. What are the final products after digestion of carbohydrates and proteins?

Answer. The final product produced after digestion of carbohydrates is glucose and of proteins is amino acids.

Q7. What is saliva? State its role in the digestion of food.

Answer. Saliva is a watery fluid secreted by the salivary glands in the mouth. The digestive

functions of saliva include moistening food, and helping to create a food bolus, so it can be swallowed easily. Saliva contains the enzyme amylase that breaks some starches down into maltose

and dextrin.

Q8. Explain the process of nutrition in Amoeba.

Answer. Amoeba is an important protozoa found in fresh water. It feeds on microscopic plants and animals present in water. The mode of nutrition in amoeba is Holozoic. And the process of obtaining food by amoeba is called phagocytosis. The different processes involved in the nutrition of amoeba

1. Ingestion: Ingestion is the process of taking food in the body. Amoeba is a unicellular animal, so it doesn't have a mouth for ingestion of food. Amoeba ingests the food by encircling it by forming pseudopodia. When the food is completely encircled, the food is engulfed in the form of a bag called food vacuole.

2. Digestion: Digestion is the process of breaking the large and insoluble molecules in small and water soluble molecules. In amoeba, several digestive enzymes react on the food present in the food vacuoles and break it down into simple and soluble molecules.

3. Absorption: The food digested by digestive enzymes is then absorbed in the cytoplasm by the process of diffusion. While the undigested food remains in the food vacuole. If a large amount of food is absorbed by amoeba, the excess food is stored in the cytoplasm in the form of glycogen and lipids.

4. Assimilation: During this step the food absorbed by the cytoplasm is used to obtain energy, growth and repair. This process of utilizing absorbed food for obtaining energy, repair and growth is called assimilation.

5. Egestion: When a sufficient amount of undigested food gets collected in the food vacuole, it is thrown out of the body by rupturing cell membrane. The process of removal of undigested food from the body is called egestion.

Q9. State two differences between arteries and veins.

Answer. Arteries

1. Arteries carry oxygenated blood, away from the heart except pulmonary artery.
2. These are thick-walled, highly muscular except arteries of cranium and vertebral column.
3. Valves are absent.

Blood in arteries moves with pressure. Veins

1. Veins carry deoxygenated blood, towards the heart except pulmonary veins.
2. These are thin-walled.
3. Valves are present which provide unidirectional flow of blood.
4. Blood in veins moves under very low pressure.

Q10. How are the alveoli designed to maximise the exchange of gases?

Answer. Alveoli are small pouches or sacs like structure. They are surrounded by blood capillaries.

Thus a large amount of air is brought in contact with the air in the lungs. More than millions of alveoli are present in the lungs. The presence of millions of alveoli in the lungs provides a very large surface area for the exchange of gases. The availability of large surface area maximises the exchange of gases.

Q11. Name two excretory products other than O_2 and CO_2 in plants.

Answer. The two excretory products other than O_2 and CO_2 in plants are resins and gums.

Short Answer Type Questions [3 Marks]

Q12. In single celled organisms diffusion is sufficient to meet all their requirements of food, exchange of gases or removal of wastes but it is not in case of multicellular organisms.

Explain the reason for this difference.

Answer. Unicellular organisms can absorb sufficient oxygen because of its complete contact with the

atmosphere, but in multicellular organisms the rate of absorption and diffusion becomes very less

because all cells are not in direct contact with the atmosphere. Multicellular organisms require greater amount of oxygen to sustain life processes which cannot be fulfilled by the process of diffusion.

Q13. Name the acid presents in the following:

(i) Tomato (ii) Vinegar (iii) Tamarind

Answer.(i) Oxalic acid (ii) citric acid (iii) Tartaric acid.

Q14.State the role of the following in human digestive system :

(i) Digestive enzymes (ii) Hydrochloric acid (iii) Villi

Answer.

(i) Digestive enzymes – Foods need to be broken into their small or simpler

molecules so that they can be absorbed into the bloodstream. However, the physical breakdown of

food is not enough. Enzymes are hence needed for the chemical breakdown of food and speeding up

the digestive process. The products of digestion can hence be small enough to be absorbed.

(ii) Hydrochloric acid – Hydro chloric acid helps to kill the germs which might have entered in to the

system through food. It creates acidic medium for the pepsin to act on food to breakdown proteins.

(iii) Villi – Villi are finger like projections in the small intestine. They help to increase the surface area

for absorption of the digested food. Villi are richly supplied with blood vessel which help to absorb

digested food in to the blood stream.

Q15. In mammals and birds why is it necessary to separate oxygenated and de-oxygenated ?

Answer. Mammals and birds are warm blooded animals. This means they can control their body temperature and do not have to depend on environment for their body temperature regulation. Because of this birds and mammals require optimum oxidization of glucose which would be possible with good supply of oxygen. So it is required to have separate oxygenated and de-oxygenated blood to supply the required amount of oxygen.

Q16. List three characteristics of lungs which make it an efficient respiratory surface.

Answer. These features which particularly make our lungs efficient for gas exchange.

- 1.Thin: the air sac walls are very thin so that gases can quickly diffuse through them. Oxygen is absorbed in to the blood and carbon dioxide is given out in to the lungs to be exhaled out.
- 2.Moist: the air sacs are moist with mucus so that gases can dissolve before diffusing.
- 3.Large surface area: the surface area for gases to diffuse through in human lungs is roughly the same as a tennis court. The alveoli help to increase the surface area for absorption of oxygen.
- 4.Good blood supply: the air sacs or the alveoli have a large capillary network so that large volumes of gases can be exchanged. More the flow of blood more exchange.

Q17. (a) What is the role of HCl in our stomach ?

(b) What is emulsification of fats ?

(c) Which protein digesting enzyme is present in pancreatic juice ?

Answer.

(a)(i) It sterilises food by killing pathogens and other microbes.

(ii) It has a pH of 2, which is perfect for enzymes such as pepsin to break down proteins as effectively

as possible.

(iii) Helps emulsify food (digestion of protein and stimulates the pancreas to produce digestive enzymes and bile) and protects against harmful ' bacteria

(b) Breakdown of large globule fats into smaller fats droplets is known as emulsification.

(c) Trypsin is the enzyme secreted by the pancreas which aids in digestion of proteins.

Describe in brief the function of kidneys, ureters, urinary bladder and urethra.

Answer. The Kidneys filter the blood and concentrate the filtrate to make urine. They also help regulate blood pressure.

Ureters transport the urine to the urinary bladder.

Urinary bladder is like a holding tank for the urine until it's ready to be excreted. Urethra is the tube

that connects the urinary bladder to the outside of the body for excretion.

Long Answer Type Question [5 Marks]

Q18. Explain the process of breakdown of glucose in a cell (ii) in the absence of oxygen.

Answer. The process of breakdown of glucose in a cell are as follows:

The first step in the breakdown of glucose both in presence of O_2 and in absence of O_2 is same. In this step, glucose is broken down into pyruvate.

Second step which involves further breakdown of pyruvate into simple compounds can take place in

two different ways:

(i) In presence of O_2 : In the presence of O_2 , pyruvate is converted into CO_2 and water. Energy released during aerobic respiration is much greater than that released during an anaerobic respiration.

(ii) In absence of O_2 : In the absence of O_2 in yeast, pyruvate is converted into ethanol and CO_2 and

the process is called fermentation. In absence of O_2 , in our muscle cells, pyruvate is converted into

lactic acid. The build up of lactic acid in muscle cells causes cramps.

Q19. (a) Explain how does the exchange of gases occur in plants across the surface of stems, roots and leaves.

(b) How are water and minerals transported in plants ?

Answer.

(a) In plants there are tiny pores called stomata on leaves and lenticels in stem which facilitate the exchange of gases. Carbon dioxide is taken in and oxygen given out {during photosynthesis} and vice versa during respiration.

(b) Water and minerals are transported within the plant by the Xylem vessels (mainly in an upward direction); these are part of the vascular system which also includes Phloem vessels.

Phloem transports the products of photosynthesis within the plant, to all parts like the stem, roots, fruits etc. in all directions.

Q20. Draw a diagram of human excretory system and label renal artery and urethra.

State in brief the function of :

1. renal artery
2. kidney
3. ureter
4. urinary bladder

Renal artery: The renal artery carries blood to the kidneys from the abdominal aorta. This blood comes directly from the heart and is sent to the kidneys to be filtered before it passes through the rest of the body. Up to one-third of the total cardiac output per heartbeat is sent to the renal arteries to be filtered by the kidneys. Each kidney has one renal artery that supplies it with blood. The filtered blood then can exit the renal vein.

2. Kidney: The kidneys perform the essential function of removing waste products from the blood and regulating the water fluid levels. The kidneys regulate the body's fluid volume, mineral composition and acidity by excreting and reabsorbing water and inorganic electrolytes.

3. Ureter: The ureter is a tube that carries urine from the kidney to the urinary bladder. There are two ureters, one attached to each kidney.

4. Urinary bladder: The urinary bladder is an expandable muscular sac that stores urine before it is excreted out of the body through the urethra.

Q21. (a) Draw a diagram of excretory system in human beings and label the following parts.

Aorta, kidney, urinary bladder and urethra.

(b) How is urine produced and eliminated ?

Blood from the heart comes into the kidneys afferent and efferent arteriols from the renal arteries where it enters about 2-3 million nephrons per kidney. Then, it goes through the glomerulus

a tuft or bunch of blood capillaries and get rid of some of the unwanted substances like urea, uric

acid, creatinine in the blood and then continues through the renal tubules. The loop of Henley, reabsorb certain substances such as water (actually if body is dehydrated, body will send anti-diuretic hormone (ADH) to kidneys to prevent extra water from going into urine and thus saving

water for body and get rid of anything else that isn't wanted, then the urine goes through ureters to

bladder and then to urethra where it is excreted out of body as urine.

Q22. (a) Draw a diagram to show open stomatal pore and label on it:

(i) guard cells

(ii) chloroplast

(b) State two functions of stomata.

(c) How do guard cells regulate the opening and closing of stomatal pore?

Answer. (a)

(b) Two functions of stomata are:

(i) Exchange of gases between the plant and the atmosphere takes place through stomata.

(ii) Transpiration in plants takes place through stomata.

(c) Opening and Closing of Stomatal Pore: 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. Similarly, the pore closes if the guard cells shrink. As large amount of water is lost through these stomata, the plant closes these pores when it does not require carbon dioxide for photosynthesis.

Q23.(a) What is meant by breathing? What happens to the rate of breathing during vigorous exercise and why?

(b) Define translocation with respect to transport in plants. Why is it essential for plants? Where in plants are the following synthesised?

(i) Sugar (iii) Hormone

Answer. (a) The process of taking in of oxygen from air in to the lungs and expulsion of carbondioxide out of the lungs is called breathing. The rate of breathing during vigorous exercise increases by about 20 to 25 times per minute. It is because, during vigorous exercise the demand for oxygen

increases. Breathing occurs involuntarily but its rate is controlled by the respiratory center of the brain.

(b) Translocation is the transport of food from the leaves to other parts of the plant and occurs in the part of the vascular tissue known as phloem.

It is essential for plants because every part of the plant needs food for obtaining energy for building its parts and maintaining its life.

(i) Sugar is synthesised in the leaves of the plant.

(ii) Hormones are synthesised at the tips of roots and stems of a plant.

Q24. (a) Draw a sectional view of the human heart and label on it – Aorta, Right ventricle and Pulmonary veins.

(b) State the functions of the following components of transport system:

(i) Blood (ii) Lymph

Answer. (a)

(b) The functions of blood and lymph are as follows:

(i) Blood

Oxygen is transported by the blood to the tissues of the body for the breakdown of digested food. Carbon dioxide is transported to the lungs by the blood plasma.

The digested and absorbed nutrients are transported by blood to the tissues. Nitrogenous wastes are transported to the kidneys.

It regulates the body temperature and maintains the pH of the body tissues.

It transports various hormones from one region to another and bring about the coordination. It maintains water balance to constant level.

The lymphocytes produce antibodies against the invading antigens and protect from diseases. It helps in rapid healing of wounds by forming a clot at the site of injury.

(ii) Lymph

It cleans the cellular environment.

It returns proteins and tissue fluids to the blood (drainage)

It provides a pathway for the absorption of fats and fat-soluble vitamins into the bloodstream.

It defends the body against disease.

ist the three events that occur during the process of photosynthesis.

Q25. Explain the role of stomata in this process.

(b) Describe an experiment to show that “sunlight is essential for photosynthesis.”

Answer.

(a) The three events that occur during the process of photosynthesis are:

(i) Absorption of light energy by the green pigment chlorophyll.

(ii) Conversion of light energy into chemical energy and the splitting of water molecule into hydrogen and oxygen.

(iii) Reduction of carbon dioxide into carbohydrate.

Role of Stomata

Stomata are tiny pores present on the surface of leaves. They are also present on the surface of young stems. Stomata are mainly engaged in the exchange of gases (entry of CO₂ and release of O₂) associated with photosynthesis. Plant closes the stomata when it does not need CO₂ for photosynthesis.

(b) Sunlight is essential for photosynthesis

Procedure:

(i) Place a healthy green potted plant in a dark room for 1-2 days. This is done to ensure that the plant consumes all its reserve food and the leaves do not contain any starch.

(ii) Then, cover a portion of a leaf of this plant on both sides with two uniform pieces of black paper,

fixed in position with two paper clips.

(iii) Now, expose this plant to bright light. After a few hours, remove the leaf and decolorize it with

alcohol and test the presence of food (starch) with iodine solution.

Observation: It can be observed that the portion of the leaf covered with black paper does not prepare food.

Conclusion: This is because the food prepared by plants through the process of photosynthesis is stored as starch. Starch reacts with the iodine solution to give blue-black colour. Only those portions of the leaf that were exposed to sunlight could photosynthesise. Hence, gives blue-black colour when tested with iodine. The portion of the leaf covered with black paper did not receive sunlight.

Hence, starch was not produced. Thus, it can be concluded that the sunlight is essential for photosynthesis.

Practice item for CCT

The kidney's primary function is the elimination of waste from the bloodstream by production of urine. They perform several homeostatic functions such as: -

1. Maintain volume of extracellular fluid
2. Maintain ionic balance in extracellular fluid
3. Maintain pH and osmotic concentration of the extracellular fluid.
4. Excrete toxic metabolic by-products such as urea, ammonia, and uric acid. Urea is the end product of a set of biochemical reactions, and the urea produced in the liver is transported to the kidneys and finally excreted as a waste product in urine. The way the kidneys do this is with nephrons. There are over 1 million nephrons in each kidney; these nephrons act as filters inside the kidneys. The kidneys filter needed materials and waste, the needed materials go back into the bloodstream, and unneeded materials become urine and is gotten rid of.

1. The basic functional unit of a kidney, according to the text above would be:

- A. Urea
- B. Ammonia
- C. Nephron
- D. Uric acid

Q2. The principal nitrogenous excretory compound in humans is synthesized

- A. In the liver but eliminated mostly through kidneys
- B. In kidneys but eliminated mostly through liver
- C. In kidneys as well as eliminated by kidneys
- D. In liver and also eliminated by the same through bile duct.

CH 8 HOW DO ORGANISMS REPRODUCE?

Reproduction : It is the process by which living organisms produce new individuals of the same species. Reproduction is necessary for the survival and increase in the population of a species. If organisms do not reproduce, their population decreases and species will become extinct.

Do organisms create carbon copies of themselves ?

The DNA (Deoxyribonucleic acid) molecules in the chromosomes in the nucleus are responsible for the transfer of characters from the parents to their offspring. During reproduction the reproductive cells produce two copies of the DNA which separate into two cells. The DNA copies will be similar but not identical to each other. So, the new individuals have slight variations from their parents.

This is the basis for variations and evolution of new species.

The importance of variation : DNA copying during reproduction is important for maintaining the body designs of different organisms to survive in the existing environment. But the environment is constantly changing due to changes in temperature, climate, water levels etc. If organisms cannot adjust themselves to the changes in the environment then their species will become extinct. If there are variations in some individuals of a species, they may be able to survive the changes in the environment. So, variations in species are necessary for the survival of different species and for the evolution of new species.

Types of reproduction : There are two main types of reproduction in living organisms. They are asexual reproduction and sexual reproduction.

Asexual reproduction is reproduction in which new individuals are produced from a single parent.

Sexual reproduction is reproduction in which two individuals are involved to produce a new individual.

Asexual reproduction is of different types.

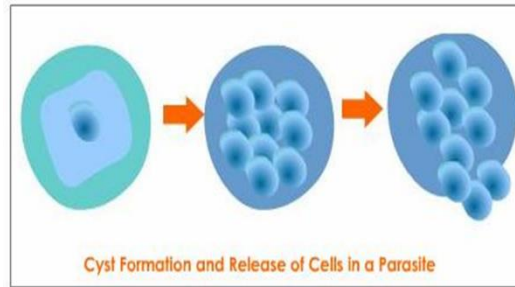
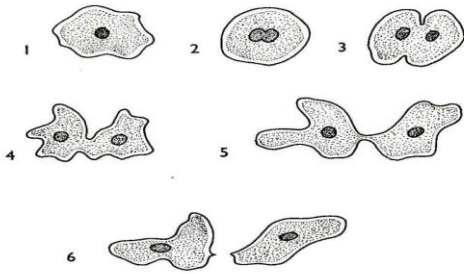
They are Fission, Budding, Regeneration, Fragmentation, Spore formation, Vegetative propagation etc.

Fission : Fission is an asexual reproduction by which a unicellular organism divides and forms two or more new individuals.

Fission is of two types. They are binary fission and multiple fission.

Binary fission : In this method an organism divides and forms two individuals. First the nucleus divides and forms two nuclei. Then the cytoplasm divides and forms two daughter cells. E.g. - Amoeba, Paramecium etc.

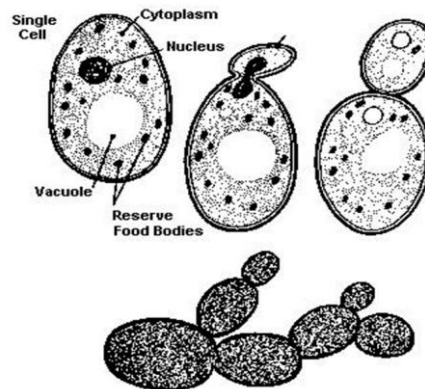
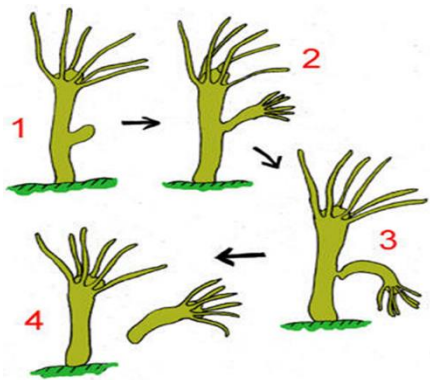
Multiple fission : In this method one organism divides into many daughter cells. E.g. – Plasmodium (Malarial parasite).



**BINARY
FISSION IN
AMOEBAS
MULTIPLE
FISSION IN**

PLASMODIUM

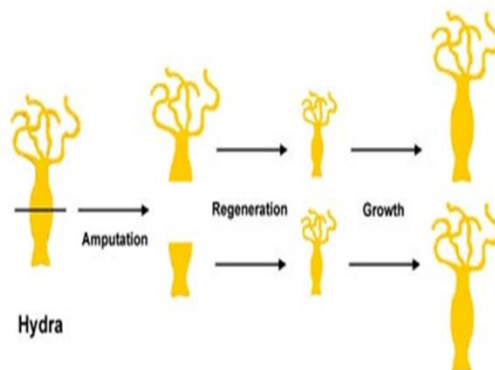
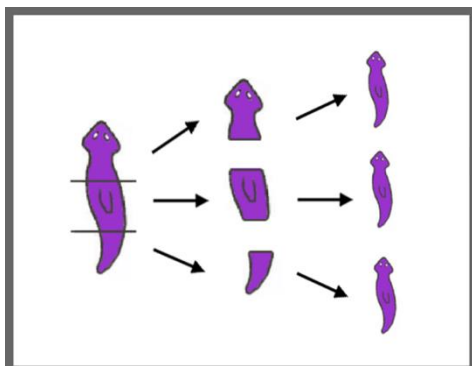
□ **Budding** : In this method a bud like projection is formed on the body of the organism. The bud then develops into a new individual. Then it separates from the parent and forms an independent individual. E.g.- Hydra, Yeast etc



BUDDING IN HYDRA

BUDDING IN YEAST

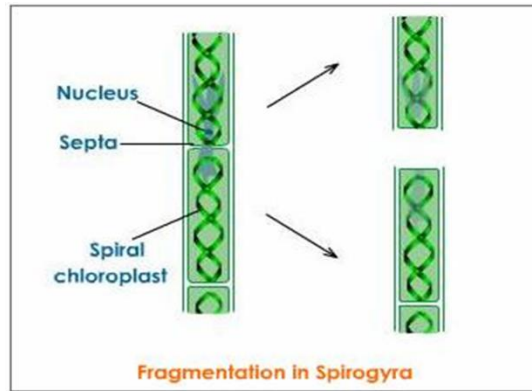
□ **Regeneration** : In this method a part of the body of the organism if cut or broken can develop into a new individual. E.g.- Hydra, Planaria, Star fish etc.



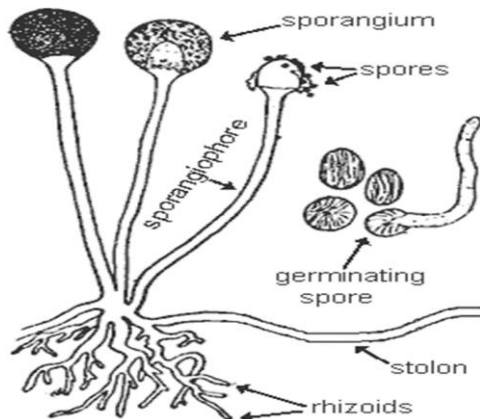
REGENERATION IN PLANARIA

REGENERATION IN HYDRA

□ **Fragmentation** : In this method the body of a simple multicellular organism breaks up into smaller pieces on maturation and each fragment develops into new individuals. E.g. - Spirogyra.



□ **Spore formation** : In this method sporangia produce tiny cells called spores. When the spores come in contact with a moist surface, it develops into new individuals. E.g.- Rhizopus, Mucor, Penicillium etc.



□ **Vegetative propagation** : In this method new plants are produced from the vegetative parts of the plant like root, stem or leaf. E.g. - from roots in Dahlia, sweet potato; from stem in Potato, Ginger; from leaf in Bryophyllum, Begonia.

□ Plants produced by vegetative propagation produce flowers and fruits earlier than those produced from seeds. It also helps in the propagation of plants which do not produce seeds like rose, jasmine banana etc.

□ Vegetative propagation can also be done artificially by cutting, layering, grafting etc.



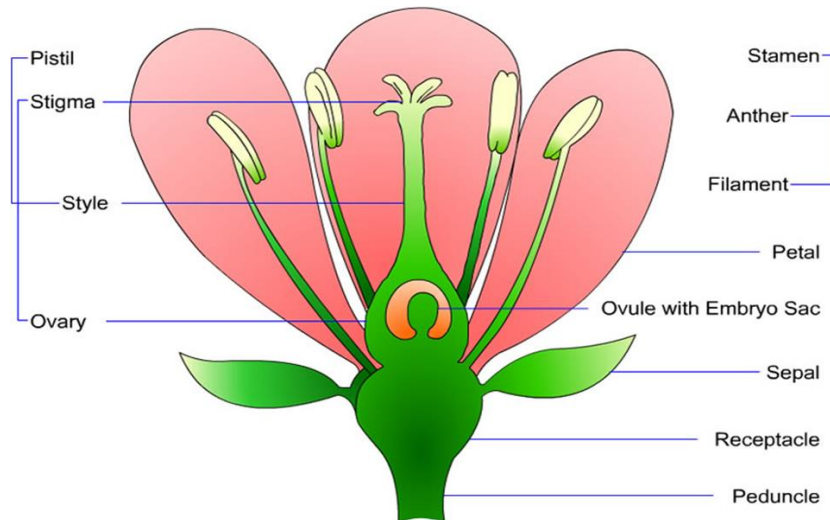
BRYOPHYLLUM



LEAF BUDS IN

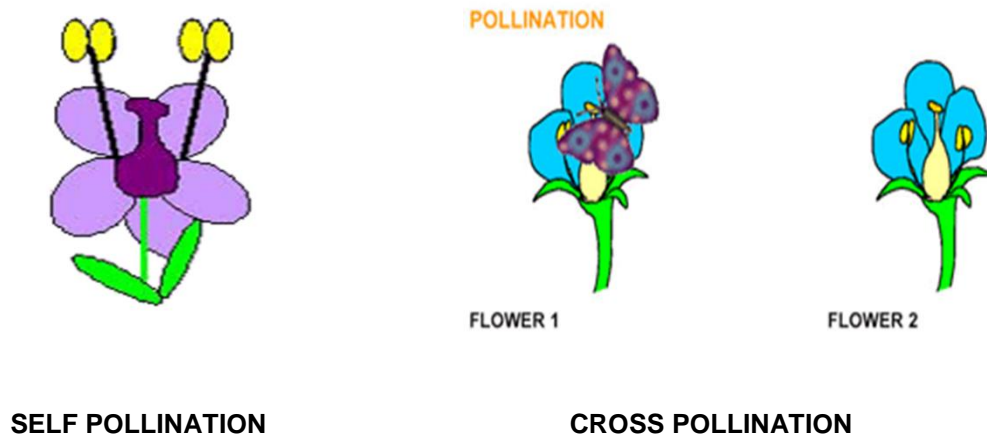
SEXUAL REPRODUCTION IN FLOWERING PLANTS

Reproductive parts of a flower : The stamen and pistil are the reproductive parts of the flower. Stamen is the male reproductive part. It produces pollen grains in the anther which contains the male germ cell (male gamete). Pistil is the female reproductive part. It produces ovules in the ovary which contain the female germ cell (female gamete).

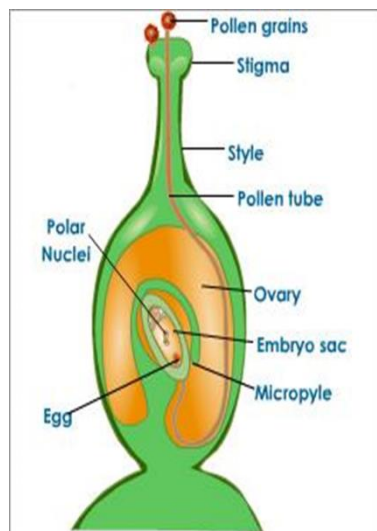


Pollination : The transfer of pollen grains from the anther to the stigma of a flower is called pollination. It takes place by wind, water or insects.

If the pollen grains are transferred from the anther to the stigma of the same flower called **self-pollination** and if it is transferred from the anther of one flower to the stigma of another flower called **cross pollination**.



Fertilization : After the pollen grain is transferred to the stigma it produces a pollen tube which passes through the style and enters the ovary and ovule. In the ovule the male germ cell (male gamete) fuses with the female germ cell (female gamete) to form a zygote. This process is called fertilization.

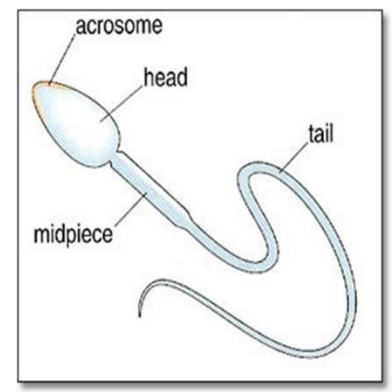
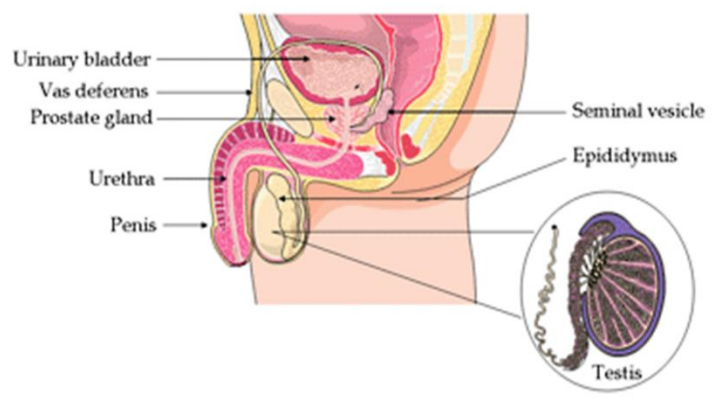


□ After fertilization the zygote divides several times and forms the embryo which then develops into the seed and the ovary develops into the fruit.

REPRODUCTION IN HUMAN BEINGS

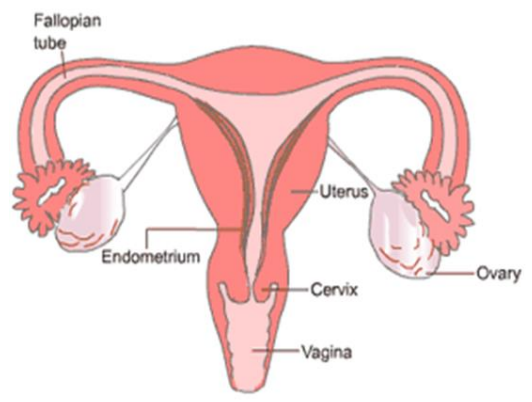
Male reproductive system : The male reproductive system consists of a pair of testes which produces the male reproductive cells called sperms and the hormone testosterone. It is present in sac like structures called scrotum. From each testis arises a tube called vas deferens. It joins into the urethra. The urethra is enclosed in a muscular organ called penis. It has an opening called genital pore. The seminal vesicles and prostate glands produce fluids which provide nutrition and help in the movement of the sperms.

Human Male Reproductive System

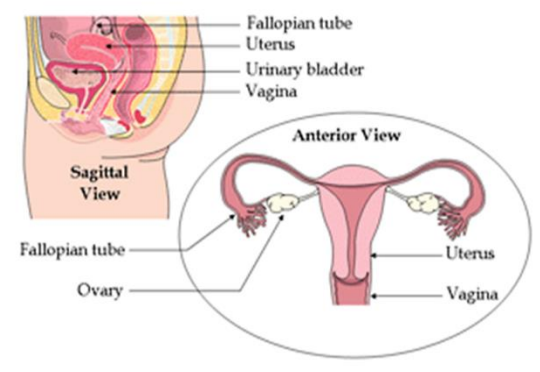


STRUCTURE OF SPERM

Female reproductive system : The female reproductive system consists of a pair of ovaries which produces the female reproductive cells called ova or eggs and the hormone estrogen. Above the ovaries are tubes called oviducts or fallopian tubes. The two oviducts unite into a bag like structure called uterus. The uterus has opening called vagina.



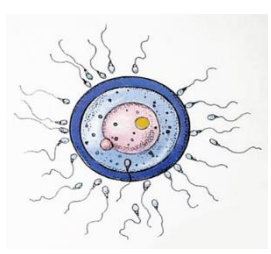
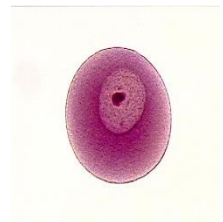
Human Female Reproductive System



FEMALE OVA

Fertilisation in beings :

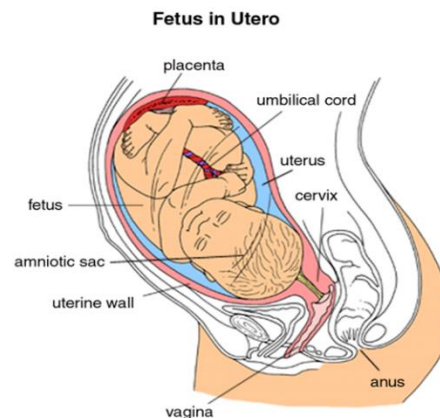
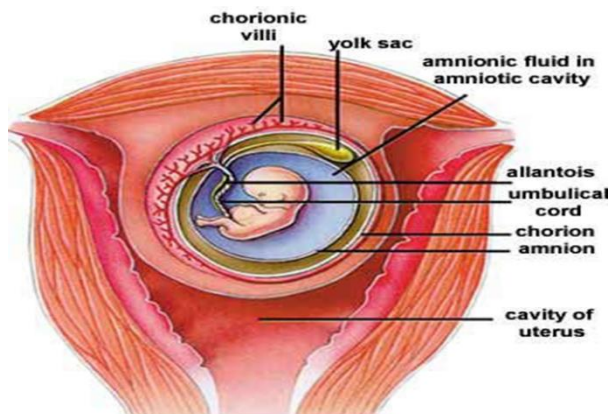
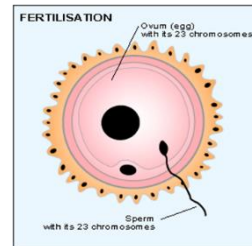
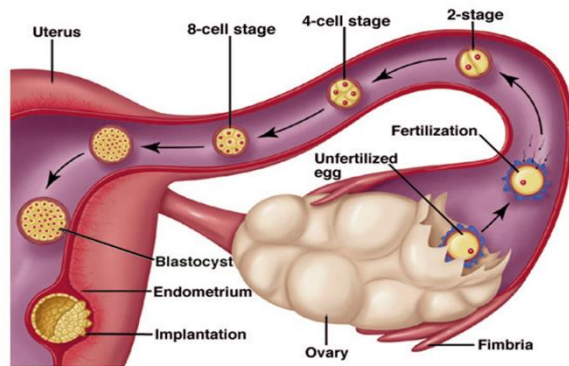
During intercourse the sperm from the male enters into the vagina. The sperms reach the oviduct. One sperm fuses with an egg and forms a zygote. The zygote then gets implanted in the uterus. The zygote then starts dividing to form an embryo. The embryo gets nutrition from the mother's blood through the placenta. The development of the child takes nine months and then the child is born.



human sexual sperms

of the female. One sperm fuses with an egg and forms the embryo. The embryo gets nutrition from the mother's blood through the placenta. The development of the child takes nine months and then the child is born.

Stages of Development-Early Embryo



Menstruation : The ovary produces one egg every month and the uterus prepares to receive the fertilized egg. Its wall becomes thick and spongy with blood vessels for nourishing the embryo. If fertilization does not take place then the uterus wall breaks and comes out of the vagina as blood and mucous. This cycle takes place once every month and is called menstruation.

Sexually Transmitted Diseases : These diseases are transmitted through sexual contact. They may be bacterial infections like gonorrhea and syphilis etc. or viral infections like warts and AIDS.

Prevention of pregnancy (Contraception) : Pregnancy can be prevented by three main methods. They are Barrier methods, Chemical methods and Surgical methods.

- Barrier methods consist of using condoms, cervical caps, Copper-T etc.
- Chemical methods consists of taking drugs like oral pills, vaginal pills etc.
- Surgical methods consists of removing or tying a small part of the vas deferens in males (Vasectomy) or fallopian tube in female (Tubectomy).

MULTIPLE CHOICE QUESTIONS:

1. Spore formation occurs in

a) Yeast (b) Hydra (c) Amoeba (d) Rhizopus

Ans: d

2. Which of the following can undergo regeneration

(a) Flat worm (b) Round worm (c) Rhizopus (d) Amoeba

Ans: a

3. Rose is multiplied by

(a) tissue culture (b) cutting (c) Layering (d) seeds

Ans: b

4. Pollen grains are produced by

(a) ovary (b) anther (c) filament (d) stigma

Ans: b

5. The male sex organ of a flower is

(a) stamen (b) sepal (c) petal (d) carpel

Ans: a

6. Male gametes are produced by

(a) pollen grains (b) embryo sac (c) sigma (d) ovary

Ans: a

7. Receptive part of carpel is

(a) ovary (b) Stigma (c) placenta (d) style

Ans: b

8. On germination each pollen grain produces

(a) one male gamete (b) 3 male gametes (c) four male gametes (d) 2 male gametes

Ans: d

9. In man fertilization takes place in

(a) ovary (b) vagina (c) fallopian tube (d) uterus

Ans: c

10. Which of the following is a mechanical barrier to conception

(a) condom (b) abortion (c) Cu T (d) oral pill

Ans: a

11. Fertilization in plants occurs in

(a) embryo sac (b) Pollen tube (c) stigma (d) style

Ans: a

12. Name the fusion product of male & female gametes

(a) ovum (b) zygote (c) PEN (d) sperm

Ans: b

13. Which part of the flower forms the fruit

(a) stamen (b) ovary (c) petals (d) ovule

Ans: b

14. The normal duration of menstrual cycle is

(a) one day (b) 14 days (c) 28 days (d) 7-8 days

Ans: c

15. Arrest of reproductive capacity in woman in the age of 45-55 years is known as

(a) menopause (b) Puberty (c) menarche (d) gestation

Ans: a

16. Vital connection between mother and foetus is called

(a)uterus (b) Placenta (c) vagina (d) embryo sac

Ans: b

17. The process of attachment of embryo in the uterus is called

(a) placentation (b) implantation (c) gestation (d) ovulation

Ans; b

18. Which of the following is not an STD

(a) AIDS (b) syphilis (c) typhoid (d) gonorrhoea

Ans: c

19. Which of the following is an IUCD

(a) Cu T (b) Diaphragm (c) tubectomy (d) oral pills

Ans: a

20. Which of the following is a sexually transmitted viral disease

(a) genital warts (b) syphilis (c) typhoid (d) gonorrhoea

Ans: d

VERY SHORT ANSWER TYPE QUESTIONS (1mark each)

1. Define reproduction.

Ans : It is the process of producing new organism of the same species by existing organisms of a species.

2. Define fertilization. Where the fertilization does takes place in human female?

Ans: It is defined as the fusion of a male gamete(sperm) with a female gamete(ova) to form a zygote during sexual reproduction.

The fertilization takes place in oviduct in human female

3. Name two type of reproduction.

Ans: Two main type of reproductions is asexual reproduction and sexual reproduction.

4. The anther contains: a. Sepal b. ovules c. carpel d. Pollen grains

Ans : Pollen grains

5. What method will you use for growing jasmine and rose plant?

Ans: Artificial mode of vegetative reproduction-layering and grafting are used for growing jasmine and rose plant.

6. Define menstruation.

Ans-The breakdown and removal of inner thick and soft lining of uterus along with blood vessels in the form of vaginal bleeding is called menstrual flow or menstruation.

7. Write the name of male and female reproductive part of a flower.

Ans: Male reproductive part is stamen, which consists of filament and anther. Female reproductive part is carpel, which consists of ovary, style and stigma.

8. Define gestation period. What is the gestation period in human?

Ans: The time period from the development of foetus inside the uterus till birth is called gestation period. In humans, the gestation period lasts for 9 months or 40 week or 280 days.

9. Why do testes in mammals descend in scrotum?

Ans: The location of the scrotum regulates the temperature of the testes because sperm formation requires a lower temperature than the body temperature.

10. Name the type of fission carried out by Amoeba.

Ans : Amoeba reproduces by binary fission in which one cell divides into two daughter cells.

11. Name two sexually transmitted diseases.

Ans : Gonorrhoea and syphilis.

12. What is vegetative propagation?

Ans : The development of new plants from parts such as roots, stem and leaves, of the plant is called vegetative propagation.

13. Name the male and female gonads and what are the products they produce.

Ans: Male gonads-Testes, Products-Hormone testosterone which stimulates the secretion of sperm from testes.

Female gonads – ovaries, Products-hormones estrogen and progesterone, which stimulates the secretion of eggs.

14. Which part of human female reproduction system is called - birth canal and the -womb?

Ans –Vagina is called the birth canal and the uterus is called the womb

15. Write the full form of IUCD and AIDS,

Ans- (a) Intra Uterine Contraceptive Device (b) Acquired immune deficiency syndrome.

16. What is syngamy?

Ans: The fusion of one male gamete with an egg to form zygote is called syngamy.

17. What is advantage of fruit formation in plant?

Ans: Fruit formation helps in easy dispersal of seed.

18. What is ovulation?

Ans: The release of ovum or the egg from the ovary is called ovulation.

19. What is menopause?

Ans-The permanent stoppage of menstruation at age of 45-50 years is called menopause.

SHORT ANSWER TYPE QUESTIONS (Each of 2 marks)

1. What is the importation of DNA copying in reproduction?

Ans- DNA copying helps to pass on the parental body features to offspring's. It produces variations, which are useful for the survival of species over time.

2. Why is variation beneficial to the species but not necessarily for the individual?

Ans-Organisms are normally adopted to live in a particular kind of niche. In case of alternation in the ecological conditions of that niche, the organisms would not be able to survive. Only the variants' the organisms resistant to changes would survive and grow further. Thus variation is beneficial to the species not necessarily for the individual.

3. How does binary fission differ from multiple fission?

Ans- Binary fissions results in the formation of two equally sized daughter cells, whereas multiple fission results in the formation of many daughter cells.

4. How will an organism be benefited if it reproduces through spores?

Ans -An organism if it reproduces through spores in the following ways:

a. Spores are formed in large number.

B. Spores have an outer thick wall that protect them in adverse conditions until they come in contact with another moist surface and begin to grow.

5. Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?

Ans- More complex organisms cannot give rise to new individuals through regeneration because:

i. Their body is highly complicated.

ii. There are specific organs for specific functions.

iii. There is a labour division in the body of complex organisms.

iv. Regeneration is carried out by specialized cells which are not present in complex organisms.

6. Why vegetative reproduction is practiced for growing some type of plants?

Ans-Vegetative reproduction is practiced in some types of plants due the following reasons:

- a. The plants which do not produce viable seeds are propagated by vegetative propagation such as banana, orange and rose.
- b. Plants raised by vegetative propagation bear flower and fruit earlier than those produce from seeds.
- c. Seedless fruits are produced by vegetative propagation.

7. Why is DNA copying an essential part of the process of reproduction?

Ans-a) DNA copying provides cellular apparatus in the daughter cells.

b) DNA copying is essential for obtaining exact body design.

c) It is essential for inheritance of features from parents to offspring.

8. . What are the changes seen in girl's at the time of puberty?

Ans-Variou changes take place in girl's body at the time of puberty :

a) Thick hair growth in the arm pit and genital area.

b) Oily skin and appearance of pimples

c) breast size begins to increase

d) Girls begins to menstruates etc.

9. . What is the role of the seminal vesicles and the prostate gland?

Ans: The secretion of seminal vesicles activates and nourishes the sperms whereas the secretion of prostate gland contributes the mortality and fertility of sperms.

10. How is the process of pollination different from fertilization?

Ans: Pollination is the process of transfer of pollen grains from anther to stigma whereas fertilization is the process of fusion of male gamete with a female gamete to form zygote.

11. How does the embryo get nourishment inside the mother's body?

Ans-The embryo gets nourishment inside the mother's body through placenta. This tissue contains villi on the embryo's side and is surrounded by blood from the mother's side.

Substances like glucose and oxygen pass from the mother's blood to the embryo through villi.

12. If a women is using copper –Twill it help in protecting her from sexually transmitted diseases?

Ans: No, because copper-T helps in preventing pregnancy ,but not provide protection against sexually transmitted diseases.

13. Show by a series of labeled diagram, the manner in which reproduction in Hydra.

Ans- Hydra reproduces by budding using the regenerative cells. A bud develops as a outgrowth in hydra due to repeated cell division of specific site, when full mature, the bud detaches from the parent's body and develop into new individuals.

14. Describe regeneration.

Fig

Ans- It is ability of a fully differentiate organisms to give rise to new individual from its body parts. For example-Hydra and Planaria.

If Hydra is cut into two or more pieces grow into new and complete Hydra .This is known as regeneration.

15. Define the terms unisexual and bisexual flowers by giving one example of each.

Ans- Unisexual flower means flower which contain only one sex organs either stamen or carpel but not both. Eg-papaya, watermelon. Bisexual flower means flower which contain both stamen and carpels. Eg- hibiscus.

16. Leaves of the bryophyllum fallen on the ground produce new plants whereas the leaves of rose do not. Why?

Ans- Leaf of bryophyllum show vegetative propagation in plants where a part of the body becomes detached and develop into a new supporting plant. Here leaves of bryophyllum having plantlets along the margin of the leaf, while this structure is absent in rose plant.

17. Why does menstruation occur?

Ans. The removal of the inner, thick and soft lining of the uterus along with its blood vessels as well as blood in the form of vaginal bleeding is called menstruation. In humans after a girl attains puberty ovaries start producing mature ovum every month and also uterus lining gets thickened to receive zygote. When the uterus does not receive any zygote then menstruation occurs to excrete lining of uterus and degenerating ovum.

18. What are the different methods of contraception?

Ans. The different methods of controlling the child birth are –

(a) Hormonal methods: Various kinds of pills containing hormones which prevent the release of egg from the ovary, without interfering with other phases of menstrual cycle, are taken orally.

(b) Barrier method: These are the physical and chemical barriers which prevent the sperms meeting the egg. Physical devices such as condoms, diaphragms and cervical caps are used.

(c) Intrauterine Devices: Commonly called as I.U.Ds, they are the devices made of plastics and come in different shapes. The most commonly among these is copper- 'T'. These devices are placed inside the uterine cavity and permanently kept there. It prevents the implantation in the uterus.

(d) Surgical methods. The surgical methods are safe and permanent.

(i) Vasectomy. In this operation, a small piece of vas deferens is cut and removed and the two ends of the cut vas deferens are tied.

(ii) Tubectomy. In this operation, fallopian tubes are cut, tied with nylon thread to close the passage, which prevents the passage of eggs.

Q.19. How are the modes of reproduction different in unicellular and multicellular organisms?

Ans. Unicellular organisms contain only one cell so they reproduce by asexual reproduction.

Example: budding, binary and multiple-fission are some of the asexual methods. Multicellular organisms which have complex body designs (have organ systems) ex. Humans, animals, plants reproduce sexually.

Q.20. How does reproduction help in providing stability to populations of species?

Ans. Reproduction is the process through which an organism produces new organism of its own kind. It is necessary because in a population organisms die due to old age or disease thus it keeps the number of organisms in a population constant and provides stability to a population.

SHORT ANSWER TYPE QUESTIONS (3 Marks each)

1. What is advantages of sexual reproduction over asexual reproduction?

Ans- a) Sexual reproduction plays a prominent role in evolution of new species whereas asexual reproduction does not.

b) Sexual reproduction provides opportunity for new combination of gens and thus causes genetic variation. This is not applicable by asexual reproduction.

2. What are function performed by testis in human beings.?

Ans- The testis produces sperms and secrets the hormone testosterone, which regulates the formation of sperms and brings about changes in appearance seen in boys at the time of puberty.

3. Why does menstruation occur?

Ans- Every month as one of the ovaries releases ovum,the uterine wall thickens and prepares itself for receiving the developing zygote.If the fertilization of the ovum does not take place, the lining of uterine wall slowly breaks and menstruation occurs.

4. Differentiate between natural and artificial vegetative propagation.

Ans

Natural propagation

Artificial propagation

a. New parts are obtained from vegetative Parts of old plants

b. Better quality of plant cannot maintained

a. New plant are obtained by vegetative propagation, cutting, layering and grafting artificially

b. Better quality of the plant can be develop.

5. Draw a diagram of a flower to show its male and female reproductive parts. Label on it : a.- the ovary b- the anther c- the filament d- the stigma .

Ans- fig—

6. Describe the fertilization in flower .

Ans : Pollination is followed by fertilization in plants after pollen lands on the suitable stigma, it has to reach the female germ cells in the ovary. The pollen tube grows out of the pollen grain through the style to reach the ovary . After fertilization zygote divide several times to form an embryo within the ovule .The ovules than develop a tough coat and gets converted into seed. The seed contain a future embryo which converted into a seedlings.

7. What is meant by pollination? How it takes place?

Ans : It is transfer of pollen grains from the anther of the stamen to stigma of a carpel .The pollen grains are transferred by many agents like insects, birds humans wind etc.

8. What is 'vegetative propagation'? Write two examples where it is used. State two reasons of practicing vegetative propagation for giving same types of plants.

Ans-Vegetative reproduction means production of new plants from the parts of the old plant like stem roots and leaves without the help of reproductive organs.

Reason of practicing vegetative propagation-

a .It is cheaper, easier more rapid method of propagation.

b .The traits of a parents plants are preserved by vegetative propagation.

9. Illustrate the following with the help of suitable diagram:

a) Regeneration in Planaria.

b) Budding in Hydra.

Ans-Fig

Regeneration is ability of a fully differentiated organism to give rise to new individual from its lost body parts. For ex-in Planaria ,it can be cut into number of pieces and each pieces grows into complete organism. In Budding a small part of the body of the parent grows out as a 'bud' which

than detaches and become a new organism. For ex- In Hydra bud develop as an outgrowth due to repeated cell division, when fully mature it detach from parent body and develop into new individual.

10. .Give differences between asexual and sexual reproduction.

Ans:	Asexual Reproduction	Sexual Reproduction
	1.Only one parent is involved in asexual reproduction.	1.Two organisms, one male and one female are involved.
	2. Gametes are not formed.	2. Gametes are formed .
	3. Offspring's formed are genetically identical to the parent.	3. Offspring's formed are genetically Different from their parent

11. Give a short account of menstruation in females.

Ans—The breakdown and removal of the inner thick and soft lining of the uterus along with its blood vessels in the form of vaginal bleeding is called menstruation. The series of cyclic changes involves the formation of follicles, preparation of uterine wall for implantation ,ovulation ,secretion of nutritive fluid by mature endometrium. In absence of fertilization , the uterine wall collapse and leads to discharge of blood and mucus with unfertilized egg.

12. Describe why :

- a) Scrotum remains outside the body of human males ?
- b) Some plants are propagated only by vegetative propagation ?

Ans : a) Scrotum are located outside the body of human male because sperm formation requires lower temperature than the normal body temperature .

b) Some plants are propagated only by vegetaive propagation because they have lost the capacity to produce seeds .ex-Banana, orange, Jasmine etc.

13. How does reproduction help in providing stability to populations of species ?

Ans-Niche is a place or position suitable for an organism .The DNA copying during reproduction helps in the maintenance of the body design features that allow the organism to use the particular niche. This is how reproduction helps in providing stability to population of species.

LONG ANSWER TYPE QUESTIONS (5 Marks Each)

14. Draw a diagram of human female reproduction system.

Ans- DIAGRAM OF FEMALE REPRODUCTIVE SYSTEM

15. Draw a labeled diagram of longitudinal section of pistil of flower showing germination of pollen grains on the stigma.

Ans-Fig DIAGRAM OF FLOWER

16. Describe a neat and well labeled diagram of male reproductive system in human.

Ans DIAGRAM OF MALE REPRODUCTIVE SYSTEM

17. Describe the changes taking place in female reproductive organs every month Or What will happen if ovum is not fertilized? Describe the events in a sequence wise manner. Or Why does menstruation occur?

Ans-Cyclic changes taking place in the reproductive organs of non pregnant women are termed as menstrual cycle. They take place if the ovum is not fertilized. Important events in sexual cycle of females:

Ovulation-Release of mature ovum from the ovary.

Menstruation-Degeneration and removal of inner thickened lining of uterus along with blood after every 28 days, through the vaginal canal Both these events stop if pregnancy occurs and are resumed after the child birth: If fertilization does not occur, both the processes keep occurring periodically every month.

18. How do following organisms reproduce?

a) Amoeba

Ans: binary fission

b) Planaria

Ans- fragmentation, regeneration, transverse binary fission

c) Yeast

Ans- budding , spore formation

d) Frog

Ans- Sexual

e) Rose

Ans-grafting, cutting

f) Bacteria

Ans-binary fission, spore formation

TEST PAPER:

One mark question

Q1. Name the type of fission carried out by amoeba.

Ans. Binary fission.

Q2. What is vegetative propagation?

Ans. When new plants are grown by using vegetative parts like root, stem and leaves it is known as vegetative propagation.

Q3. Name an organism which reproduces by multiple fission.

Ans. Plasmodium {malarial parasite}

Q4. What is Puberty?

Ans. The age at which the human males and females becomes sexually mature is called puberty.

Q5. What is pollination?

Ans. The transfer of pollen grains from anther to the stigma of the same or another flower of the same kind is called pollination.

Q6. What is fertilization?

Ans. The fusion of male and female gametes is called fertilization.

Q7. What is placenta?

Ans. The tissue connecting developing embryo {foetus} and mother is called placenta.

Q8. What is asexual reproduction?

Ans. The process of reproduction in which only one parent is involved and no sex cells are involved is called asexual reproduction.

Q9. Write the expanded form of AIDS.

Ans. Acquired Immuno deficiency Syndrome is the full form of AIDS.

Q10. Name two sexually transmitted diseases.

Ans. 1.AIDS

2. Gonorrhoea

3. Syphilis

Two mark question

Q1. Name those parts of the flower which serve the same function as the following do in the animals:

1. Testes
2. Ovary
3. Eggs
4. Sperms

Ans. 1. Stamen

2. Carpel

3. Ovule

4. Pollen grain

Q2. What methods will you use for growing jasmine and rose plant?

Ans. Layering method of artificial vegetative propagation can be used for growing jasmine plant.
Stem cutting method

can be used for growing rose plant.

Q3. Mention any two functions of human ovary.

Ans .a. It produces ovum the female gamete.

b. It secretes hormone estrogen.

Q4. Define menstruation.

Ans. The breakdown and removal of the inner thick and soft lining of the uterus along with its blood vessels in the form of vaginal bleeding is called menstruation.

Q5. How the surgery methods are misused by people to prevent pregnancy?

Ans. Surgery methods are misused to prevent pregnancy. This method can be used for removal of unwanted pregnancies by people who do not want a particular child which happens in case of illegal sex selective abortion of female foetus.

Q6. What is the significance of human testes being located in the scrotum?

Ans. Scrotum protects the testes by regulating the temperature of the testes. Sperms need a temperature less than the body temperature for their production and development.

Q7. Questions: Name those parts of a flower which serve the same function as the following do in the animal

(i) Testis (ii) Ovary (iii) Eggs (iv) Sperms

Ans: Testis as anther

Ovary ovules present inside ovary

Eggs as eggs

Sperms as pollen grains

Q.8 Pre - natal sex determination has been prohibited by law. State two reasons.

Ans: Prenatal sex determination has been prohibited by law because of indiscriminate female foeticide. As a result of this, child sex ratio is declining at an alarming rate in some sections of our society. For a healthy society, the female male sex ratio must be maintained.

Q.9. What is placenta ? State its any two roles during pregnancy.

Ans: The placenta is an organ that connects the developing fetus to the uterine wall to allow nutrient uptake, waste elimination, and gas exchange via the mother's blood supply. "True" placentas are a defining characteristic of eutherian or "placental" mammals, but are also found in some snakes and lizards with varying levels of development up to mammalian levels the following are the roles :-

(a) For nine months the placenta feeds and nourishes the fetus while also disposing of toxic waste.

(b) Without it the baby could not survive. After your baby is born, the placenta no longer serves a function.

Q10. Small piece of root tissue was taken from the rose plant and placed in a nutrient medium. Each root tissue produced a new rose plant. Name the reproductive process involved. What type of genes will be possessed by new rose plant ?

Sol. (i) This process is called tissue culture.

(ii) Genes possessed by the new plant is same as that of the parent plant.

Three marks question

Q1. (a). What is fertilization? Distinguish between external fertilization and internal fertilization.

(b). What is the site of fertilization in human beings?

Ans.(a) Fertilization is defined as the fusion of male and female gametes to form a zygote during a sexual reproduction.

Difference between external and Internal fertilization

External fertilization

1. The fusion of male and female gametes occurs outside the body

2. Both individual discharge their gametes outside the body and development occurs outside the

Example: Frogs

(b) The site of fertilization in human beings is in the fallopian tube of female reproductive system.

Q2. Give two advantages of vegetative propagation.

Ans. 1(i). Vegetative propagation is a cheaper, easier and more rapid method of propagation in plants than growing plants from seeds.

(ii). The characteristics of the parent plant are preserved by vegetative propagation

Q3. Describe the surgical methods of birth control.

Ans. The surgical method can be done in males as well as in females.

In case of males the vas deference is blocked and sperm transfer is prevented. In case of females the fallopian tube is blocked the egg will not be able to reach the uterus. These are permanent methods of birth control.

Q4. Why is DNA copying an essential part of the process of reproduction?

Ans. DNA copying is an essential part of the process of reproduction because

1. DNA provides cellular apparatus in the daughter cells.

2. DNA in the daughter cells will control their functioning

3. DNA copies will retain the characters.

Q5. What could be the reasons for the adopting of contraceptive methods?

Ans. Contraceptive methods are adopted for the following reasons:

1. For preventing unwanted pregnancies and keeping the health of women.

2. To prevent the transmission of fatal diseases mechanical barrier methods are used.

Q.6. Mention any three advantages of variation in individuals.

Ans: (i) Variation helps in survival of species.

Internal fertilization

1. The fusion of gametes occurs inside the body.

2. The gametes fuse inside the female the body and

Development occurs

Inside the body

Example: Birds, cattle, humans

(ii) It is the basis of evolution.

(iii) It brings adaptation in individuals.

Q.7. Name the filamentous structure seen in pond. Explain how do they reproduce.

Ans: Spirogyra have filamentous structure. They reproduce by the process of fragmentation in which they break up into smaller pieces upon maturation. These pieces grow into new individuals.

Q.8. A student noticed that an organism by mistake was cut in two parts. After sometime both the parts developed into new individuals.

(a) Name the mode of reproduction used by the organism.

(b) State the type of cells which carry this process.

(c) Write examples of two organisms which multiply by this process.

Ans:

(a) Regeneration (asexual reproduction)

(b) Specialised cells.

(c) Hydra and Planaria

Q9. Ravi took three bread slices and kept the three pieces of the slices in the following conditions.

(i) Slice 1 in a dried and dark place.

(ii) Slice 2 in a moist and dark place.

(iii) Slice 3 in moist and in refrigerator.

What would he observe in each of the above conditions ? Give reasons for your answer ?

Ans:

(i) In Slice 1, No spore will develop due to lack of moisture.

(ii) A white cottony mass surrounded with a black mass is seen spreading on the surface of slice 2 due to formation of sporangia and spores as moisture and darkness provide favourable condition.

(iii) In slice 3, no spore will be formed as it is kept at a lower temperature in the refrigerator, which is not a favourable condition.

Q10. (i) State the function of (a) stigma (b) pollen tube. (ii) What happens to the ovule after fertilization ?

Ans: .

(i) (a) Stigma receives pollens.

(b) Pollen tube helps to carry the male germ cell to the female germ cell from the stigma to the ovary.

(ii) After fertilization, the ovule develops into seed.

Q11. Explain the structure of flower with the help of a labeled diagram.

Ans. DIAGRAM OF FLOWER

The flower is made up of four main parts:

1. Sepals 2. Petals 3. Stamen 4. Pistil

Seeds are green leaf like structure. Petals are colourful parts of the flower. Stamens are made up of filament and anther and are called the male part of the flower. Pistil is known as the female part of the flower and consists of stigma, style and ovary.

Q.12. Differentiate between asexual and sexual reproduction.

Ans.

Asexual reproduction

Sexual reproduction

1. Only one parent is required.

1. Two organisms, one male and one Female are involved.

2. Gametes are not involved.

2. Gametes are involved

3. Offsprings formed are genetically identical to the parent.

3. Offspring's formed are genetically different from the parent

4. Multiplication occurs faster.

4. multiplication is slower

Examples are amoeba, hydra.

Examples are fishes, mammals and reptiles.

Q.13. What is the significance of fertilization? Enumerate the method of fertilization as seen in a flowering plant.

Ans. Significance of fertilization:

1. Fertilization restores the number of chromosomes.

2. It brings variation in the Offsprings.

The methods of fertilization as seen in a flowering plant are as follows:

In plants pollination is followed by fertilization. The pollen grains are deposited on stigma and form tubes called the pollen tubes which grow through the style and reach the ovary. The pollen tube contains male gamete and the ovary contains ovules which contain the egg or female

gamete. The male gamete fuses with the female gamete to form the zygote which divides and redivides to form embryo. The ovary develops into fruit and ovules develop into seed.

Q.14. Describe the asexual reproduction in amoeba. Describe budding in hydra.

Ans. Asexual reproduction in amoeba by binary fission. Binary fission is division of one cell into two similar cells. In this method the nucleus first divides into two, followed by the division of cytoplasm. The cell finally splits into two daughter cells

Hydra reproduces by budding using the regenerative cells. A bud develops as an outgrowth in hydra due to repeated cell division at one specific site. When fully mature, the bud detaches itself from the parent body and develops into independent individuals

Q.15. {a} Draw labeled diagram of the female reproductive system in human beings.

{b }How the sexual mode of reproduction leads to better survival of the species.

Ans.(a) DIAGRAM OF FEMALE REPRODUCTIVE SYSTEM

{b} As we know in cell division, copy of DNA is having some variation from the original one and in sexual reproduction germ cells from two different individuals fuses together and thus create new combination of variants and as the variations are in living individuals, so naturally they are favourable variations and combination of such favourable variation will provide survival of species.

Q16. Write the function of the following with respect to the point given below :

- (a) Urethra in male reproductive system.
- (b) Long tail of sperms.
- (c) Inner linings of uterus is richly supplied with blood.
- (d) Pollen tube develops from the pollen grain which lands on stigma.
- (e) Testes are located outside abdominal cavity in scrotum.

Ans:

- (a) Common passage for sperms and urine.
- (b) Helps sperms to move towards the female germ-cell.
- (c) To nourish the growing embryo.
- (d) To reach female germ cells.
- (e) Sperm formation requires a lower temperature.

Chapter – 9

Heredity and Evolution

Heredity:

The transmission of characters (or traits) from the parents to their offspring is called heredity.

Variation:

The differences in the characteristics (or traits) among the individuals of a species is called variation.

For example, human height is a trait which shows variation. Another example of variation in human beings involves ears. The lowest part of the ear is called earlobe. In most of the people, the earlobe is 'hanging' and it is called free earlobe. In some people, earlobe is closely attached to the side of the head and it is called attached earlobe.

Genetics: The study of heredity and variation is known as genetics. Heredity is defined as transmission of characteristics from parents to offspring's. The differences in characters of parents and offspring's is known as variation.

Accumulation of variations:

- The significance of a variation shows up only if it continues to be inherited by the offspring for several generations.
- The great advantage of variation to a species is that it increases the chance of its survival in a changing environment.

For example, the accumulation of 'heat resistant' variation (or trait) in some bacteria will ensure its survival even when the temperature in its environment rises too much due to a heat wave or some other reasons. On the other hand, the bacteria which did not have this variation to withstand heat would not survive under these circumstances and die.

There are two types of variation- somatic variation and gametic variation.

Somatic variation occurs in the somatic cell of the body. They are not inherited or transmitted in the next generation. So, they are also known as acquired traits.

Gametic variation occurs in the germ cells of the body. They are inherited in the next generation. So, they are known as inherited traits.

Importance of variations

- It is the basis of the heredity.
- It is the basis of the evolution also.
- It increases the chances of the survival of the organism according to the changing environment.

Causes of variation

The most common causes of variations are mutation, recombination and random mating. Recombination or crossing over is one of the important reason for variation. It is a exchange of chromosome segment at the time of gamete formation.

Some important terms:

- **Chromosome** is a thread-like structure in the nucleus of a cell formed of DNA which carries the gene.
- **Genes:** Mendel used the term factor for a gene. A gene is a unit of DNA responsible for inheritance of characteristics from parents to their offspring during reproduction.
- **Allele:** A pair of genes that control the two alternatives of the same phenotypic characteristics **e.g. tt/TT**
- **Genotype** : It is the genetic constitution of an organism which determines the characters.
- **Phenotype:** The characteristic (or trait) which is visible in an organism is called its **phenotype**.
- **Dominant:** The gene which expresses itself in F1 generation is known as dominant gene.
- **Recessive:** The gene which is unable to express itself in presence of dominant gene.
- **Homozygous:** The organism in which both the allele of a gene for particular character are similar. e.g. TT/tt
- **Heterozygous:** The organism in which both the allele of a gene for particular character are unlike. E.g.

Mendel and his contribution in Genetics

- Gregor Mandel was the first scientist to make a systematic study of patterns of inheritance which involved the transfer of characteristics from parents to progeny.
- He did this by using different varities of pea plant (*Pisum sativum*) which he grew in his garden.
- Mendel used a number of contrasting visible characters of garden peas- shape of seeds (round and wrinkled), colour of seeds (yellow and green), height of pea plants (tall or dwarf), colour of flowers (white or violet) and so on.















Mendel chose pea plants for studying inheritance because –

1. Pea plants had a number of clear cut differences which were easy to identify.
2. Pea plants were self-pollinating which enabled them to produce next generation early.
3. Any generations of pea plants can be produced in a comparatively short time span and their study is much simpler than that of animals.

Hybrid:

A new form of plant resulting from a cross (or breeding) of different varieties of a plant is known as hybrid.

G.J. Mendel started his work on *Pisum sativum* (garden pea). He was known as Father of genetics. He had chosen seven pair of contrasting character-

Seed		Flower	Pod		Stem	
Form	Cotyledons	Color	Form	Color	Place	Size
						
Grey & Round	Yellow	White	Full	Yellow	Axial pods, Flowers along	Long (6-7ft)
						
White & Wrinkled	Green	Violet	Constricted	Green	Terminal pods, Flowers top	Short (1ft)
1	2	3	4	5	6	7

The reason of choosing garden pea for experiment was-

- Short life cycle.
- Large number of seeds produced.
- Self-pollination.
- Several contrasting characters can be found.

Rules for the inheritance of trait: Mendel's contribution:

Monohybrid cross:

When we breed two pea plants having one contrasting characteristic each (of one trait each) to obtain new plants, then it is called monohybrid cross.

Dihybrid cross:

When we breed two pea plants having two contrasting characteristic each (of two traits each) to obtain new plants, then it is called dihybrid cross.

Inheriyance is the transmission of genetically controlled characteristics (or traits) from one generation to the next.

Mendel Laws

Law of Dominance: If the two alleles at a locus differ, then one, the **dominant allele**, determines the organism's appearance; the other, the **recessive allele**, has no noticeable effect on the organism's appearance.

Law of Segregation: The two alleles for a heritable character separate (segregate) during gamete formation and end up in different gametes.

Law of Independent Assortment: Each pair of alleles segregates independently of other pairs of alleles during gamete formation.

Monohybrid Cross/Monohybrid inheritance and the law of segregation:

- According to Mendel's first law of inheritance: The characteristics (or traits) of an organism are determined by internal 'factors' which occur in pairs. Only one of a pair of such factors can be present in a single gamete.
- Mendel first crossed pure-bred tall pea plants with pure-bred dwarf pea plants and found that only tall pea plants were produced in the first generation or F1 generation.
- Mendel concluded that the F1 generation showed the traits of only one of the parent plants: tallness, which is dominant trait and the other trait which is suppressed by the dominant trait in f1 generation is called recessive trait that is dwarfness.
- Mendel then crossed the tall pea plants of the F1 generation and found that tall plants and dwarf plants were obtained in the second generation (F2 generation) in the ratio of 3:1 (three fourth plants were tall and one-fourth plants were dwarf).
- Mendel concluded that the dwarf trait of parent pea plant which has seemingly disappeared in the first generation progeny, reappeared in the second generation. Mendel also noted that all the pea plants produced from the hybrid, tall plants of F1 generation were either tall or dwarf, there were no plants with intermediate height (or medium height) in-between the tall.

and dwarf plants. so Mendel's experiments showed that the traits are inherited independently.

- The ratio 3:1 is known as the monohybrid ratio.

When one pair of contrasting characters was taken to cross two pea plants, it is known as monohybrid cross.

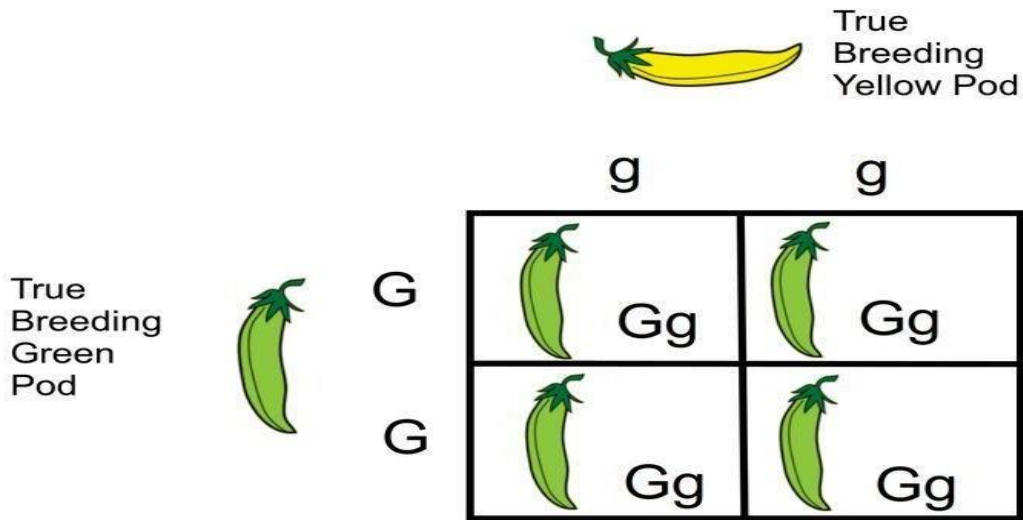


Fig.1. Monohybrid Cross

Fig.1. depicts the monohybrid cross between true breeding yellow pod and true breeding green pod. All the pods obtained was green in colour. The offspring's obtained are known as F1 progeny or First filial generation.

In case of heterozygous condition-

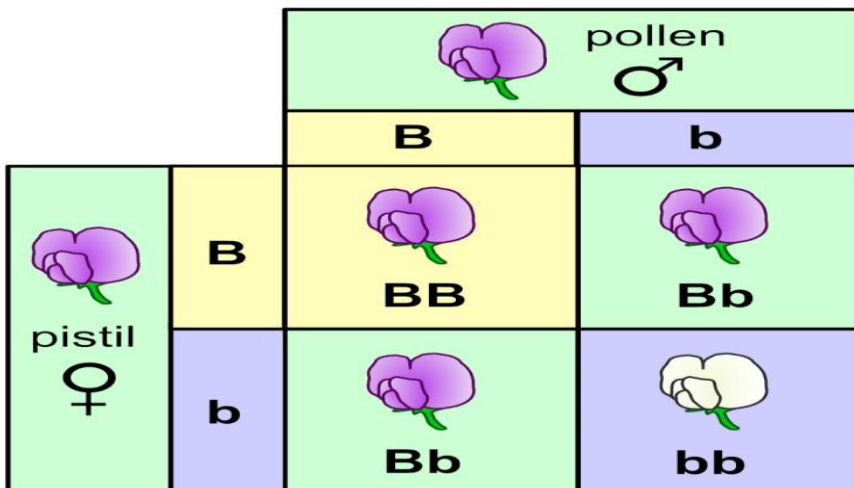


Fig.2. Monohybrid cross with heterozygous parents

In the above figure, the parents are heterozygous, so phenotypically 3 purple flower and 1 white flower was produced. But genotypically, 1 homozygous dominant (BB), 2

heterozygous dominant (Bb) and one homozygous recessive (bb).

Dihybrid Cross

When two pairs of contrasting characters are taken to cross two plants, it is known as dihybrid cross.

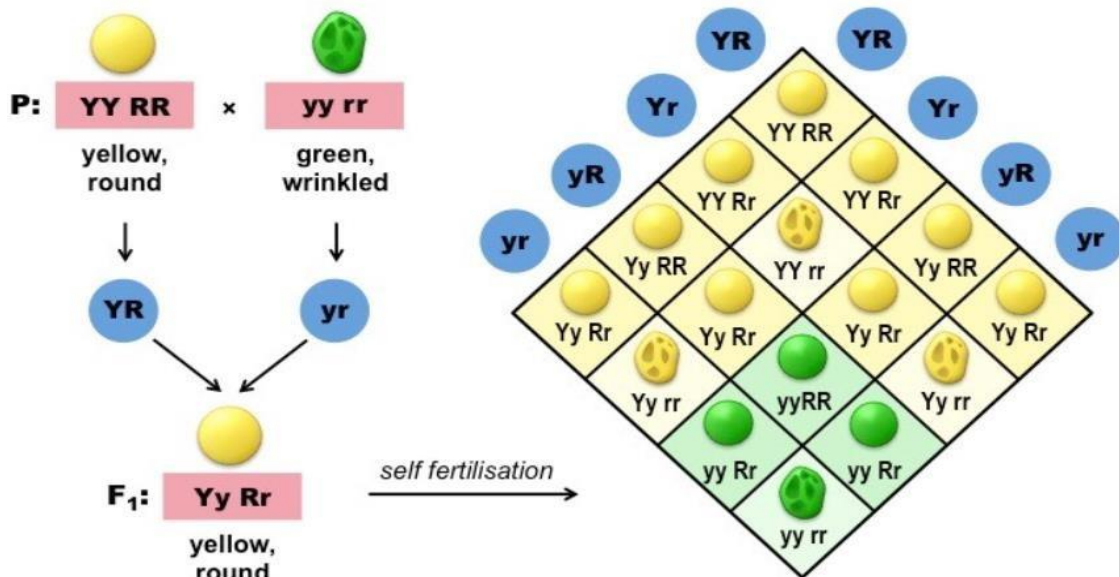


Fig.3. Dihybrid Cross

The phenotypic ratio was found to be 9:3:3:1

9 are round yellow

3 are round green

3 are wrinkled yellow

1 is wrinkled green

But the genotypic ratio was found to be 1:2:1: 2:4:2: 1:2:1.

Sex Determination

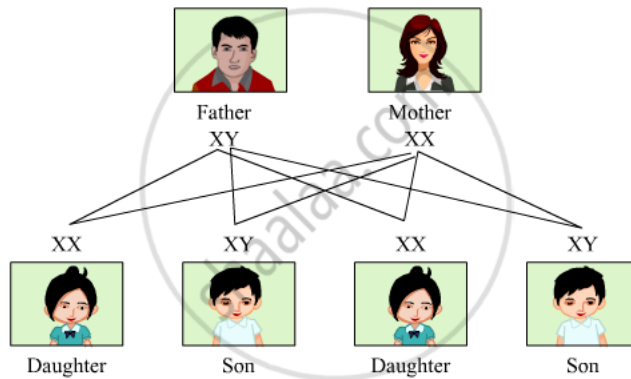
Sex determination is used to define the sex of the offspring's. Environment and genetic factors determine the sex of the offspring's. Environment factor includes temperature such as gender in turtles are determined according to the temperature.

Types of Sex Determination

Different types of sex determination are- XX-XY type (humans), XX-XO type (insects), ZW-ZZ type (chicken) and ZO-ZZ type (moths and butterflies).

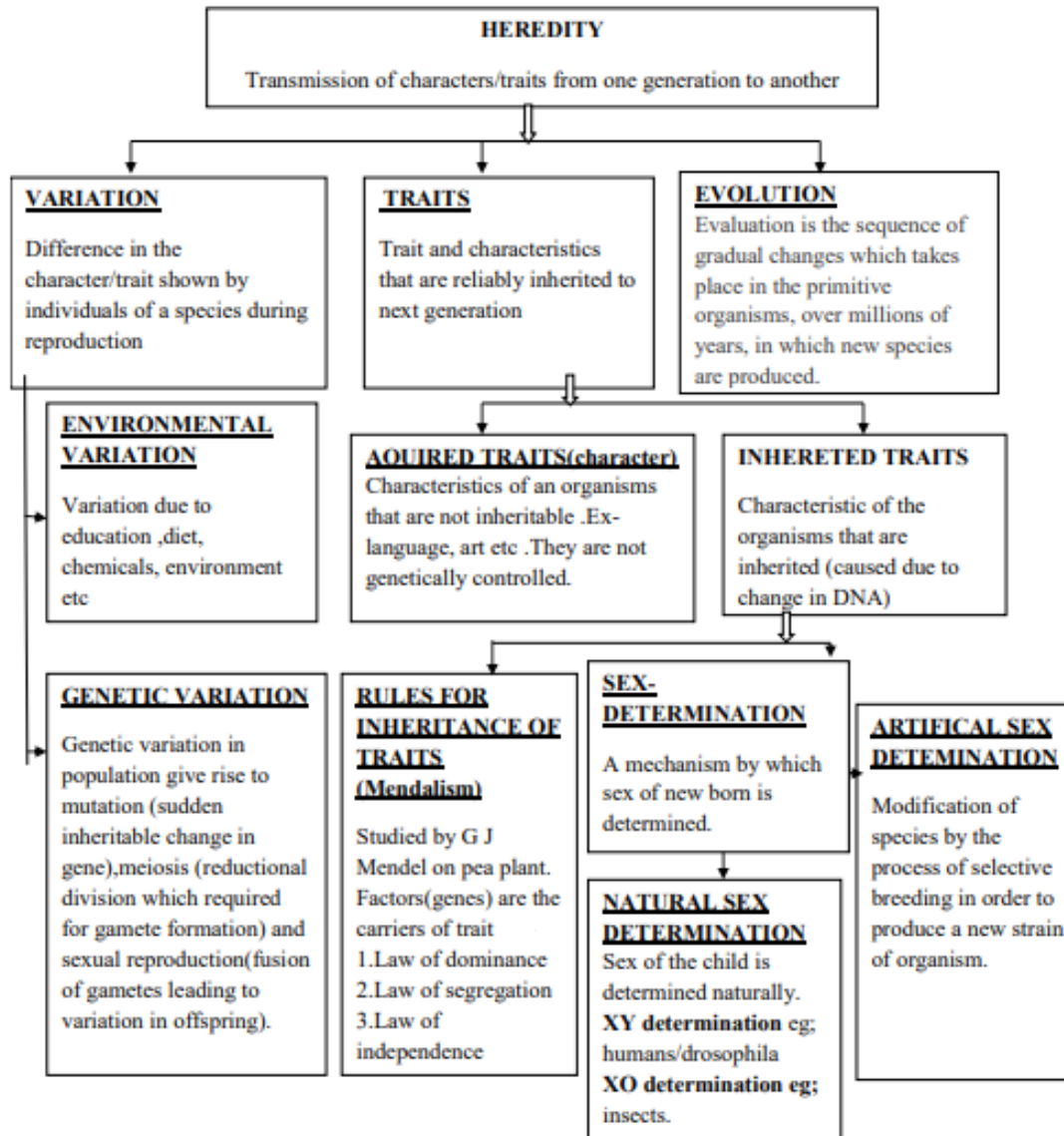
Genetic factors include the presence of sex chromosomes. For example, in humans, presence of two X chromosomes leads to female offspring whereas presence of one X and one Y chromosome forms male offspring's.

In human beings there are 23 pairs of chromosomes. Out of these 22 pair of chromosomes are known as autosomes whereas 23rd pair of chromosomes are known as sex chromosomes or allosomes. Sex of the offspring's is determined by the chromosome inherited from father.



Sex determination in human beings

Mind map-



1 mark Questions

Q1. Genetics is defined as:

- a) Study of genes
- b) The study of chromosomes
- c) The study of humans
- d) Branch of science dealing with heredity and variation.

Q2. The organism on which Mendel performed his experiments

- a) Gram
- b) Garden Pea
- c) Peanut
- d) PigeonPea

Q3. A cross between a tall plant (TT) and short pea plant (tt) resulted in progeny that were all tall plants because—

- a) Shortness is a dominant trait
- b) Tallness is a recessive trait
- c) Tallness is the dominant trait
- d) Height of pea plant is not governed by gene 'T' or 't'

Q4. The character which can be acquired but not inherited is :

- a) Colour of eye
- b) Colour of skin
- c) Nature of hair
- d) Size of body

Q5. A zygote has an X-chromosome both from the father and mother will develop into a:

- a) Boy
- b) X-Chromosome does not determine the sex of child.
- c) Girl
- d) Either boy or girl

Q6. A pregnant woman has an equal chance of her baby being blood group A or blood group AB. Which one of the following shows the possible genotypes of the woman and the father of her child?

- A. $I^A I^A$ and $I^B I^O$
- B. $I^A I^B$ and $I^B I^O$
- C. $I^A I^O$ and $I^B I^O$
- D. $I^A I^B$ and $I^A I^O$

Q7. Assertion : Recessive trait can only be expressed in homozygous condition.

Reason : Dominant trait cannot be expressed in heterozygous condition.

- a) (A) is incorrect and (R) is correct
- b) (A) is correct and (R) is incorrect
- c) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- d) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Q8. Assertion : The great advantage of variation to a species is that it increases the chance of its survival in a changing environment.

Reason: Heredity is the transmission of characters or traits from parents to offsprings.

- a) (A) is incorrect and (R) is correct
- b) (A) is incorrect and (R) is incorrect
- c) Both(A) and (R) are correct but(R) is not the correct explanation of (A)
- d)Both (A) and (R) are correct and (R) is the correct explanation of (A)

Answer:

1.d 2. b 3. c 4. d 5.c 6.A 7.b 8.c

Q9. Do genetic combination of mothers play a significant role in determining the sex of new born?

Answer. No, mothers have no role in determining the sex of the new born. Mothers have a pair of X chromosome. And all children will inherit an 'X' chromosome from their mother regardless of whether they are boys or girls.

Q10. Some plants occur in one of the two sizes: tall or dwarf. This characteristic is controlled by one pair of genes. Tallness is dominant to dwarfness. Choose suitable letters for this gene pair.

Ans. Gene pair can be represented as Tt. T-Tallness-T and Dwarfness-t.(Dominant is always represented with a capital letter and recessive with a small letter).

Short answer questions (3 marks)

Q1. Explain with an example, how genes control the characteristics (or traits).

Ans. Genes are the units of heredity i.e. they transfer characteristics from parents to offspring and determine the characteristics of the offspring.

Example-Transfer of hair color from parents to the offspring. Let's say that the mother has dominant genes for black hair, (BB gene constitution) and the father has recessive gene for blonde hair (bb gene constitution). When fertilization will occur the mother will transfer one B gene for black hair to the zygote and the father will transfer one b gene for blonde hair to the zygote. The resulting offspring will have Bb gene for hair where B is a dominant gene and b is a recessive gene. Since B is dominant it will be

expressed and b will be suppressed, the child will have black hair.

Q2. Gregor Mendel's first law of genetics states "Of a pair of contrasted characters, only one can be represented in a gamete by its internal 'factor'".

- a) Give the modern name for this 'factor'.
- b) State where these factors are found in gametes.

Ans. a) This factor is known as Genes. They are unit of heredity transferred from parents to offspring. Each parent has a gene pair in each cell for each trait studied. One member of the gene pair segregates into a gamete, thus each gamete only carries one member of the gene pair and hence only one out of a pair of contrasted characters is represented in a gamete by its gene.

b) These internal factors known as genes are found on chromosomes which are made of DNA and protein and found in the nucleus of the cell.

Q3. Why did Mendel choose pea plants for conducting his experiments on inheritance?

Ans. 1. Short life cycle.

2. Large number of seeds produced.

3. Self-pollination.

4. Several contrasting characters can be found.

Q4. What is meant by dominant genes and recessive genes? Give one example of each.

Ans. A dominant gene is a gene that is expressed or appears in an organism in the presence of any another gene. Whereas, a recessive gene is a gene that is suppressed in an organism (doesn't appear) in the presence of a dominant gene. A recessive gene is expressed or appears in an organism only if the other gene present is recessive.

Example- Height in Pea plant. Tall Plants may have gene combination of TT or Tt. (where T is a dominant gene). Dwarf plants will only have gene combination of tt (where t is a recessive gene)

Q5. State Mendel's first and second law of inheritance.

Ans. Mendel's first law of inheritance is Law of Segregation which states that gene determines the characteristics/traits of an organism which always occur in pairs. One member of the gene pair segregates into a gamete.

Mendel's second law of inheritance is also known as law of independent assortment which states that in inheritance of more than one pair of traits in a cross simultaneously, the factors responsible for each pair of traits are distributed independently to the gametes.

Q6. "Only variations that confer an advantage to an individual organism will survive in a population". Do you agree with this statement? Give reason for your answer.

Ans. Yes; only variations that confer advantage to an individual organism will survive in a population.

For example- In a population of red beetles, some sudden variation in reproduction produces a green colored beetle. Red beetles are a easy source of prey as they can be easily spotted on the green bushes. The green colored beetle that was produced by a variation could mix up with the green bushes and protect itself from being a prey to predator. If the variation that has occurred in the color of the beetle was blue, then it would have been of no advantage to help in surviving, as it would be easily open to predation like the red beetles.

Q7. A person first crossed pure-bred pea plants having round-yellow seeds with pure-bred pea plants having wrinkled-green seeds and found that only A-B type of seeds were produced in the F₁ generation. When F₁ generation pea plants having A-B type of seeds were cross-bred by self-pollination, then in addition to the original round-yellow and wrinkled-green seeds, two new varieties A-D and C-B type of seeds were also obtained.

- (a) What are A-B type of seeds?
- (b) State whether A and B are dominant traits or recessive traits.
- (c) What are A-D type of seeds?
- (d) What are C-B type of seeds?
- (e) Out of A-B and A-D types of seeds, which one will be produced in
 - (i) minimum numbers, and
 - (ii) maximum numbers, in the F₂ generation ?

(a) Ans. Round Yellow.

Round yellow- RRYY, wrinkled green-rryy. On crossing these two pea plants we get RrYy combination which has dominant gene R for Round shape and Dominant gene Y for yellow color. Hence A-B types of seed produced as a result of the first cross are Round yellow.

(b) A and B are dominant traits since they are Round (R) and yellow (Y)

(c) Round-green

When RrYy obtained in the first generation is self-pollinated, the new varieties obtained are RY, Ry, rY, ry; where RY- Round yellow, Ry-Round green, rY-Wrinkled yellow, and ry- wrinkled green. Since A-B type of seed is Round and yellow, therefore A-D type of seed is Round and Green.

(d) Wrinkled-yellow

When RrYy obtained in the first generation is self-pollinated, the new varieties obtained are RY, Ry, rY, ry; where RY- Round yellow, Ry-Round green, rY-Wrinkled yellow, and ry- wrinkled green. Since A-B type of seed is Round and yellow, therefore C-B type of seed is wrinkled and yellow.

- (e) (i) A-D (Round and green 'Ry' will be produced in minimum number)
- (ii) A-B (Round and yellow 'RY' will be produced in maximum number in F₂ generation)

CCT Question:

Read the newspaper article and answer the questions that follow.

A copying machine for living beings?

Without any doubt, if there had been elections for the animal of the year 1997, Dolly would have been the winner! Dolly is a Scottish sheep that you see in the photo. But Dolly is not just a simple sheep. She is a clone of another sheep. A clone means: a copy. Cloning means copying 'from a single master copy'. Scientists succeeded in creating a sheep (Dolly) that is identical to a sheep that functioned as a 'master copy'.

It was the Scottish scientist Ian Wilmut who designed the 'copying machine' for sheep. He took a very small piece from the udder of an adult sheep (sheep 1).

From that small piece he removed the nucleus, then he transferred the nucleus into the egg-cell of another

(female) sheep (sheep 2). But first he removed from that

egg-cell all the material that would have determined sheep 2 characteristics in a lamb produced from that egg-cell. Ian Wilmut implanted the manipulated egg-cell of sheep 2 into yet another (female)

sheep (sheep 3). Sheep 3 became pregnant and had a lamb: Dolly.

Some scientists think that within a few years it will be possible to clone people as well. But many governments have already decided to forbid cloning of people by law.



Q1. Which sheep is Dolly identical to?

- A Sheep 1
- B Sheep 2
- C Sheep 3
- D Dolly's father

Q2. In line 14 the part of the udder that was used is described as "a very small piece". From the article text you can work out what is meant by "a very small piece". That "very small piece" is :

- A. a cell.
- B. a gene
- C. a cell nucleus
- D. a chromosome

Q3. In the last sentence of the article it is stated that many governments have already decided to forbid cloning of people by law.

Two possible reasons for this decision are mentioned

below. Are these reasons scientific reasons?

Circle either "Yes" or "No" for each.

Reason:	Scientific ?
Cloned people could be more sensitive to certain diseases than normal people.	Yes / No
People should not take over the role of a Creator.	Yes / No

Answers

Q1. A

Q2. A

Q3. Yes, NO

Ch- 10. Light- Reflection and Refraction

1. **Ray of Light** : A line drawn in the direction of propagation of light is called a ray of light.

2. **Beam of Light** : A group of rays of light emitted by a source of light is called a beam of light. A light beam is of three types.

(i) **Parallel beam** : A group of light rays parallel to each other is known as parallel beam of light. 7.

(ii) **Divergent beam** : A group of light rays spreading out from a source of light is called divergent beam of light.

(iii) **Convergent beam** : A group of light rays meeting at a point is called convergent beam 8. of light.

3. **Reflection of Light** : There are some surfaces which have ability to send the light back in the same medium when light strikes it. This 9. phenomena of sending the light back in the same medium by a surface is called reflection of light.

(i) The incident ray, the reflected ray and the normal at the point of incidence all lie in a same plane.

(ii) The angle of incidence is always equal to the angle of reflection, $\angle i = \angle r$.

4. **Image** : When light rays meet or appear to meet after reflection from a mirror, then it is called an image.

1. **Real Image** : It is a kind of image which is formed by actual intersection of light rays after reflection.

2. **Virtual Image** : It is a kind of image which is formed by producing the reflected rays backward after reflection.

5. **Plane Mirror** : Plane mirror is a piece of glass whose one side is polished by using silver paint, which is covered by a coating of red paint to protect the silver layer.

6. **Spherical Mirrors** : It is part of hollow glass sphere whose one surface is polished.

There are two types of spherical mirror.

(i) **Concave Mirror** : It is a spherical mirror whose outer surface is polished and inner or concave side is reflecting surface.

(ii) Convex Mirror : It is a spherical mirror whose inner is polished and outer side or convex side is the reflecting surface.

Principal Focus :

A point on the principal axis of a spherical mirror where the rays of light parallel to the principal axis meet or appear to meet after reflection from the mirror.

Focal Length :

The distance between the pole (P) and principal focus(F) of a spherical mirror is called the focal length of the mirror. It is denoted by f.

Uses of Concave Mirror :

(i) It is used as a shaving mirror because when it is placed close to the face, it forms a large image.

(ii) It is used in solar heating devices like solar cooker, because it converges Sun's rays over a small area to produce high temperature.

(iii) It is used for security checking purposes.

10. Uses of Convex Mirror :

(i) It is used as rear view mirror in automobiles because it gives erect image as well as diminished due to which Pt has wider field of view.

(ii) It is also used in street lights.

11. Mirror Formula :

It is a relation between distance of object, distance of image from the pole of the mirror and its focal length, i.e., relation between 'u', 'v' and It is given by

$$1/f=1/u+1/v$$

12. Magnification : It is defined as the ratio of height of image to the height of the object. It is denoted by letter m.

$$m= \text{height of image}/\text{height of object}$$

13. Refraction of Light : The bending of ray of light when it passes from one medium to another is called refraction of light.

Laws of Refraction :

(i) The incident ray, the refracted ray and the normal at the point of incidence all lie in the same plane.

(ii) When a ray of light undergoes refraction then the ratio of sine of angle of incidence to the sine of angle of refraction is constant.

14. The Refractive Index : The refractive index of medium 2 with respect to medium 1 is given by the ratio of the speed of light in medium 1 and the speed of light in medium 2. This is usually represented by the symbol n_{21} . This can be expressed in an equation form as

15. Refraction by spherical lenses : Lens is a transparent medium which is formed by joining two pieces of spherical glass. There are two types of lenses.

(i) Convex Lens : It is a lens which is thicker at the centre and thinner at the edges.

(ii) Concave Lens : It is a lens which is thinner at the centre and thicker at the edges.

16. Terms related to a lens

Optical Centre of Lens : It is the centre of the lens through which light can pass without any deviation.

Principal Axis : It is the line passing through optical centre and is perpendicular to the line joining its edges.

Principal Focus : It is a point on the principal axis where all light rays which are parallel to principal axis either converge or appear to diverge from, after refraction.

17. Lens formula :

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

18. Magnification : Magnification, $m = \frac{h_2}{h_1}$

Ratio of height of image to the height of object.

It is also given by v/u i.e., Ratio of distance of image to the distance of object.

19. Power of a lens : A beam of light parallel to principal axis either gets converged or diverged after refraction by a lens. Some lenses converge the beam of light to a small extent and some lenses converge it to a large extent. This ability of lens to converge or diverge a beam of light is known as the power of lens. SI unit of power of lens is dioptre : One dioptre is the power of a lens whose focal length is 1 m.

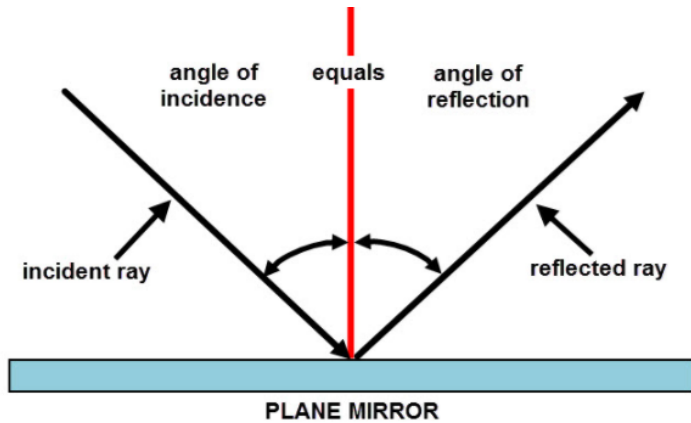
Power of a combination of two or more lenses :

If two or more lenses are placed together to form a combined lens then the power of this combined lens is equal to the sum of the powers of individual lenses.

$$P = P_1 + P_2 + P_3 + \dots$$

Reflection

1. The incident ray, reflected ray and the normal all lie in the same plane.
2. Angle of incidence = Angle of reflection [$\angle i = \angle r$]



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:

- **Convex mirror:** In this mirror reflecting surface is convex. It diverges the light so it is also called a diverging mirror.
- **Concave mirror:** In this mirror reflecting surface is concave. It converges the light so it is also called converging mirror.

Important terms related to spherical mirror

- **Center of Curvature:** The centre of hollow sphere of which mirror is a part.
- **The radius of curvature:** The radius of hollow sphere of which mirror is a part.
- **Pole:** The centre of mirror (middle point) is pole.
- **Principal axis:** The line joining the pole and center of curvature is called principal axis.
- **Aperture:** It is the effective diameter of the spherical mirror.
- **Principal Focus:** The point on the principal axis, where all the incident rays parallel to principal axis converge or diverge after reflection through mirror.
- **Focal Length:** The distance between pole and focus is focal length.

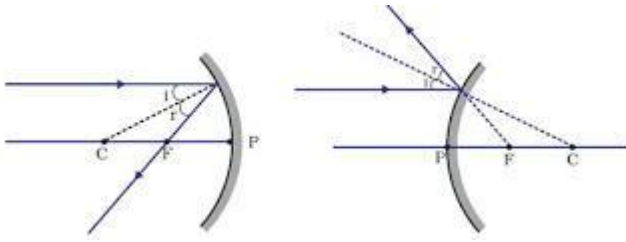
Relationship between focus and radius of curvature

Focal length is half the distance between pole and radius of curvature.

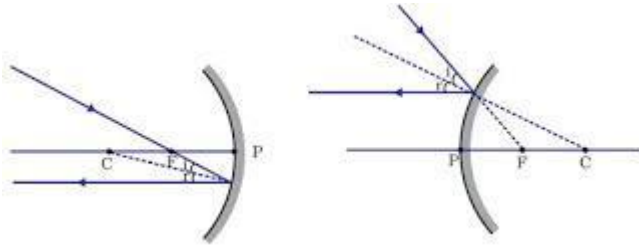
$$F = R/2$$

Rules for making ray diagrams in spherical mirrors

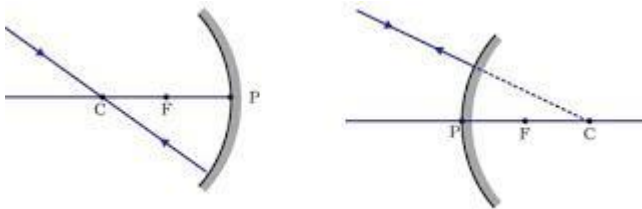
- (i) A ray parallel to the principal axis, after reflection, will pass through the principal focus in case of a concave mirror or appear to diverge from the principal focus in case of a convex mirror.



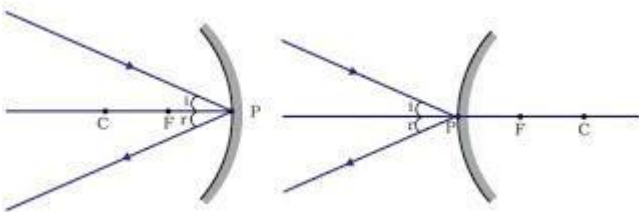
(ii) A ray passing through the principal focus of a concave mirror or a ray which is directed towards the principal focus of a convex mirror, after reflection, will emerge parallel to the principal axis.



(iii) A ray passing through the centre of curvature of a concave mirror or directed in the direction of the centre of curvature of a convex mirror, after reflection, is reflected back along the same path.



(iv) A ray incident obliquely to the principal axis, towards a point P (pole of the mirror), on the concave mirror or a convex mirror, is reflected obliquely. The incident and reflected rays follow the laws of reflection at the point of incidence (point P), making equal angles with the principal axis.



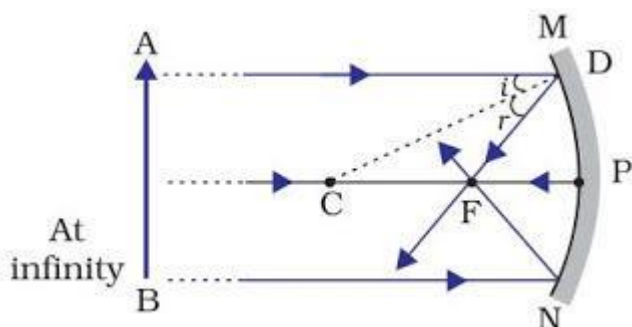
Ray diagrams for images formed by concave mirror

(i) When object is at infinity

Image Position – At 'F'

Nature of image – Real, inverted

Size – Point sized or highly diminished

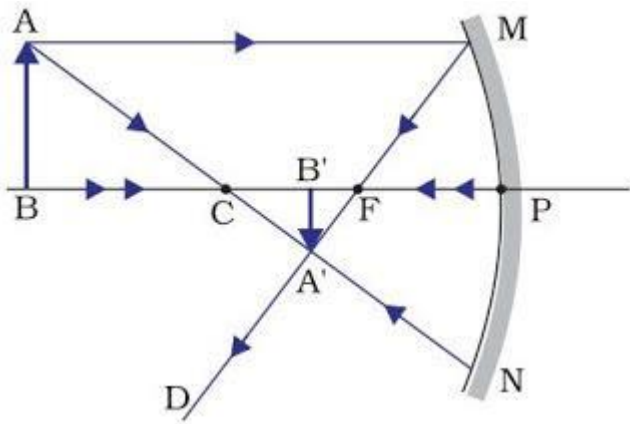


(ii) When object is beyond 'C'

Image Position – Between ‘F’ and ‘C’

Nature of image – Real, inverted

Size – Diminished

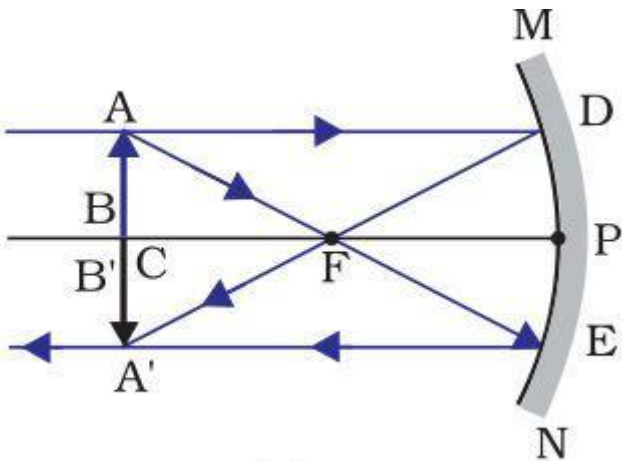


(iii) When object is at ‘C’

Image Position – At ‘C’

Nature of image – Real, inverted

Size – Same size as that of object

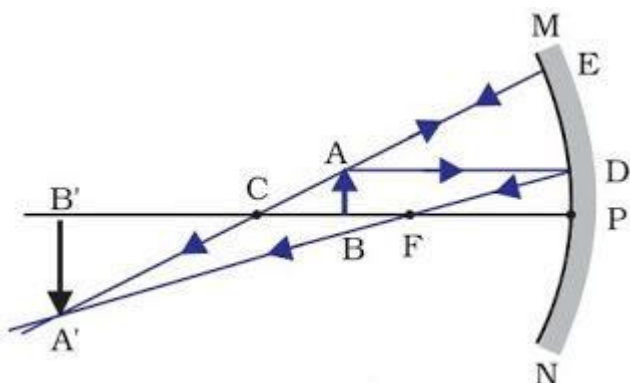


(iv) When object is placed between ‘F’ and ‘C’

Image Position – Beyond ‘C’

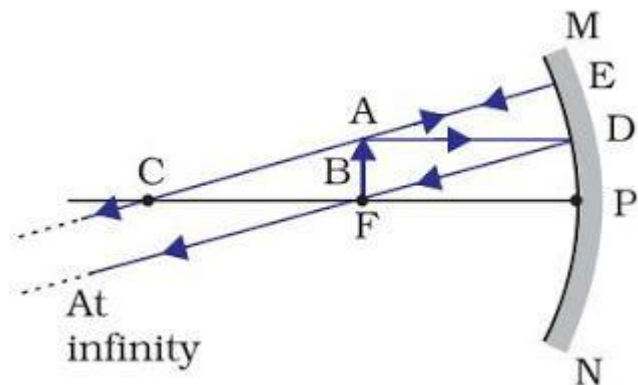
Nature of image – Real, inverted

Size – Enlarged



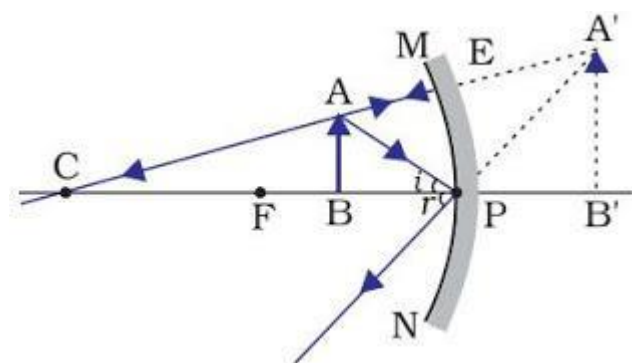
(v) When object is placed at ‘F’

Image Position – At Infinity
 Nature of image – Real, inverted
 Size – Highly enlarged



(vi) When object is between 'P' and 'F'

Image Position – Behind the mirror
 Nature of image – Virtual, erect
 Size – Enlarged

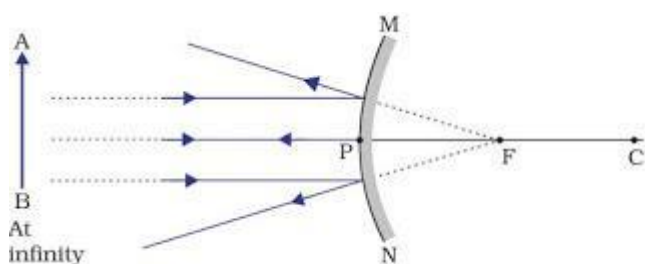


Uses of Concave Mirror: It is used as a makeup mirror, the reflector in torches, in headlights of cars and searchlights, doctor's head-mirrors, solar furnace, etc.

Ray diagrams of images formed by convex mirror

(i) When object is placed at infinity

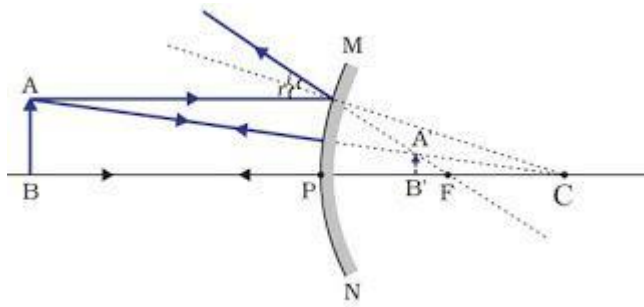
Image Position – At 'F'
 Nature of image – Virtual, erect
 Size – Point sized



(ii) When object is placed between pole and infinity

Image Position – Between 'P' and 'F'
 Nature of image – Virtual, erect

Size – Diminished



Sign Conventions in 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.

Mirror formula:

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ where 'u' is object distance, 'v' is the image distance and 'f' is the focal length of spherical mirror

Magnification

The magnification produced by a spherical mirror is the ratio of the height of the image to the height of the object. It is usually represented as 'm'.

$m = h'/h = -(v/u)$. If m is -ve it is a real image and if it is +ve it is a virtual image.

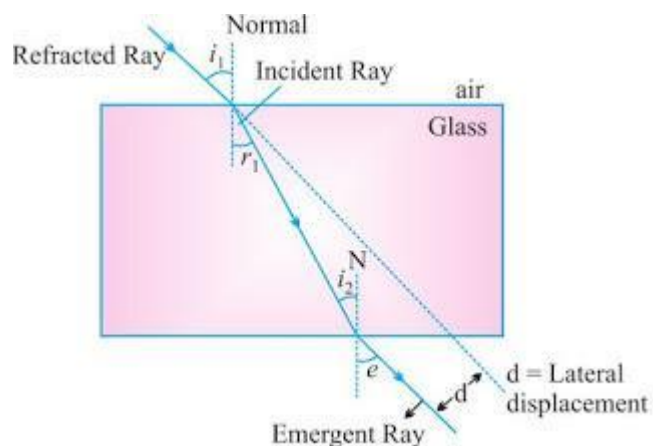
REFRACTION

Refraction of Light: The bending of light at the interface of two different mediums is called Refraction of light.

- If the velocity of light in medium is more, then medium is called optical rarer. Example, air or vacuum is more optical rarer.
- If the velocity of light in medium is less, then medium is called optical denser. Example, glass is more denser than air.

Refraction through a rectangular glass slab

When the light is incident on a rectangular glass slab, it emerges out parallel to the incident ray and is laterally displaced. It moves from rarer to denser medium and then again to the rarer medium.



Laws of Refraction

- The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane.
- The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant, for the light of a given colour and for the given pair of media. This law is also known as Snell's law of refraction.

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

Refractive Index: It represents the amount or extent of bending of light when it passes from one medium to another.

Refractive index of medium 1 with respect to medium 2,

$$n_{12} = \frac{\text{Speed of light in medium 2}(V_2)}{\text{Speed of light in medium 1}(V_1)}$$

Absolute Refractive Index: Refractive index of medium with respect to air or vacuum is called Absolute Refractive Index.

$$\text{Absolute refractive index of medium, } n_m = \frac{\text{Speed of light in air}(c)}{\text{Speed of light in medium}(V_m)}$$

Lens: The transparent refracting medium bounded by two surfaces in which at least one surface is curved is called lens.

Lenses are mainly two type

- **Convex lens:** Spherical lenses formed by binding two spherical surfaces bulging outward are known as convex lenses
- **Concave lens:** Spherical lenses formed by binding two spherical surfaces such that they are curved inward are known as concave lenses

Important terms related to spherical lenses

Center of Curvature: The centres of two spheres, of which lens is a part is called the centre of curvature.

Radii of Curvature: The radii of spheres, of which lens is part is called radius of curvature.

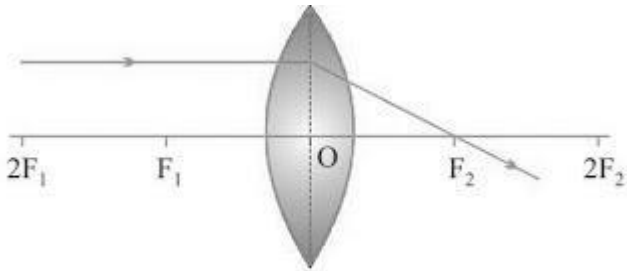
Principal Axis: The line joining the centres of curvature of two surfaces of lens is called principal axis.

Optical Center: It is a special point on the principal axis. Light incident on the optical centre passes through the lens without deviation.

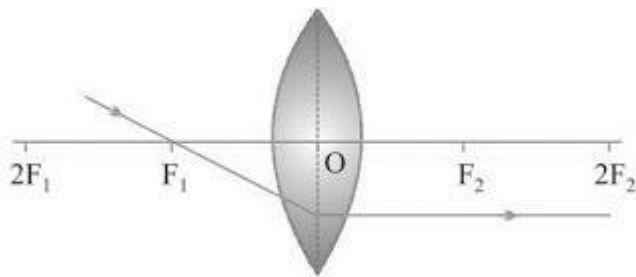
Principal Focus: The point on the principal axis at which all incident rays parallel to the principal axis converge or appear to diverge after refraction through the lens.

Rules for image formation by convex lens

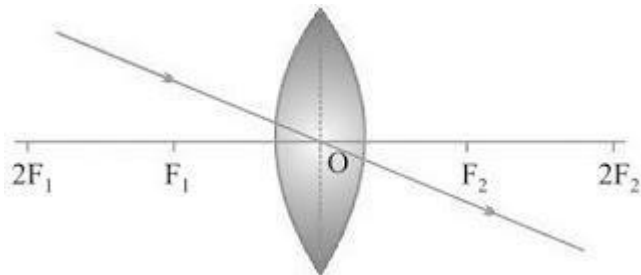
(i) A ray of light parallel to principal axis of a convex lens always pass through the focus on the other side of the lens.



(ii) A ray of light passing through the principal focus will emerge parallel to principal axis after refraction.



(iii) A ray of light passing through the optical center will emerge without any deviation.



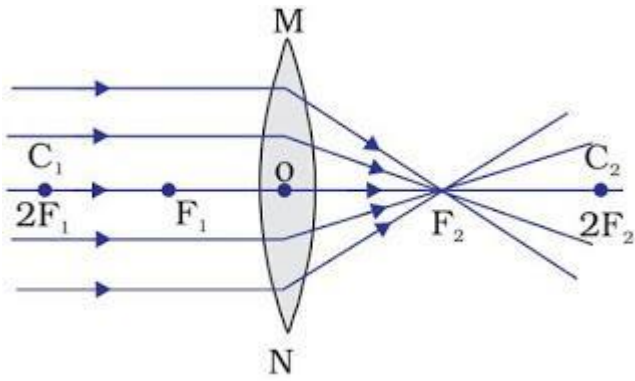
Ray Diagrams of Image formed by Convex Lens

(i) When object is at infinity

Image Position – At 'F₂'

Nature of image – Real, inverted

Size – Point sized or highly diminished

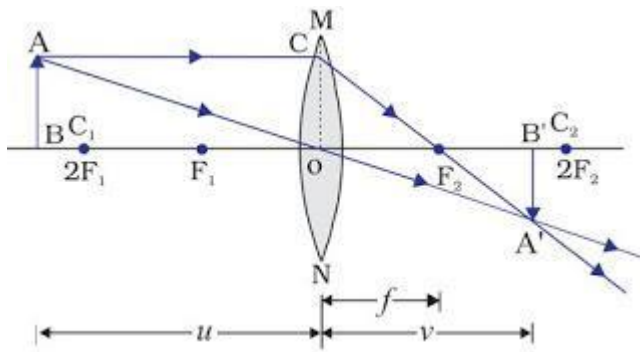


(ii) When object is beyond '2F1'

Image Position – Between 'F2' and '2F2'

Nature of image– Real, inverted

Size – Diminished

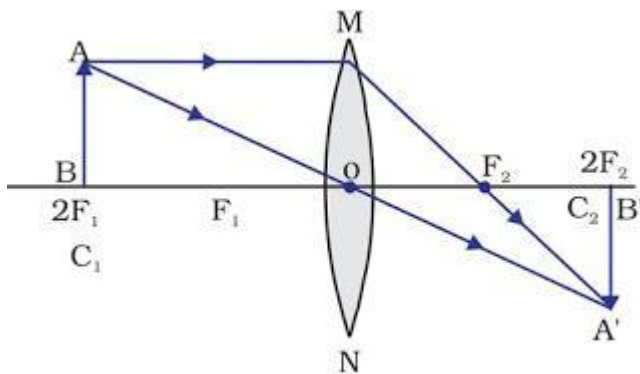


(iii) When object is at '2F1'

Image Position – At '2F2'

Nature of image – Real, inverted

Size – Same size

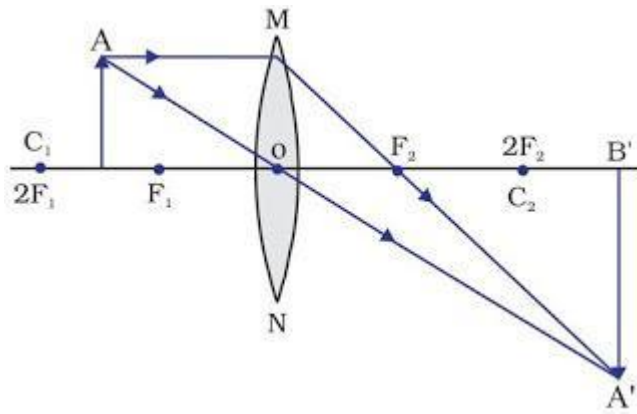


(iv) When object is between 'F1' and '2F1'

Image Position – Beyond '2F2'

Nature of image – Real, inverted

Size – Enlarged

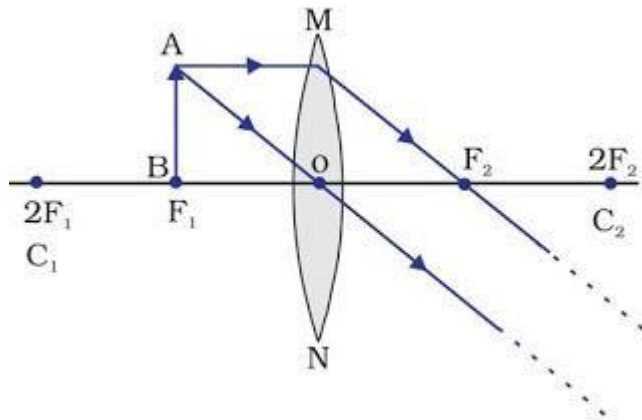


(v) When object is at 'F1'

Image Position – At Infinity

Nature of image – Real, inverted

Size – Highly enlarged

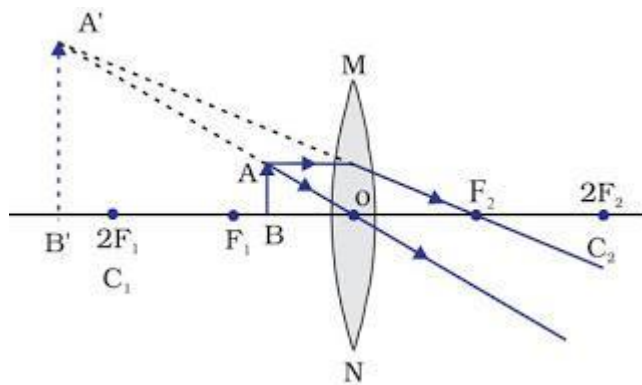


(vi) When object is between 'F1' and optical centre

Image Position – On the same side of the lens as object

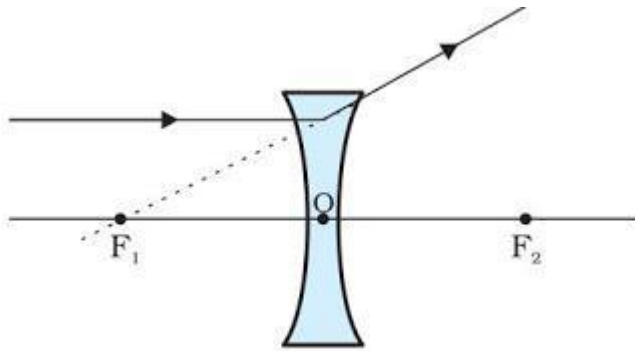
Nature of image – Virtual and erect

Size – Enlarged

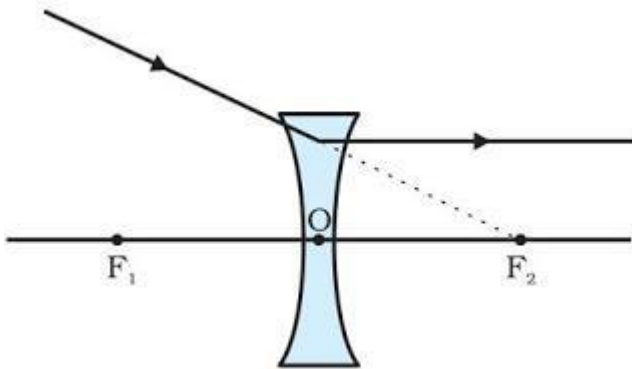


Rules for Image Formation by Concave Lens

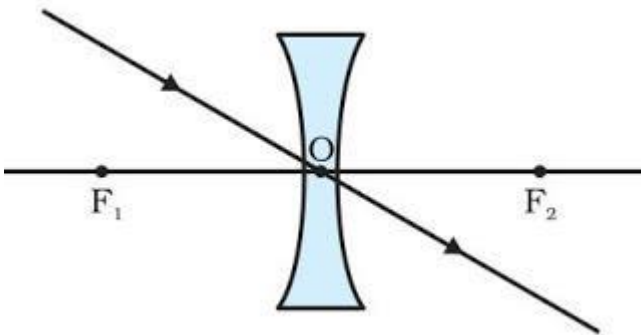
(i) A ray of light parallel to the principal axis appear to diverge from the principal focus located on the same side of the lens.



(ii) A ray of light appearing to meet at the principal focus of a concave lens will emerge parallel to principal axis.



(iii) A ray of light passing through the optical centre of a lens will emerge without any deviation.



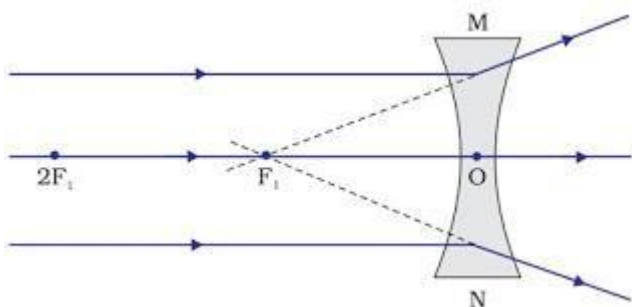
Ray Diagrams of Images Formed by a Concave Lens

(i) When object is placed at infinity

Image Position – At 'F1'

Nature of image – Virtual, erect

Size – Point sized or highly diminished

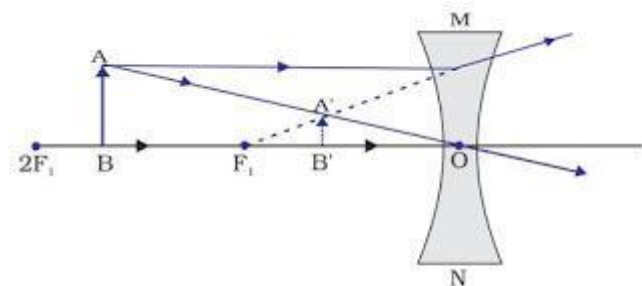


(ii) When object is placed between infinity and optical centre

Image Position – Between 'F' and 'O'

Nature of image – Virtual, erect

Size – Diminished



Sign convention for spherical lenses

• Sign conventions are similar to the one used for spherical mirrors, except that measurements are taken from optical center of the lens.

Lens formula: $1/v - 1/u = 1/f$

Magnification:

The linear magnification produced by a lens is defined as the ratio of the size of the image (h') to the size of the object (h). It is represented by m i.e.,

$$m = h'/h = (v/u).$$

If the magnification of a lens is negative, then the image formed is inverted and real.

If the magnification of a lens is positive, then the image formed is erect and virtual.

Power of Lens: Power of a lens is the reciprocal of its focal length.

$P = 1/f$ (in metre). The SI unit of power of a lens is dioptre (D).

1 dioptre is the power of lens whose focal length is one meter.

Power of convex lens = Positive, Power of concave lens = Negative

Chapter 10: Light Reflection and Refraction

Multiple choice Questions

- The image of an object at center of curvature of concave mirror is formed at
 - Focal length
 - Twice of focal length
 - Between pole and focus
 - Beyond center of curvature
- A point object is kept at a distance of 15 cm in front of a small concave mirror having radius of curvature 30cm. The image will be formed at
 - At focal length
 - On focus
 - At center of curvature
 - At infinity
- The power of a lens of focal length 25cm in diopter is
 - 0.25D
 - 2.5D
 - 4D
 - 0.4D
- The full length image of a distant tall building can be seen by using
 - concave mirror
 - convex mirror
 - a plane mirror
 - both concave and plane mirror

5. If the magnification of a lens has a negative value the image is
a) real and inverted b) virtual c) erect d) none of these

6. When a ray of light enters a medium B from medium A it is found to bend away from the normal. The refractive index of medium B with respect to A will be
a) greater than unity b) lesser than unity c) equal to unity d) zero

Answers: 1. (b) 2. (d) 3. (c) 4. (a) 5. (a) 6. (b)

Assertion and reasoning questions

The following questions consists 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 for A
- b) Both A and R are true and R is not the correct explanation for A
- c) A is true but R is false
- d) A is false but R is true.

1. Assertion (A). A dentist uses concave mirrors for examining a tooth.

Reason (R). A concave mirror always forms an erect image of an object

2. Assertion (A).The value of focal length in a concave mirror is taken as –ve and in a convex mirror is taken as +ve.

Reason(R). All distances measured to the right of the origin are taken as +ve and those measured along the left of the origin are taken as –ve.

3. Assertion (A). The power of a concave lens is positive.

Reason (R). A concave lens always forms a virtual image of an object.

4. Assertion (A). Refractive index has no units.

Reason (R). Refractive index is a ratio of two similar units.

5. Assertion (A). A convex mirror always forms a small image of an object.

Reason (R). Image in a convex mirror is formed behind the mirror

Answers: 1, (c) 2. (a) 3. (d) 4. (a) 5. (b)

Answer in a word or sentence (1 mark)

1. What is the magnification produced by a plane mirror?

Ans. 1

2. What type of image is formed on a cinema screen?

Ans. Real image.

3. If a spherical lens has focal length -15 cm , what type of lens is it?

Ans. Concave.

4. An object is kept 60 cm from a converging lens of focal length 20 cm, What is the nature of the image?

Ans. Real and inverted.

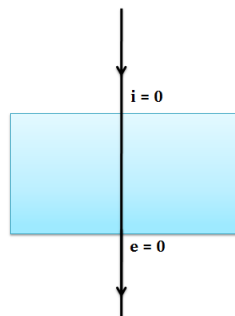
5. Why does a ray of light bend when it travels from one transparent medium into another?

Ans. Its speed changes.

Short Answer Questions (3 marks)

1. What will happen to a ray of light when it falls normally on a surface? Show diagrammatically.

Ans) No bending of light ray occurs. It goes straight from one medium to another.



2. An object 4cm in height is placed at 15 cm in front of a concave mirror of focal length 10 cm. At what distance from the mirror should a screen be placed to obtain a sharp image of the object. Calculate the height of the image.

Ans) $1/f = 1/v + 1/u$

$$1/v = 1/f - 1/u$$

$$= 1/-10 - 1/-15 = -30\text{cm}$$

$$m = h'/h = (v/u)$$

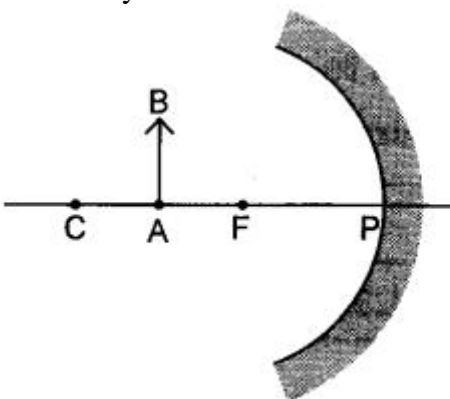
$$h' = (v/u) \times h = -30\text{cm} / -15 \text{ cm} = -8\text{cm}$$

3. Which mirrors should be used for the following? Justify.
a) Headlights of a car b) Rearview mirror of a car

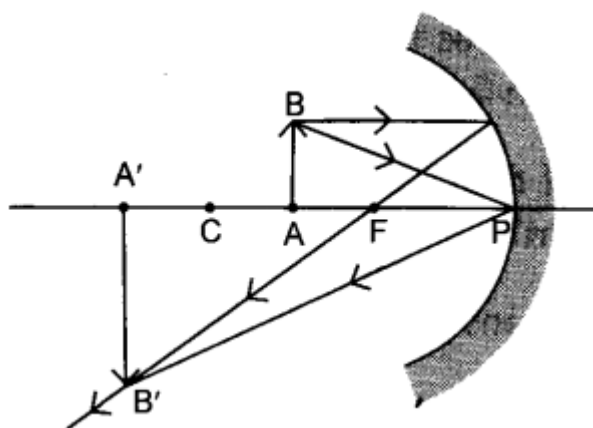
Ans) a) concave mirror. It forms a parallel strong beam of light when the bulb is at its focus

b)convex mirror . It forms a smaller image and covers a large area behind the car

4. Draw the following diagram and show the formation of image of the object AB with the help of suitable rays.



Answer.



5. At what distance should an object be placed from a convex lens of focal length 18 cm to obtain an image at 24 cm from it on the other side. What will be the magnification produced in this case?

Answer.

$$f = +18 \text{ cm}, v = 24 \text{ cm}$$

$$\text{Using, } \frac{1}{f} = \frac{1}{v} - \frac{1}{u}, \text{ we get, } \frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$= \frac{1}{24} - \frac{1}{18} = \frac{3-4}{72}$$

$$\Rightarrow u = -72 \text{ cm.}$$

Object should be kept at a distance of 72 cm on the left side of the convex lens.

$$\text{Magnification, } m = +\frac{v}{u} = \frac{24}{-72} = \frac{-1}{3}$$

Image is inverted, real and diminished.

Long Answer Type Questions (5 Mark)

1. A lens can form a magnified erect image as well as magnified inverted image of an object placed in front of it. State the nature of this lens and draw ray diagrams to justify the above statement.

Ans) convex lens. Ray diagrams for erect and magnified image- object between focus and lens.

Ray diagrams for magnified inverted image- object between F and 2F or at F

2. How are power and focal length of a lens related? What is meant by 1 dioptre power?

You are provided with two lenses of focal length 30cm and 50cm respectively. Which lens will converge the light more? Why?

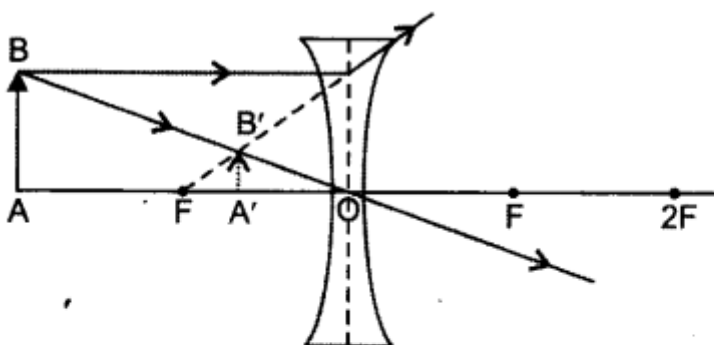
Ans) Power of lens is inversely proportional to the focal length of the lens.

When focal length of a lens is 1 metre the power of the lens is said to be 1 dioptre.

Lens with focal length 30cm has more power than lens with focal length 50 cm and hence will converge the light more.

- 3 (a) Draw a ray diagram to show the formation of image of an object placed between infinity and the optical centre of a concave lens.
 (b) A concave lens of focal length 15 cm forms an image 10 cm from the lens. Calculate
 (i) the distance of the object from the lens.
 (ii) the magnification for the image formed.
 (iii) the nature of the image formed.

Answer. (a) Image formation when the object is at any position between infinity and optical centre:



Position of image: Between F and optical centre

Nature of image: Virtual, erect and diminished.

(b) $f = -15 \text{ cm}$ $v = -10 \text{ cm}$

(i) Using, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we get

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{-10} - \frac{1}{-15} = -\frac{1}{30}$$

$$\therefore u = -30 \text{ cm}$$

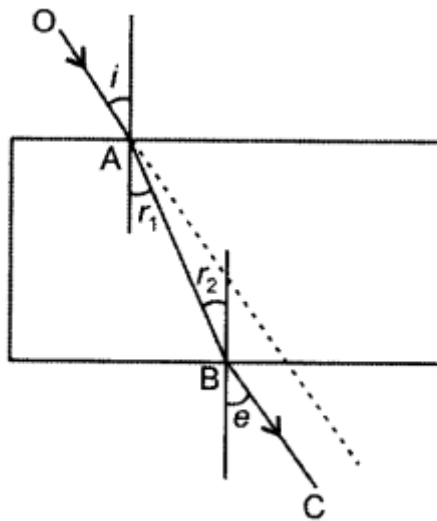
Therefore the object is at 30 cm from the concave lens on its left side.

(ii) $m = \frac{-10}{-30} = \frac{1}{3}$

(iii) m is +ve, so image is erect. v is -ve, so image is virtual. As $m < 1$, image is diminished.

- 4 In an experiment with a rectangular glass slab, a student observed that a ray of light incident at an angle of 55° with the normal on one face of the slab, after refraction strikes the

opposite face of the slab before emerging out into air making an angle of 40° with the normal. Draw a labelled diagram to show the path of this ray. What value would you assign to the angle of refraction and angle of emergence?



1. Answer.

OA – incident ray

i is angle of incidence = 55°

Given $r_2 = 40^\circ$

r_1 and r_2 are alternate interior angles,

$\therefore \angle r_1 = \angle r_2 = 40^\circ$

So, angle of refraction = 40°

Since, the emergent ray is parallel to the incident ray, the angle of emergent must be equal to angle of incidence, i.e. $\angle e = \angle i = 55^\circ$

Creative and Critical thinking

Lenses

Lenses are everywhere in the world around us—in everything from car headlamps and flashlights to the [LED](#) lights used in [electronic](#) instrument panels.

Our eyes contain probably the most amazing lenses of all. Think what happens when you look at the world around you. One minute you're staring at the ground in front of your feet. Seconds later, you hear an [airplane](#) screaming past, turn your head, and watch it fly by. Do this trick with a pair of [binoculars](#) and you'll find it takes you quite a while to adjust the focus from near-sight (looking at the ground) to far (watching the plane). Try it with the naked eye and you won't even notice what you're doing. That's because your eyes have flexible lenses, controlled by tiny muscles, that can bulge in and out, changing shape instantly to focus on anything from the prints on your finger to the surface of the Moon. How amazing is that?

We all have lenses in our eyes, but many of us balance extra ones on the end of our noses to correct long and short sight. You'll also find lenses in [binoculars](#) (which use two or three lenses in each of the cylinders serving your eyes) and [telescopes](#), though not all [microscopes](#) use them. Ordinary (optical) microscopes use a series of glass lenses to magnify tiny objects, while super-powerful [electron microscopes](#) use electromagnets to bend electron beams that help us see in even more detail. Movie

projectors and [projection televisions](#) use lenses to convert small movie pictures into giant images that



lots of people can view at once.

LEDs (light-emitting diodes) used in instrument panels have tiny plastic lenses built into them to magnify the light they produce. The lens is the curved plastic bit on the left (the top of the LED that shines toward you.)

What are lenses made from?

In two words, glass or plastic.

Plastics, though lighter, cheap, and easily molded to shape, certainly have their drawbacks: their optical quality is generally not as good as glass, they scratch very easily, they change their optical properties more readily than glass as the temperature changes, they don't transmit all light wavelengths as well as glass, and they don't always bend light as successfully. Glass has drawbacks too: its heavy, expensive and it can shatter

How do you measure the power of a lens?

The power of a lens is measured in diopters (D). The diopter measurement of a lens is the reciprocal of the focal length in meters

Answer the following questions:

1. Name some of the devices which use lenses.
2. Compare the advantages and disadvantages of lenses made of plastics as compared to those made from glasses.
3. How are power and focal length related?
4. Our eyes contain probably the most amazing lenses of all. Justify this statement.
5. Calculate the power of a lens having focal length 20 cm.

Answers:

1. Binoculars, telescopes, microscopes, LEDs, Movie projectors and projection televisions.
2. **Advantages:** lighter, cheap, and easily molded to shape.

Disadvantages: their optical quality is generally not as good as glass, they scratch very easily, they change their optical properties more readily than glass as the temperature changes, they don't transmit all light wavelengths as well as glass, and they don't always bend light as successfully.

- 3 Power is the reciprocal of focal length.
- 4 Our eyes have flexible lenses, controlled by tiny muscles, that can bulge in and out, changing shape instantly to focus on anything at different distances in seconds.
- 5 $P = 1 / f = 100 / 20 = 5 \text{ D}$

CH 11

HUMAN EYE AND COLOURFUL WORLD

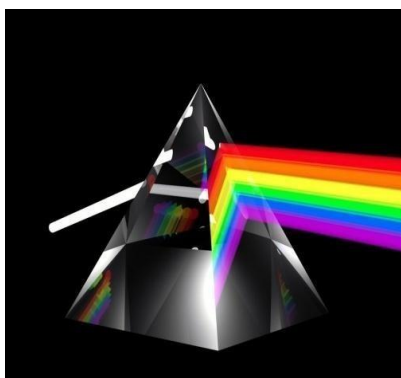
Refraction through prism

Prism: It is a piece of glass or any transparent material bounded by triangular and three rectangular surfaces. The rectangular surfaces are called refracting surfaces. The angle between two refracting surfaces is called **refracting angle** or **angle of prism**.

The line along which the two refracting surfaces meet is called refracting the edge. Any section of prism which is perpendicular to refracting edge is called principal section of edge.

Difference between refraction through glass prism and glass slab is as follows-

In slab, the emergent ray is parallel to the incident ray but in case of prism, emergent ray is not parallel to the incident ray because opposite faces of prism are not parallel to each other.



Dispersion of White Light by Glass Prism

When light falls on the prism it splits the incident light into band of colours. The sequence of colours observed are VIBGYOR (Violet, Indigo, Blue, Green, Yellow, Orange and Red). This band of colour is known as **Spectrum**. So, this splitting of incident light into different colours is known as **Dispersion**. This splitting is due to bending of light rays at different angles. Violet light bends most whereas red light bends least. The phenomenon of rainbow is also due to dispersion of light.

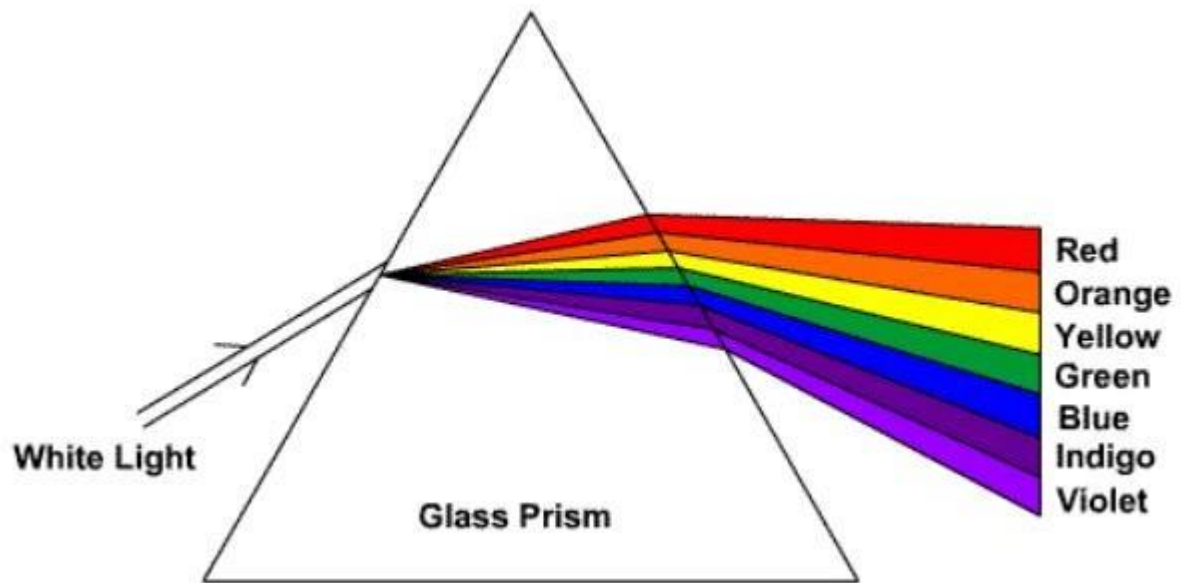


Fig.3. Dispersion of White Light through Prism

The band of these seven colours formed because of dispersion of light is known as **Spectrum**.

Total Internal Reflection

When a light passes from denser to rarer medium and angle of incidence is greater than critical angle, the light will reflect in the denser medium. This is known as **Total Internal Reflection**.

Condition for Total Internal Reflection

- Light should pass from denser to rarer medium
- Angle of incidence should be greater than the critical angle.

Critical angle is defined as angle of incidence for which angle of refraction is 90 degrees

Atmospheric Refraction

Twinkling of Stars

When star light enters the atmosphere, it undergoes refraction. Due to this refractive index changes as the light bends towards the normal. The apparent position of the stars appears slightly different from the actual position. Since the physical conditions of the earth's atmosphere are not stationary, the apparent positions of stars keep on changing. That is why they appear to twinkle.

Advance Sunlight and Delayed Sunset

The sun is visible 2 minutes before the actual sunrise or sunset appears 2 minutes after the actual sunset has taken place is due to atmospheric refraction.

Tyndall Effect

When beam of light strikes tiny water droplets, suspended particles of dust etc.(called as **Colloidal Particles**), the path of the beam becomes visible. This is known as **Tyndall Effect**. The colour of scattered light depends upon the size of colloidal particles. Very fine particles scatter mainly blue light while particles of larger size scatter light of longer wavelengths.

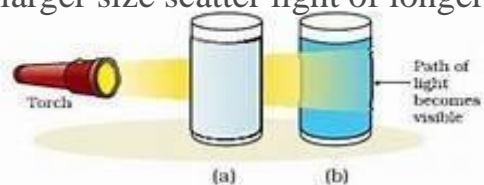


Fig. 2.3: (a) Solution of copper sulphate does not show Tyndall effect. (b) mixture of water and milk shows Tyndall effect.

Scattering

The process in which light is transmitted in all directions when it is incident on a particle which has greater diameter is called **scattering**. **Applications of Scattering:**

- i. **The sky appears blue:** When white light passes through the atmosphere, violet, indigo and blue colours encounter suspended particles. These waves are absorbed and then scattered and are received by our eyes.
- ii. **The sun appears yellow:** Violet, indigo and blue colours are scattered in the upper atmosphere, so the resultant light is yellow. When this light enters our eyes, it appears yellow.
- iii. **The sky appears dark instead of blue to an astronaut:** In space, no particles are present thus, no scattering occurs. Hence, the sky appears dark.
- iv. **The smoke coming out of coal fired chimney appears blue on a misty day:** The tiny particles of smoke and moisture scatter blue colour of white light passing through it. When this blue light reaches our eyes, the smoke appears blue, the sky appears dark instead of blue to an astronaut. In space, no particles are present, thus, no scattering occurs. Hence, the sky appears dark.
- v. **The motorists use orange lights rather than normal white light on a foggy day:** If the motorist uses white light while driving in fog, then the tiny droplets of water will scatter a large amount of blue light. This scattered blue light, on reaching the eyes, will decrease visibility and hence, driving will become extremely difficult. However, when orange light is used, it doesn't get scattered on account of longer wavelength and hence, the driver can see clearly.

Why sky appears red in colour during sunrise and sunset?

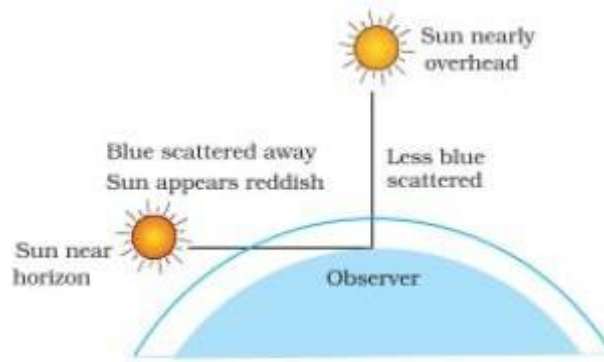


Fig.4. Reddening of Sun at rise and set

During sunrise and sunset, light from the Sun near the horizon passes through thicker layers of air and larger distance in the earth's atmosphere before reaching our eyes. Light from the Sun overhead would travel relatively shorter distance, resulting in white appearance of sun. Near the horizon, most of the blue light and shorter wavelengths are scattered away by the particles. Therefore, the light that reaches our eyes is of longer wavelengths, hence the reddish appearance.

1 MARKER OBJECTIVE TYPE QUESTIONS

Q1. The image formed retina of human eye is

- a) Virtual and erect
- b) Real and inverted

c) Virtual and inverted

d) Real and erect

Q2. The change in the focal length of human eye is caused due to

a) Ciliary muscles

b) Pupil

c) Cornea

d) Iris

Q3. The least distance of distinct vision for a young adult with normal vision is

a) 25 m

b) 20 m

c) 25 cm

d) 20 cm

Q4. The persistence of vision for human eye is -

a) 1/10th of a second

b) 1/16th of a second

c) 1/6th of the second

d) 1/18th of a second

Q5. The light sensitive cells of retina which are sensitive to the intensity of light are—

a) Cones

b) Rods

c) Both rods and cones

d) None of these

Q6 Assertion (A): Some persons have the difficulty to see the objects in dim light during night. Reason (R): This is due to improper functioning of rod-shaped cells which respond to intensify variation in light.

- (a) (A) is incorrect and (R) is correct.
- (b) (A) is correct and (R) is incorrect.
- (c) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (d) Both (A) and (R) are correct and (R) is the correct explanation of (A).

Q7. Assertion (A): The colour of the clear sky appears blue.

Reason (R): The sky of the moon appears dark.

- (a) (A) is incorrect and (R) is correct.
- (b) (A) is correct and (R) is incorrect.
- (c) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (d) Both (A) and (R) are correct but (R) is the correct explanation of (A).

Q8. Assertion (A): The human eye has more field of view.

Reason (R): For a normal eye, the farthest point upto which the eye can see objects clearly is infinity.

- (a) (A) is incorrect and (R) is correct.
- (b) (A) is correct and (R) is incorrect.
- (c) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (d) Both (A) and (R) are correct but (R) is the correct explanation of (A).

Answer: 1. (b) 2. (a) 3. (c) 4. (b) 5. (b) 6.(d) 7.(c) 8. (c)

2 mark questions-

Q1. Complete the following statements :

When the sun is setting, the light from it has to travel a thickness of the earth's atmosphere and only..... wavelength..... light is able to reach us. Sunset is therefore.....

Ans. greater; longer; red; red

Q2. A student claims that because of atmospheric refraction, the sun can be seen after it has set, and the day is, therefore, longer than if the earth had no atmosphere.

(a) What does the student mean by saying that the sun can be seen after it has set ?

(b) Do you think that the students' conclusion is correct ?

Ans. a) This means that due to atmospheric refraction we continue to see the sun about two minutes after the actual sunset. No such atmospheric refraction could have been possible if the earth had no atmosphere. Hence, the day is longer due to the atmosphere of earth.

b) Yes

Q3. We know that light refracts (or bends) when it goes from one medium to another. Now, the atmosphere contains only air. Then how does light get refracted on passing through only air in the atmosphere ?

Ans. The atmosphere only contains air but all the air in the atmosphere is not at the same temperature. Some of the air layers are cold whereas others are comparatively warm. The cooler air layers of the atmosphere behave as optically denser medium for the light rays whereas the warmer air layers behave as optically rarer medium. So, light gets refracted on passing through these layers of air in the atmosphere.

(a) Q4. What is spectrum ? What is the name of glass shape used to produce a spectrum ?

(b) How many colours are there in a full spectrum of white light ? Write the various colours of spectrum in the order, starting with red.

Ans.

(a) The band of seven colours formed on a white screen, when a beam of white light is passed through a glass prism is called spectrum of white light. A glass prism is used to produce a spectrum.

(b) There are seven colours in the spectrum of white light. The colours are Red, Orange, Yellow, Green, Blue, Indigo and Violet.

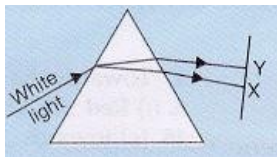
Q5. Explain why, if we look at objects through the hot air over a fire, the objects appear to be moving (or shaking) slightly.

Ans.

The air just above the fire becomes hotter. This hotter air is optically rarer but the colder air further up is optically denser, so when we see the objects by the light coming from them through hot and cold air layers having different optical densities, then refraction of light takes place randomly due to which the objects appear to be moving slightly.

3 mark questions-

Q1. In the figure given alongside, a narrow beam of white light is shown to pass through a triangular glass prism. After passing through the prism, it produces a spectrum YX on the screen.



- (a) State the colour seen (i) at X, and (ii) at Y.
(b) Why do different colours of white light bend through different angles with respect to the incident beam of light ?

Answer-

- (a) (i) violet (ii) Red
(b) Different colours of white light bend through different angles because different colours travel through different speeds through in the glass prism.

- Q2. (a) What is atmospheric refraction ? What causes atmospheric refraction ?
(b) Why do stars twinkle on a clear night ?
(c) Explain why, the planets do not twinkle at night.

Ans. a) The refraction of light caused by the earth's atmosphere is called atmospheric refraction. It is caused due to the varying optical densities of different layers of earth's atmosphere.

b) The light coming from a star undergoes atmospheric refraction due to varying optical densities of air at various altitudes. The continuously changing atmosphere refracts the light from the star by different amounts from one moment to the next. Thus, the star-light reaching our eyes increases and decreases continuously and the star appears to twinkle.

c) Planets appear to be quite big to us and can be considered to be a collection of a very large number of point sources of light. The dimming effect produced by some of the point sources is nullified by brighter effect produced by some other point sources. Thus, the overall brightness remains the same and the planets do not appear to twinkle.

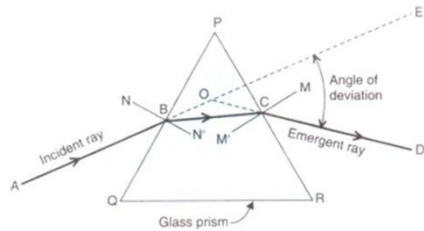
Q3. a) Draw a diagram to show the refraction of light through a glass prism. On this diagram, mark

1. incident ray
2. emergent ray, and
3. angle of deviation.

(b) What is a rainbow? What are the two conditions necessary for the formation of a rainbow in the sky?

(c) What acts as tiny prisms in the formation of a rainbow?

Ans. a)



(b) Rainbow is an arch of seven colours visible in the sky which is produced by the dispersion of sun's light by raindrops in the atmosphere. A rainbow is formed in the sky when the sun is shining and it is raining at the same time.

(c) Raindrops

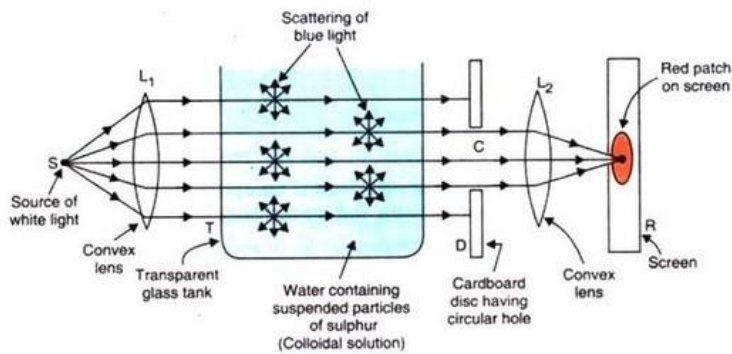
Q4. When a beam of white light is passed through a prism, it splits to form lights of seven colours. Is it possible to recombine the lights of seven colours to obtain the white light again? Explain your answer.

Ans.

Yes, it is possible to recombine the lights of seven colours to obtain the white light again by placing another similar prism alongside the first one in the inverted position as shown below. The first prism disperses the white light into seven coloured rays. The second prism receives all the seven coloured rays from the first prism and recombines them into original white light. This is because the refraction produced by the second prism is equal and opposite to that produced by the first prism.

CCT Question-

(a)



An arrangement for observing the scattering of light in a colloidal solution to show how the sky appears blue, and the sun appears red at sunrise and sunset.

- (b) Blue light scatters more easily due to its smaller wavelength.
- (c) Shortest wavelength component i.e. blue light scatters away when the sun appears red at sunrise or sunset.
- (d) Gas molecules present in the air.

Q. In an experiment(as shown above) to study the scattering of light by passing a beam of white light through a colloidal solution of sulphur in a transparent glass tank :

- (a) Which colour is observed from the front of the glass tank? Does this colour correspond to the colour of sky on a clear day or the colour of sky around the sun at sunset ?
- (b) Which colour is observed from the sides of the glass tank? Does this colour correspond to the colour of sky on a clear day or the colour of sky around the sun at sunset ?
- (c) Why are the ‘danger signal’ lights red in colour ?

Ans.

- (a) Red colour is observed from the front of the glass tank. This colour corresponds to the colour of sky around the sun at sunset.
- (b) Blue colour is observed from the sides of the glass tank. This colour corresponds to the colour of sky on a clear day.

(c) ‘Danger’ signals are red in colour because the red coloured light having longer wavelength is the least scattered by fog or smoke particles. Due to this the red light can be seen in the same colour even from a distance.

CH 12 ELECTRICITY

GIST OF THE LESSON

- 1. Positive and negative charges:** The charge acquired by a glass rod when rubbed with silk is called positive charge and the charge acquired by an ebonite rod when rubbed with wool is called negative charge.
- 2. Coulomb:** It is the S.I. unit of charge. One coulomb is defined as that amount of charge which repels an equal and similar charge with a force of 9×10^9 N when placed in vacuum at a distance of 1 meter from it. Charge on an electron = -1.6×10^{-19} coulomb.
- 3. Static and current electricity:** Static electricity deals with the electric charges at rest while the current electricity deals with the electric charges in motion.
- 4. Conductor:** A substance which allows passage of electric charges through it easily is called a conductor. A conductor offers very low resistance to the flow of current. For example copper, silver, aluminum etc.
- 5. Insulator:** A substance that has infinitely high resistance does not allow electric current to flow through it. It is called an 'insulator'. For example rubber, glass, plastic, ebonite etc.
- 6. Electric current:** The flow of electric charges across a cross-section of a conductor constitutes an electric current. It is defined as the rate of flow of the electric charge through any section of a conductor.

Electric current = Charge/Time or

$$I = Q/t$$

Electric current is a scalar quantity.

- 7. Ampere:** It is the S.I. unit of current. If one coulomb of charge flows through any section of a conductor in one second, then current through it is said to be one ampere.
1 ampere = 1 coulomb/1 second or $1 \text{ A} = 1\text{C}/1\text{s} = 1\text{Cs}^{-1}$
1 milliampere = 1 mA = 10^{-3} A
1 microampere = $1\mu\text{A} = 10^{-6}$ A
- 8. Electric circuit:** The closed path along which electric current flows is called an 'electric circuit'.
- 9. Conventional current:** Conventionally, the direction of motion of positive charges is taken as the direction of current. The direction of conventional current is opposite to that of the negatively charged electrons.

- 10. Electric field:** It is the region around a charged body within which its influence can be experienced.
- 11. Electrostatic potential:** Electrostatic potential at any point in an electric field is defined as the amount of work done in bringing a unit positive charge from infinity to that point. Its unit is volt. Positive charges move from higher to lower potential regions. Electrons, being negatively charged, move from lower to higher potential regions.
- 12. Potential difference between two points:** The Potential difference between two points in an electric field is the amount of work done in bringing a unit positive charge from one to another. Potential difference = Work done/Charge or $V = W/Q$
- 13. One volt potential difference:** The Potential difference between two points in an electric field is said to one volt if one joule of work has to be done in bringing a positive charge of one coulomb from one point to another.
 1 volt = 1 joule/1 coulomb or $1 V = 1J/1C$
- 14. Galvanometer:** It is device to detect current in an electric circuit.
- 15. Ammeter:** It is device to measure current in a circuit. It is always connected in series in a circuit.
- 16. Voltmeter:** It is a device to measure potential difference. It is always connected in parallel to the component across which the potential difference is to be measured.
- 17. Ohm's law:** This law states that the current passing through a conductor is directly proportional to the potential difference across its ends, provided the physical conditions like temperature, density etc. remains unchanged.
 $V \propto I$ or $V = RI$
 The proportionality constant R is called resistance of conductor.
- 18. Resistance:** It is a property of a conductor by virtue of which it opposes the flow of current through it. It is equal to the ratio of the potential difference applied across its ends and the current flowing through it.
 Resistance = Potential difference/Current or $R = V/I$
- 19. Ohm:** It is the S.I. unit of resistance. A conductor has a resistance of one ohm if a current of one ampere flows through it on applying a potential difference of one volt across its ends.
 1 ohm = 1 volt/1 ampere or $1\Omega = 1V/1A$
- 20. Factors on which resistance of a conductor depends:** The resistance R of a conductor depends

i) Directly on its length L i.e. $R \propto L$.

ii) inversely on its area of cross-section A i.e. $R \propto 1/A$

iii) on the nature of material of the conductor on. On combining the above factors, we get

$$R \propto L/A$$

$R = \rho * L/A$ The proportionality constant ρ is called resistivity of conductor.

21. Resistivity: It is defined as the resistance offered by a cube of a material of side 1 m when current flows perpendicular to its opposite faces. Its S.I. unit is ohm-meter (Ωm). Resistivity, $\rho = RA/L$

22. Equivalent resistance: If a single resistance can replace the combination of resistances in such a manner that the current in the circuit remains unchanged, then that single resistance is called the equivalent resistance.

23. Laws of resistances in series:

i) Current through each resistance is same.

ii) Total voltage across the combination = Sum of the voltage drops.

$$V = V_1 + V_2 + V_3$$

iii) Voltage drops across any resistor is proportional to its resistance.

$$V_1 = IR_1, V_2 = IR_2, V_3 = IR_3$$

iv) Equivalent resistance = Sum of the individual resistances.

$$R_s = R_1 + R_2 + R_3$$

v) Equivalent resistance is larger than the largest individual resistance.

24. Laws of resistances in parallel:

i) Voltage across each resistance is same and is equal to the applied voltage.

ii) Total current = Sum of the currents through the individual resistances.

$$I = I_1 + I_2 + I_3$$

iii) Currents through various resistances are inversely proportional to the individual resistances.

$$I_1 = V/R_1, I_2 = V/R_2, I_3 = V/R_3$$

iv) Reciprocal of equivalent resistance = Sum of reciprocals of individual resistances. $1/R_p = 1/R_1 + 1/R_2 + 1/R_3$

v) Equivalent resistance is less than the smallest individual resistance.

25. Joule's law of heating: It states that the heat produced in a conductor is directly proportional to (i) the square of the current I through it (ii) proportional to its resistances R and

(i) the time t for which current is passed. Mathematically, it can be expressed as $H = I^2Rt$ joule = $I^2Rt/4.18$ cal

or

$$H = VIt \quad \text{joule} = VIt/4.18\text{cal}$$

26. **Electric energy:** It is the total work done in maintaining an electric current in an electric circuit for given time.

$$\text{Electric energy, } W = VIt = I^2Rt \text{ joule}$$

27. **Electrical power:** Electrical power is the rate at which electric energy is consumed by an appliance.

$$P = W/t = VI = I^2R = V^2/R$$

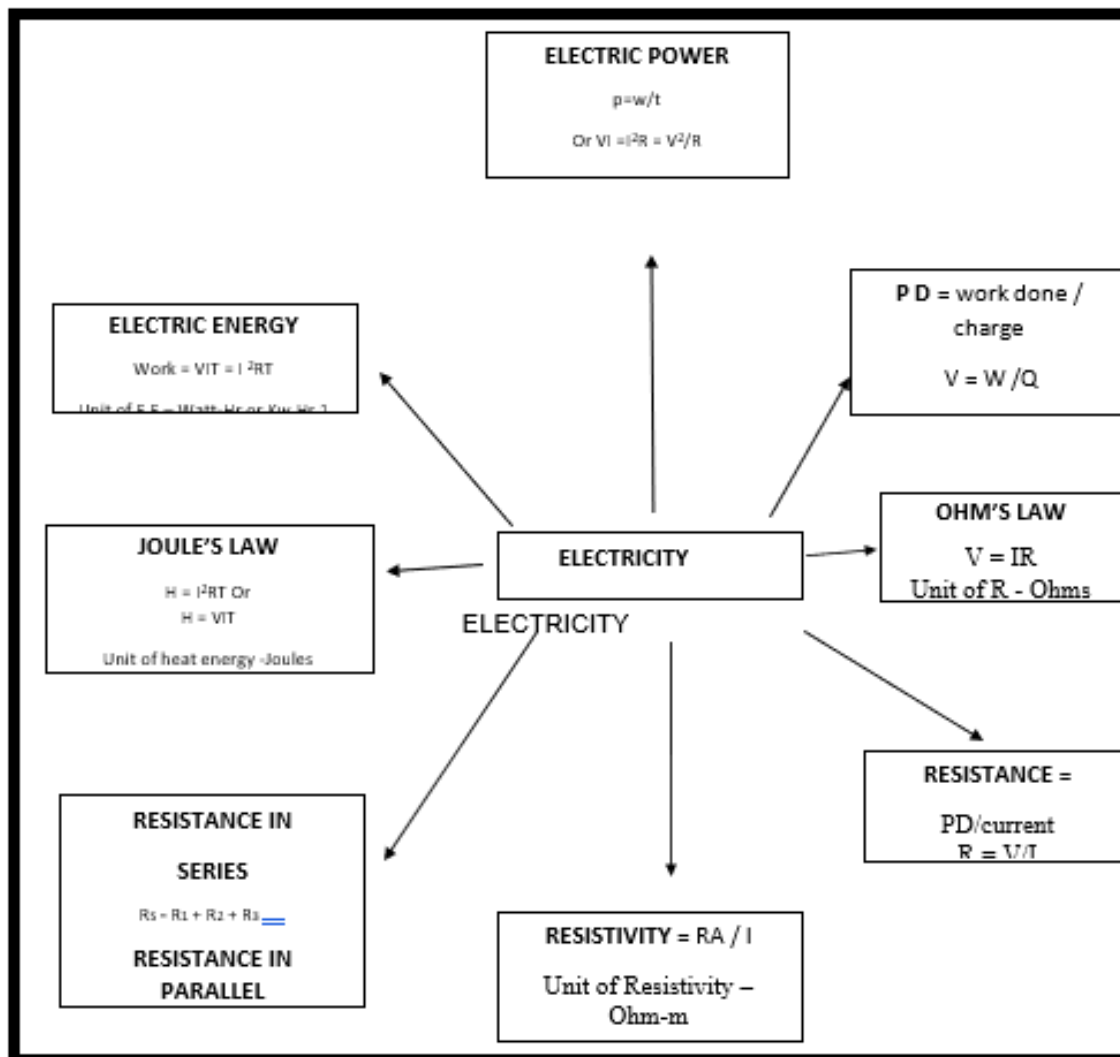
28. **Watt:** It is the S.I. unit of power. The power of an appliance is 1 watt if one ampere of current flows through it on applying a potential difference of 1 volt across its ends.

$$1 \text{ watt} = 1 \text{ joule/1 second} = 1 \text{ volt} \times 1 \text{ ampere}$$

$$\text{or } 1 \text{ W} = 1 \text{ Js}^{-1} = 1 \text{ VA}$$

$$1 \text{ kilowatt} = 1000 \text{ W}$$

MIND MAP



Ch 12 ELECTRICITY

One-mark Questions

(1) What is the SI unit of electric potential?

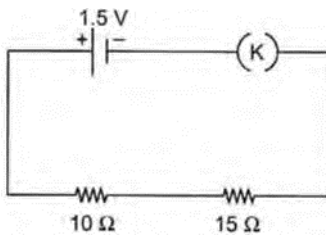
Ans Volt is the SI unit of electric potential.

(2) Mention one reason why tungsten is used for making filament of electric lamp

Ans Tungsten is used for making filament because of its high melting point and
Low Resistivity.

(3) Draw a schematic diagram of a circuit consisting of a cell of 1.5 V, 10 ohm resistor and 15 ohm resistor and a plug key all connected in series

Ans Circuit diagram



(4) State a difference between the wire used in the element of an electric heater and in a fuse wire.

Ans The wire used in element of electric heater has high resistance and high melting point where as a fuse wire has a low resistance and low melting point

(5) Name a device that helps to maintain a potential difference across a conductor.

Answer. Cell or battery

(6) . What happens to resistance of a conductor when its area of cross-section is increased?

Resistance decreases as $R \propto \frac{1}{A}$.

(7) How is a voltmeter connected in the circuit to measure the potential difference between two Points?

Ans Voltmeter is connected in parallel in the circuit.

(8) . What happens to the resistance of a conductor when temperature is increased?

Ans: The resistance of a conductor increases with rise in temperature.

(9) What is the resistance of an ideal voltmeter?

Ans: The resistance of an ideal voltmeter is infinite

(10) What is least count of voltmeter?

Ans The minimum potential difference measured by a voltmeter between the two given terminals is called the least of count that voltmeter

TWO MARKS QUESTIONS

(1) The amount of charge passing through a cell in four second is 12 C. Find the current supplied by cell

Ans Given $t = 4 \text{ s}$ $q = 12 \text{ C}$

$$I = q/t$$

$$I = 12/4$$

$$I = 4 \text{ Ampere}$$

(2) Name the device/instruments used to measure potential difference. How is it connected in an electric circuit?

Ans : The device which is used to measure potential difference is voltmeter. Voltmeter is connected in parallel in an electric circuit.

(3) (a) What are the values of mA and μA ?

(b) Draw the symbols of battery and rheostat

Ans (a) $1 \text{ mA} = 10^{-3} \text{ Ampere}$

$$1 \mu\text{A} = 10^{-6} \text{ Ampere}$$



(4) Give reason for the following:

- Tungsten used almost exclusively for filament of electric lamp.
- Why do we use copper and aluminium wires for transmission of electric current?

Ans a. Tungsten is used in making the filament of electric lamp because it has High resistivity and high melting point

- The copper and aluminium have low resistivity and high conductivity

(5) List in a tabular form two differences between a voltmeter and an ammeter.

Ans :

	Voltmeter	Ammeter
1	voltmeter is connected parallel in an electric circuit.	Ammeter is connected series in an electric circuit.
2	Its resistance is very high	Its resistance is very low

(6) Mention two special features of the material to be used as element of an electric iron

Ans : A material to be used as element of an electric iron must have

(i) high melting point, (ii) high resistivity

(7) A large number of free electrons are present in metals yet no current flows in the absence of electric potential across it. Explain the statement with reason.

Ans : Though there are large number of free electron present in a conductor, but their motion is random motion in the absence of potential difference. Their average velocity is zero. Hence there is no current flowing in conductor. But when a potential difference is applied across the ends of the conductor, it sets the electrons to move in a direction. The motion of charge produces an electric current in the conductor.

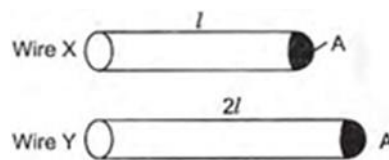
(8) Explain two disadvantage of series arrangement for house hold circuit

Ans (1) In series circuit ,if one electrical appliance stop working due to some defect then all other appliances also stop working because the whole circuit is broken.

(2) In series circuit, all the electrical appliances have only one switch due to which they cannot be turned off or turned on separately

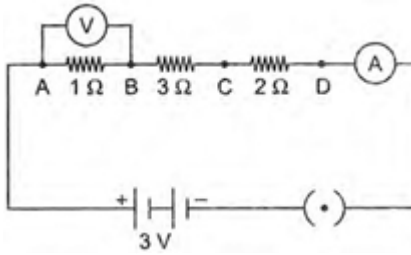
(9) Out of the two wires X and Y shown below. Which one has greater resistance.

Justify your answer



$$R_x = \rho l/A \quad R_y = \rho 2l/A \quad R_y = 2 R_x$$

(10) How would the reading of voltmeter (V) change, if it is connected between B and C? Justify your answer



$$R=R_1+R_2+R_3$$

$$R= 6 \text{ Ohm}$$

$$I=2 \text{ Ampere}$$

$$R=1+2+3$$

$$I=3/6$$

$$\text{voltage across B and C } V=IR, V=1/2 \times 3= 1.5 \text{ Volt}$$

Three Marks

(1) (a) Write two points of difference between electric energy and electric power. (6) Out of 60 W and 40 W lamps, which one has higher electrical resistance when in use.

(c) What is the commercial unit of electric energy? Convert it into joules. Answer. (a) Difference between electric energy and electric power:

Electrical energy	Electric power
(i) The work done or energy supplied by the source in maintaining the flow of electric current is called electrical energy. It appears in the form of heat given by $H=VIt = I^2Rt$	(i) The time rate at which electric energy is consumed or dissipated by an electrical device is called electric power and is given by $P=VI$
(ii) It is equal to the product of power and time i.e. $E = P \times t$	(ii) It is equal to the rate of doing work by an energy source $P=W/t$
(iii) Its SI unit is joule (J)	(iii) Its SI unit is watt (W)

i.e. less the power of electrical device, higher is its electrical resistance.

(c) Kilowatt hour - Commercial unit of electrical energy

$$1 \text{ kWh} = 1000 \text{ Wh} = 1000 \text{ J/S} \times 3600 \text{ sec} = 3600000 \text{ J} = 3.6 \times 10^6 \text{ J}$$

(2) (a) Define electric power. Express it in terms of potential difference V and resistance R.

(b) An electrical fuse is rated at 2 A. What is meant by this statement?

(c) An electric iron of 1 kW is operated at 220 V. Find which of the following fuses that respectively rated at 1 A, 3 A and 5 A can be used in it.

Answer.

(a) Electric power: It is the rate of doing work by an energy source or the rate at which energy is dissipated or consumed per unit time in the electric circuit is called electric Power

$$\begin{aligned}\text{So, Power } P &= \frac{\text{Work done } (w)}{\text{Time } (t)} \\ &= \frac{\text{Electrical energy dissipated}}{\text{Time } (t)} \\ &= VI = \frac{V^2}{R}\end{aligned}$$

(b) It means, the maximum current will flow through it is only 2 A. Fuse wire will melt if the current exceeds 2 A value through it.

(c) Given: $P = 1 \text{ kW} = 1000 \text{ W}$, $V = 220 \text{ V}$

$$\text{Current drawn, } I = \frac{P}{V} = \frac{1000}{220} = \frac{50}{11} = 4.54 \text{ A}$$

To run electric iron of 1 kW, rated fuse of 5 A should be used.

(3). What is meant by electric current? Name and define its SI unit. In a conductor electrons are flowing from B to A. What is the direction of conventional current? Give justification for your answer. A steady current of 1 ampere flows through a conductor. Calculate the number of electrons that flows through any section of the conductor in 1 second. (Charge on electron 1.6×10^{-19} coulomb).

Answer.

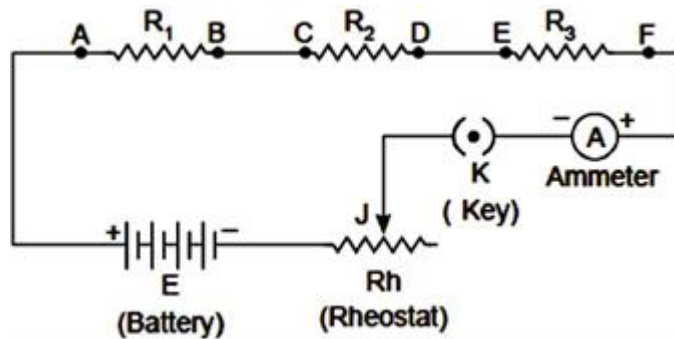
- Electric Current: The amount of charge 'Q' flowing through a particular area of cross section in unit time 't' is called electric current, i.e.
- Electric current, $I = Q/t$
- SI unit of electric current is ampere.
- One ampere of current is that current which flow when one coulomb of electric charge flowing through a particular area of cross-section of the conductor in one second, i.e. $1\text{A} = 1 \text{ Cs}^{-1}$.
- The direction of conventional current is A to B, i.e. opposite to the direction of flow of electrons. In a metal, flow of electrons carrying negative charge constitutes the current. Direction of flow of electrons gives the direction of electronic current by convention, the direction of flow of positive charge is taken as the direction of conventional current.

$$\text{For } q = 1 \text{ coulomb, } n = \frac{1 \text{ C}}{1.6 \times 10^{-19} \text{ C}} = \frac{10^{19}}{1.6} = 6.25 \times 10^{18} \text{ electrons}$$

Five marks Questions

. Draw a labelled circuit diagram showing three resistors R_1 , R_2 and R_3 connected in series with a battery (E), a rheostat (Rh), a plug key (K) and an ammeter (A) using standard circuit symbol. Use this circuit to show that the same current flows through every part of the circuit. List two precautions you would observe while performing the experiment.

Answer



Aim: Same current flows through every part of the above circuit.

Procedure:

Connect ammeters, 'A'1 between B and C, and 'A'2 between D and E. Adjust the sliding contact of the rheostat initially for a small current. Note all the ammeter readings. These readings give us current flowing through the resistors R_1 , R_2 and R_3 .

The current in the circuit is now increased by changing the position of sliding contact 'J' of the rheostat. Note all the ammeter readings each time.

Conclusion: Same reading of all the ammeters in each observation concluded that same current flows through every part of the circuit.

Precautions:

All the connections should be tight and properly connected as per circuit diagram.

The positive terminal of the ammeter and voltmeter must be connected to the positive terminal of the battery or battery eliminator.

(2) State Ohm's law. Write the necessary conditions for its validity. How is this law verified

experimentally? What will be the nature of graph between potential difference and current for a conductor? Name the physical quantity that can be obtained from this graph.

Answer. Ohm's law: When the physical conditions such as temperature etc. remain same, the current

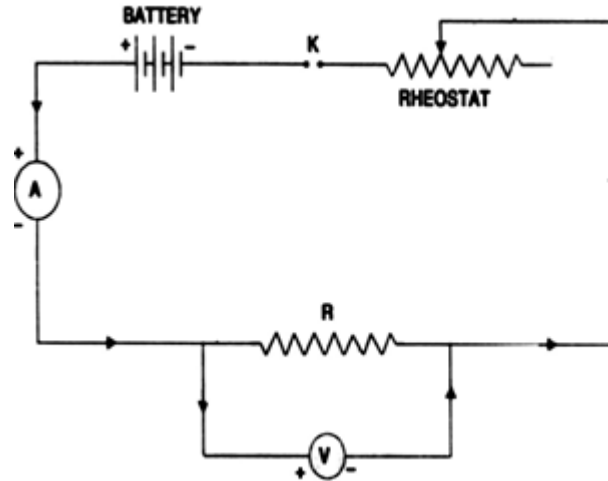
flowing through the conductor is directly proportional to the potential difference applied across the ends of the conductor, i.e.,

$$I \propto V \text{ or } V \propto I$$

$$\Rightarrow \frac{V}{I} = \text{constant}$$

$$\Rightarrow V = IR$$

where R is constant of proportionality and is called resistance of the wire.

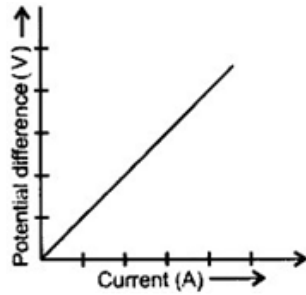


2. Close the key, so that current begins to flow in the circuit.
3. Note down the potential difference (V) across the conductor PQ of resistance R shown by the voltmeter and the corresponding current (I) shown by the ammeter.
4. Now move the knob of rheostat so that the current in the circuit increases.
5. Again note down the potential difference (V) across the conductor R in the voltmeter and current in the circuit shown by ammeter.
6. Repeat the experiment five times by increasing the current in the circuit by moving the knob of the rheostat in steps.

S. No.	Potential Difference (V)	Current (I)	V/I
1			
2			
3			
4			

The value of $V/I = R$ (constant)

Plot a graph between V and I by taking V along X-axis along. We get a straight line passing through origin



T

Conclusion : From the graph between V and I , we conclude that $I \propto V$, which is Ohm's law. Hence Ohm's law is verified.

Ohm's law does not hold under all conditions. Ohm's law does not hold for non-ohmic material such as electrolyte

- (3) .Two devices of rating 44 W, 220 V and 11 W, 220 V are connected in series. The combination is connected across a 440 V mains. The fuse of which of the two devices is likely to burn when the switch is ON? Justify your answer

Using $P = \frac{V^2}{R}$

$$R_1 = \frac{V^2}{P_1} = \frac{220 \times 220}{44} = 1100 \Omega$$

$$R_2 = \frac{V^2}{P_2} = \frac{220 \times 220}{11} = 4400 \Omega$$

Equivalent resistance in series

$$R_s = R_1 + R_2 = 1100 + 4400 = 5500 \Omega$$

Current, $I = \frac{V}{R_s} = \frac{440}{5500} = 0.08 \text{ A}$

According to Joule's law of heating

$$H_1 = I^2 R_1 t$$

$$= (0.08)^2 \times 1100 \times 1 = 7.04 \text{ J}$$

$$H_2 = I^2 R_2 t$$

$$= (0.08)^2 \times 4400 \times 1 = 28.16 \text{ J}$$

$\Rightarrow H_2 > H_1$

ASSERTION AND REASON

DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

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

- (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
- (c) Assertion (A) is true but reason (R) is false.
- (d) Assertion (A) is false but reason (R) is true.
- (e) Both Assertion and Reason are false.

(1) Assertion : The connecting wires are made of copper.

Reason : The electrical conductivity of copper is high.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion(A).

Copper conducts the current without offering much resistance due to high electrical conductivity

(2) Assertion : A conductor has $+3.2 \times 10^{-19}$ C charge.

Reason : Conductor has gained 2 electrons.

Ans : (c) Assertion (A) is true but reason (R) is false.

Conductor has positive charge, so it has lost two electrons.

(3) Assertion : If a graph is plotted between the potential difference and the current flowing, the graph is a straight line passing through the origin.

Reason : The current is directly proportional to the potential difference.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion(A).

(4) Assertion : Longer wires have greater resistance and the smaller wires have lesser resistance.

Reason : Resistance is inversely proportional to the length of the wire.

Ans : (c) Assertion (A) is true but reason (R) is false

(5) Assertion : Alloys are commonly used in electrical heating devices, like electrical iron, toasters etc.

Reason : Alloys do not oxidise (burn) readily at high temperatures.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion(A).

OBJECTIVE QUESTIONS

(1) Two unequal resistances are connected in parallel. Which of the following statement is true?

- (a) current in same in both
- (b) current is larger in higher resistance
- (c) voltage-drop is same across both
- (d) voltage-drop is lower in lower resistance

Ans : (c) voltage-drop is same across both

(2) 20 coulomb charge is flowing in 0.5 second from a point in an electric circuit then value of electric current in amperes will be

- (a) 10
- (b) 40
- (c) 0.005
- (d) 0.05

Ans : (b) 40

(3) A cylindrical rod is reformed to twice its length with no change in its volume. If the resistance of the rod was R , the new resistance will be

- (a) R
- (b) $2R$
- (c) $4R$
- (d) 8

Ans : (c) $4R$

(4) 100 J of heat is produced each second in a 4 W resistance. The potential difference across the resistor is

- (a) 20 V
- (b) 10 V
- (c) 5 V
- (d) 15 V

Ans : (a) 20 V

(5) A wire of resistance R is cut into ten equal parts which are then joined in parallel. The New resistance will be

- (a) 0.01 R
- (b) 0.1 R
- (c) 10 R
- (d) 100 R

Ans (a) 0.01 R

(6) Two bulbs have the following ratings:

(1) 40 W, 200 V . (2) 20 W, 100 V

The ratio of their resistance is

- (a) 1 : 2
- (b) 2 : 1
- (c) 1 : 1
- (d) 1 : 3

Ans : (b) 2 : 1

(7) An electric kettle consumes 1 kW of electric power when operated at 220 V. A fuse wire of what rating must be used for it?

- (a) 1 A (b) 2 A
(c) 4 A (d) 4.5 A

Ans : (d) 5 A

(8) The length of a wire is doubled. By what factor does the resistance change

- (a) 4 time as large (b) twice as large
(c) unchanged (d) half as large

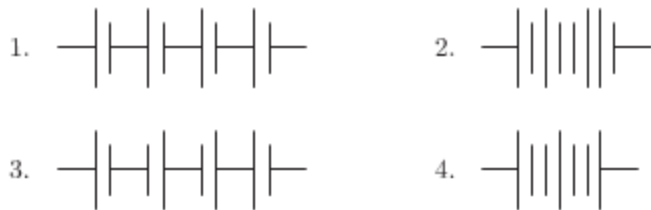
Ans : (d) half as large

(9) The resistivity does not change if

- (a) the material is changed (b) the temperature is changed
(c) the shape of resistor is changed (d) both material and temperature is are changed

Ans (c) the shape of the resistor is changed

(10) The proper representation of series combination of cells (Figure) obtaining maximum potential is

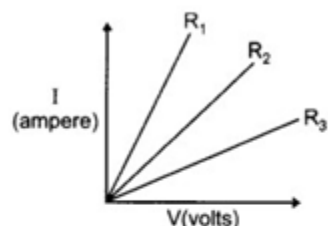


- (a) 1 (b) 2 (c) 3 (d) 4

Ans : (a) 1

i) A student carries out an experiment and plots the V - I graph of three samples of nichrome wire with resistances R_1 , R_2 and R_3 respectively.

Which of the following is true?

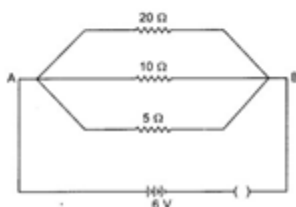


- (a) $R_1 = R_2 = R_3$
- (b) $R_1 > R_2 > R_3$
- (c) $R_3 > R_2 > R_1$
- (d) $R_2 > R_3 > R_1$

ii) What is the minimum resistance which can be made using five resistors each of $1/5 \text{ W}$?

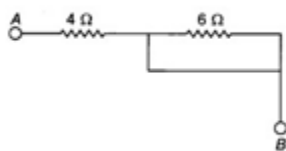
- (a) $1/5 \Omega$
- (b) $1/25 \Omega$
- (c) $1/10 \Omega$
- (d) 25Ω

iii) The current flows through the 10Ω resistor in the following circuit.



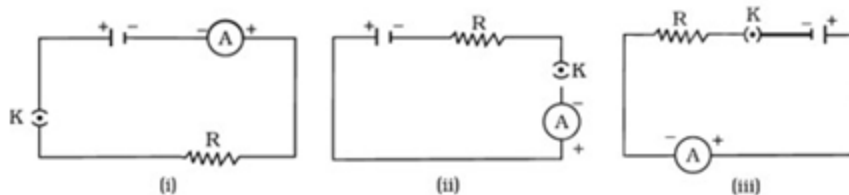
- (a) 1.2 A
- (b) 0.6 A
- (c) 0.2 A
- (d) 2.0 A

iv) The effective resistance between A and B is



- (a) 4Ω
- (b) 6Ω
- (c) May be 10Ω
- (d) Must be 10Ω

v) A cell, a resistor, a key and ammeter are arranged as shown in the circuit diagrams.



The current recorded in the ammeter will be

- a) maximum in (i)
- b) maximum in (ii)
- c) maximum in (iii)
- d) the same in all the cases

Answer i) c ii) b iii) b iv) a v) d

Electrical resistivity and resistance

Electrical resistivity and its inverse, electrical conductivity are fundamental properties of a material that quantifies how strongly it resists or conducts electric current. A low resistivity indicates a material that readily allows electric current to flow.

Resistance is defined as the ratio of potential difference across a conductor to the current passing through it. Resistance is the property of a conductor to resist the flow of charges through it.

Both resistance and resistivity describe how difficult it is to make electrical current flow through a

material, but unlike resistance, resistivity is an intrinsic property. This means that all pure copper wires

irrespective of their shape and size, have the same resistivity, but a long, thin copper wire has a much

larger resistance than a thick, short copper wire. Every material has its own characteristic resistivity. For

example, rubber has a far larger resistivity than copper. Resistivity of metals also varies with temperature.

The resistance of almost all alloys increases with increase in temperature but the rate of change of resistance is less than that of metals. In fact, the resistance of certain alloys such as Manganin, Eureka, and Constantan show practically no change in resistance to a considerable range of temperature.

Question 1:- What happens to the resistivity of a wire if it is stretched?

- a) It will increase
- b) It will decrease
- c) First increases then decreases
- d) Remains the same.

Question 2:- Though silver is a good conductor, why it is not an ideal choice for transmission of electricity?

- i) It is expensive
 - ii) It oxidizes and tarnishes when it comes in contact with air.
 - iii) Its resistivity decreases with increase in temperature
- a) Only (i)
 - b) Only (ii)
 - c) Both (i) and (ii)
 - d) Only (iii)

Question 3:- The area of cross section of a wire becomes half when its length is stretched to double. How the resistance of the wire is affected in the new condition?

_ Question 4:- The resistivity does not change if

- (a) the material is changed
- (b) the temperature is changed
- (c) the shape of the resistor is changed
- (d) both material and temperature are changed

Answer1. D

2. C

3. Volume of the wire remains the same before and after stretching. Assuming wire to be cylindrical in shape then volume = Area of base x height/ length due to stretching if length is increased area will decrease.

$$R = \rho l/A$$

New length = 2l

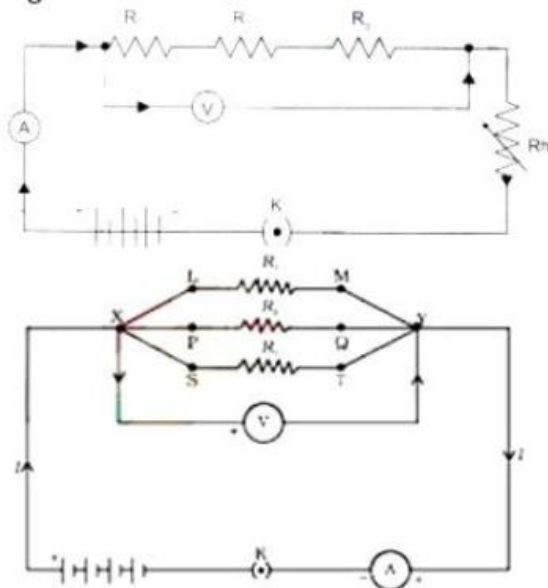
New Area = A/2

Resistance increases four times.

4. C

Read the following and answer any four questions:

In resistance for a system of the resistor, there are two methods of joining the resistors together as shown below

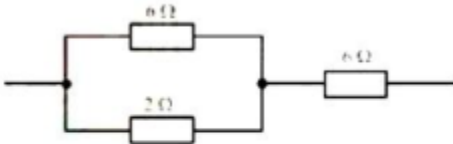


It showed an electric current in which 3 resistors having resistor R_1 , R_2 and R_3

respectively are join end to end i.e series. While the combination of the resistor in which 3 resistors connected together which point X and Y are said to be parallel.

- i. The total potential difference across a combination of a resistor in series is equal to
 - a. $V_1 + V_2 + V_3$
 - b. $V_1 - V_2 + V_2$
 - c. $V_1 + V_2$
 - d. None of these
- ii. In a series combination of resistor, the current is
 - a. same at every point of the circuit
 - b. different at every point of the circuit
 - c. zero
 - d. can not be determined
- iii. The electrical energy disputed in the resistor is given by
 - a. $W = VIT$
 - b. $W = VIR$
 - c. $W = RIT$
 - d. $W = RT$
- iv. If 5 resistor, each of value 0.2 ohm are connected in series what will be the resultant resistance
 - a. 1 ohm
 - b. 10 ohm
 - c. 6 ohm
 - d. 8 ohm

v. The figure given below shows three resistors.



Their combined resistance is:

- a. $16\ \Omega$
- b. $14\ \Omega$
- c. $\frac{20}{3}\ \Omega$
- d. $\frac{15}{2}\ \Omega$

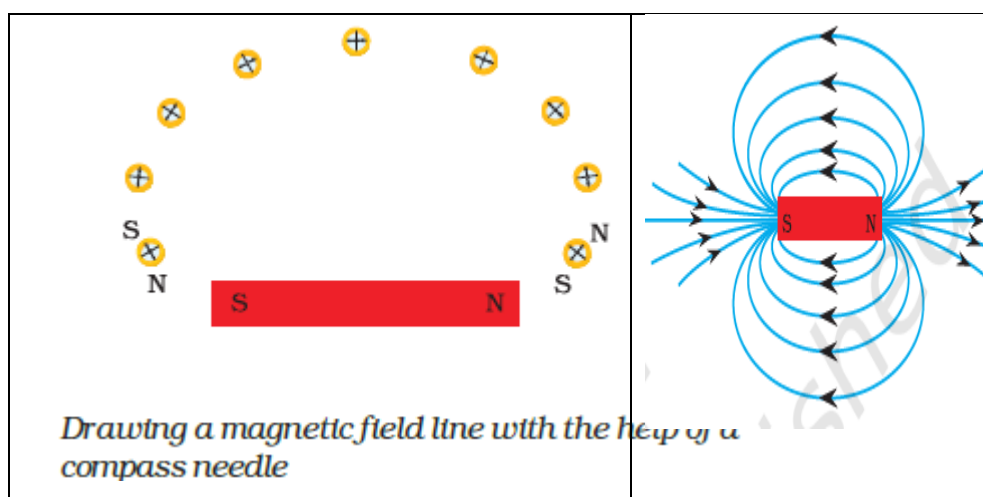
Answer

- i. (a) $V_1 + V_2 + V_3$
- ii. (a) Same in every point of circuit
- iii. (a) $W = VIT$
- iv. (a) 1 ohm
- v. (d) $\frac{15}{2}\ \Omega$

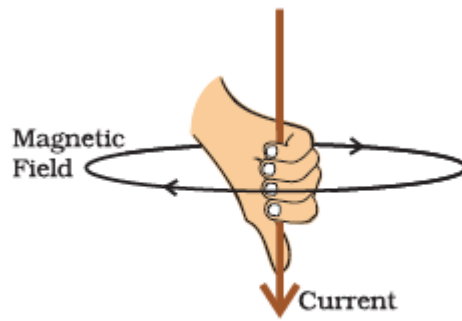
CHAPTER 13. MAGNETIC EFFECTS OF ELECTRIC CURRENT

KEY CONCEPTS & GIST OF THE LESSON

- ❖ **Magnet:** (i) is an object that attracts objects made of iron, cobalt & nickel.
(ii) Comes to rest in North-South direction, when suspended freely.
- ❖ Magnets are used: (i) In radio & stereo speakers, (ii) In refrigerator doors, (iii) on audio & video cassettes players, (iv) On hard discs & floppies of computers & (v) in children's toys.
- ❖ **Magnetic field:** The area around a magnet where a magnetic force is experienced is called a magnetic field. It is a quantity that has both direction & magnitude.
- ❖ **Magnetic field lines:** Magnetic field is represented by field lines. They are lines drawn in a Magnetic field along which a North magnetic pole moves. Magnetic field lines are called as Magnetic lines of force.

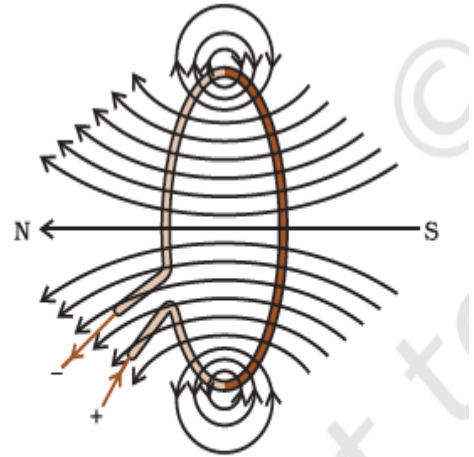


- ❖ **Properties of Magnetic field lines:**
 - (i) They do not intersect each other.
 - (ii) It is taken by convention that magnetic field lines emerge from North pole and merge at the South pole. Inside the magnet, their direction is from South pole to North pole. Therefore magnetic field lines are closed curves.
- ❖ **Magnetic field lines due to a current through a straight conductor (wire)-** consist of series of concentric circles whose direction is given by the Right hand thumb rule.
- ❖ **Right hand thumb rule:** If a current carrying straight conductor is held in your right hand such that the thumb points towards the direction of current, then the wrapped fingers show the direction of magnetic field lines.



Right-hand thumb rule

Magnetic field lines due to a current through a circular loop



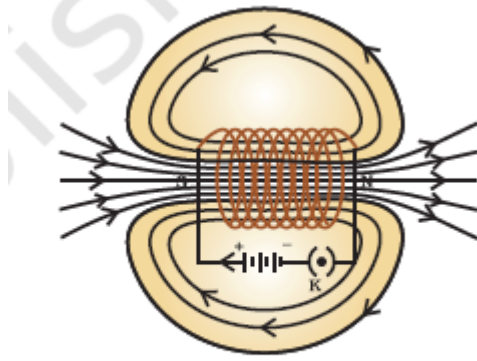
Magnetic field lines of the field produced by a current-carrying circular loop

❖ **The strength of the magnetic field at the centre of the loop(coil) depends on:**

- (i) 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 centre decreases.
- (ii) 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.
- (iii) The strength of the current flowing in the coil: as the strength of the current increases, the strength of the magnetic fields also increases.

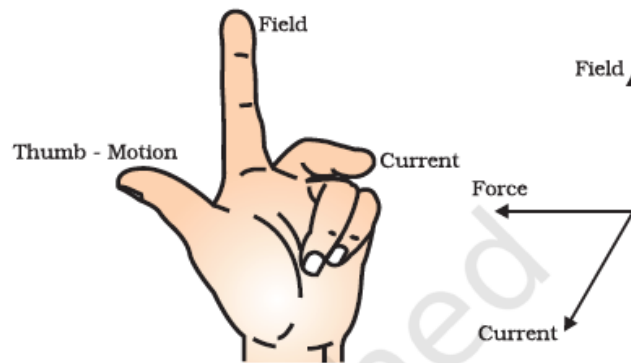
❖ **Solenoid:**

- (i) A coil of many turns of insulated copper wire wrapped in the shape of a cylinder is called a Solenoid.
- (ii) Magnetic field produced by a Solenoid is similar to a bar magnet.
- (iii) The strength of magnetic field is proportional to the number of turns & magnitude of current.



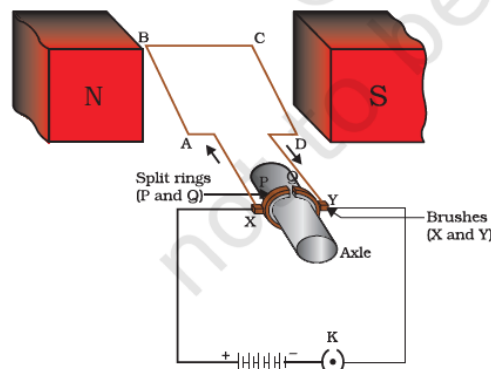
Field lines of the magnetic field through and around a current carrying solenoid.

- ❖ **Direction of Magnetic Force on a Current Carrying Conductor Placed perpendicular to the Direction of Magnetic Field - Fleming's Left hand rule:** Stretch the thumb, forefinger and middle finger of left hand such that they are mutually perpendicular. Forefinger points in the direction of magnetic field and centre finger in the direction of current, then the thumb gives the direction of force acting on the conductor.



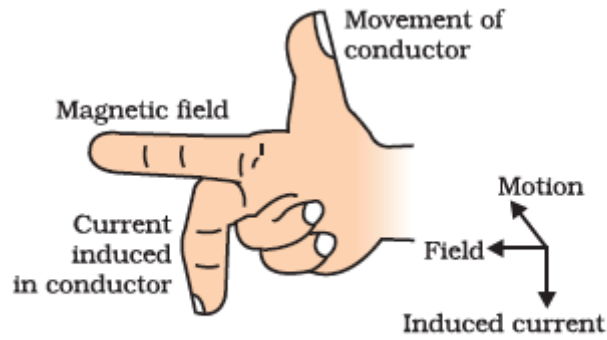
Fleming's left-hand rule

- ❖ **Electric motor:** A device that converts electric energy to mechanical energy.



- ❖ **Principle of Electric motor:** When a rectangular coil is placed in a magnetic field and a current is passed through it, force acts on the coil, which rotates it continuously. With the rotation of the coil, the shaft attached to it also rotates.
- ❖ **Electromagnetic induction:** Electricity production as a result of magnetism (induced current) is called Electromagnetic induction.
- ❖ **Fleming's Right hand rule:** gives the direction of induced current. Stretch the thumb, forefinger and middle finger of right

hand such that they are mutually perpendicular. Forefinger points in the direction of magnetic field and centre finger in the direction of induced current, then the thumb gives the direction of motion of the conductor.



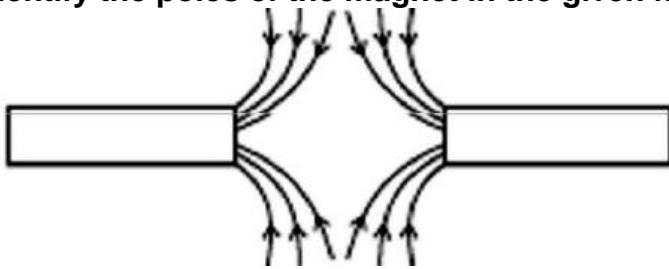
Fleming's right-hand rule

Very Short Answer Type Questions: (1 Mark)

1. **State the observation made by Oersted on the basis of his experiment with current carrying conductors.**

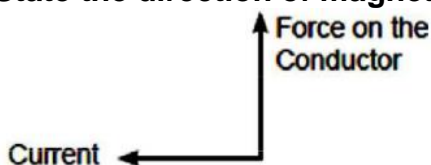
Answer. The electric current passing through a conducting wire produces magnetic effect.

2. **Identify the poles of the magnet in the given figure.**



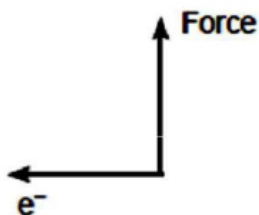
Answer. Both the poles facing each other represent south pole in nature as the magnetic field lines outside the magnet move from North to South Poles.

3. **State the direction of magnetic field in the following case.**



Answer. In given situation, according to Fleming's Left-Hand Rule Force is along y-axis. Current is along x-axis. Then magnetic field is along z-axis.

4. **State the direction of magnetic field in the following case.**



Answer. Perpendicular to the plane of paper in the outward direction by using Fleming's left hand rule.

5. **How can you show that the magnetic field produced by a given electric current in the wire decreases as the distance from the wire increases?**

Answer. The decrease in deflection of the magnetic compass needle clearly shows that the magnetic field decreases as we move away from the current-carrying conductor.

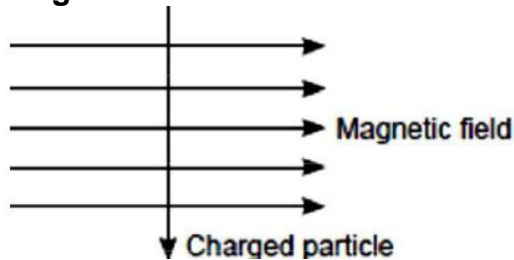
6. A current carrying straight wire held perpendicular to the plane of paper and current passes through this conductor in the vertically upward direction. What is the direction of magnetic field produced around it?

Answer. According to right-hand thumb rule, the direction of magnetic field produced around the given conductor is anticlockwise.

7. If the circular coil has n turns, the field produced is n times as large as that produced by a single turn. Justify it.

Answer. This is because the current in each circular turn has the same direction, and the field due to each turn then just adds up along the axis of the coil.

8. A charged particle enters at right angle into a uniform magnetic field as shown. What should be the nature of charge on the particle if it begins to move in a direction pointing vertically out of the page due to its interaction with the magnetic field?



Answer. Using Fleming's left hand rule, the nature of charged particle is positive.

9. When is the force experienced by a current-carrying conductor placed in a magnetic field largest?

Answer. When the length of current-carrying conductor and direction of magnetic field are perpendicular to each other, the maximum force is experienced by the current-carrying conductor.

Assertion and Reason Type Questions:

Each of these questions contain two statements, Assertion (A) and Reason (R). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

- (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
- (b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
- (c) Assertion is correct, reason is incorrect
- (d) Assertion is incorrect, reason is correct.

1. **Assertion:** A current carrying conductor experience a force in the magnetic field

Reason: The force acting on a current carrying conductor in a magnetic field is due to interaction between magnetic fields produced by the conductor and external magnetic field.

Ans : A

2. **Assertion:** In Fleming's left hand rule, the direction of magnetic field, magnetic force and current are mutually perpendicular.

Reason: Fleming's left hand rule is applied to measure the induced current.

Ans : C

3. **Assertion:** Magnetic field produced by a current carrying solenoid is independent of cross sectional area.

Reason: Magnetic field inside the solenoid is uniform.

Ans: B

4. **Assertion:** No two magnetic field-lines are found to cross each other.

Reason: At a given point two directions of magnetic field is not possible.

Ans: A

5. **Assertion:** Magnetic field at a point has only magnitude and no direction.

Reason: Magnetic field at a point is a vector quantity.

Ans : D

6. **Assertion:** Magnetic Field due to a current carrying coil at its centre becomes double if current in the coil is doubled.

Reason: Magnetic Field due to a current carrying coil at its centre is directly proportional to the current.

Ans : A

7. **Assertion:** Magnetic field lines form closed loops.

Reason: Direction of magnetic field produced around a straight current-carrying conductor is given by right-hand thumb rule.

Ans B

8. **Assertion:** Armature is rotated in the magnetic field by supplying electric current to it by some external source such as battery.

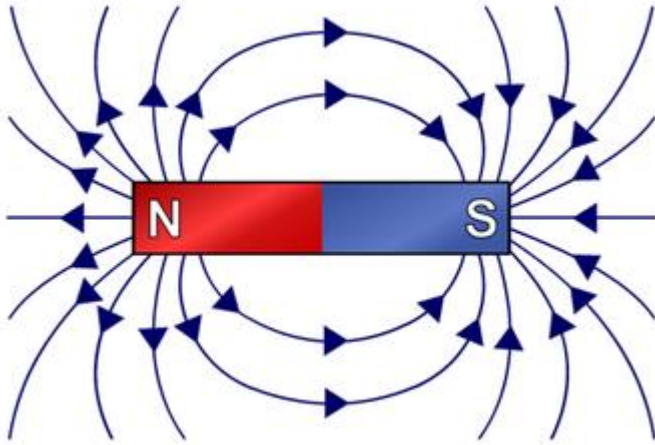
Reason: When a current carrying conductor is placed in external magnetic field it experiences a torque.

Ans: A

Case Study Based Questions: (4 Marks)

1. *Magnetic field lines:*

Magnetic field lines are imaginary *lines*. *Magnetic field lines* are a visual tool used to represent *magnetic fields*. They describe the direction of the *magnetic* force on a north monopole at any given position. The density of the *lines* indicates the magnitude of the *field*.



(1) Concept of Field lines was introduced by

- (a) Ampere (b) Orested (c) Faraday (d) Hertz

(2) Tangent at any point on the magnetic field lines gives

- (a) Direction of Magnetic field (b) direction of electric field (c) direction of both
(d) none of the above.

(3) Field lines near the poles of a Bar magnet is

- (a) Far Apart (b) Crowded (c) Parallel (d) may be crowded or distant

(4) A magnet:

- (a) can have no poles (b) must have two poles (c) may have only North Pole (d)
may have only North Pole

(5) SI Unit of magnetic field is

- (a) weber (b) gauss (c) tesla (d) ampere

Ans : (c), (a), (b), (a), (c)

2. Magnetic Resonance Imaging (MRI):

Magnetic Resonance Imaging (MRI) uses significant magnetic field of Heart and Brain and other parts inside human body for obtaining the images of different body parts. These images helps in medical diagnosis. Magnetism has, thus, got important uses in medicine.



(1) Magnetic field in the human body isthan Earth's magnetic field

- (a) greater (b) smaller (c) equal (d) depends on location

(2) A positively-charged particle (alpha-particle) projected towards west is deflected towards north by a magnetic field. The direction of magnetic field is

- (a) towards south (b) towards east
(c) downward (d) upward

(3) Which rule is used to find direction of magnetic force on a charge particle moving in magnetic field normal to its direction

- (a) Fleming's Right hand Rule (b) Fleming's Left Hand Rule
(c) Right Hand Thumb Rule (d) both (b) and (c)

(4) Magnetic field is a

- (a) Vector (b) Scalar (c) Tensor (d) both (a) and (b)

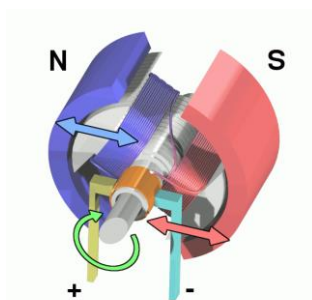
(5) Magnetic field can be produced by

- (a) bar Magnet (b) horse shoe magnet (c) Electric Field (d) all of the above

Ans: (b), (d), (b), (a), (d)

3. Electric Motor:

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft.



(1) Electric motor is used in

- (a) electric fans (b) refrigerators (c) mixers (d) all of the above

(2) In Electric motor magnetic field is produced by

- (a) Permanent magnet (b) Electro magnet (c) both (a) and (b) (d) none of the above.

(3) Direction of magnetic force on a current carrying conductor placed in magnetic field is given by

- (a) Fleming's left hand rule (b) Fleming's right hand rule
(c) Right hand palm rule (d) none of the above

(4) Moving part of an electric motor is called

- (a) armature (b) shaft (c) split ring (d) slip ring

(5) The commercial motors use

- (a) an electromagnet in place of permanent magnet
(b) large number of turns of the conducting wire in the current carrying coil
(c) a soft iron core on which the coil is wound.
(d) All of the above

Ans ; (b), (c), (a), (b) and (d)

Short Answer Type Questions(I): (2 Marks)

1. The given magnet is divided into three parts A, B, and C.

Name the parts where the strength of the magnetic field is: (i) maximum (ii) minimum. How will the density of magnetic field lines differ at these parts?



Answer.

(i) Maximum strength – at A and C

(ii) Minimum strength – at B

At A and C, magnetic field lines are crowded while at B, they are spread out.

2. A compass needle is placed near a current-carrying wire. State your observation for the following cases, and give reason for the same in each case.

(a) Magnitude of electric current in the wire is increased.

(b) The compass needle is displaced away from the wire.

Answer.

(a) **Observation:** The deflection of the needle increases.

Reason: Magnetic field strength due to current-carrying is directly proportional to current.

(b) **Observation:** The deflection in the compass needle decreases as its displacement from the current-carrying wire increases.

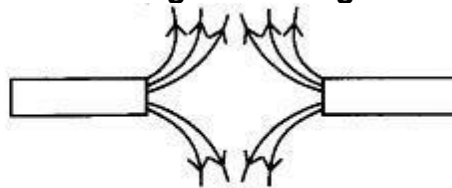
Reason: The strength of magnetic field reduces with the increase in distance from the wire.

3. Magnetic field lines of two magnets are shown in fig. A and fig. B.

Select the figure that represents the correct pattern of field lines. Give reasons for your answer. Also name the poles of the magnets facing each other.



(A)



(B)

Answer. Figure B represents the correct pattern of field lines. In figure A, field lines cross each other which is not possible because if they cross each other, at the point of intersection, there would be two directions of field lines.

In figure B, field lines are emerging in nature, so poles of magnet facing each other are north poles while opposite faces will have south polarity.

4. Identify the poles of the magnet in the given figure (1) and (2).

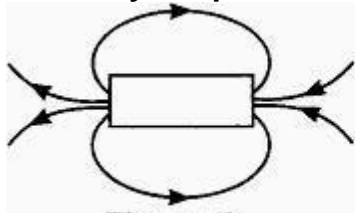


Figure (1)

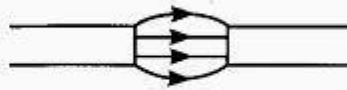


Figure (2)

Answer. Field lines emerge from north pole (N) and merge at the south pole (S) as shown in both the figures

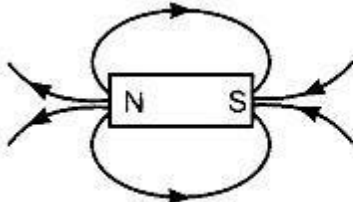


Figure (1)

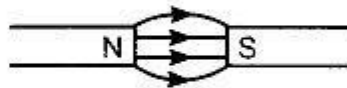


Figure (2)

5. The magnetic field associated with a current-carrying straight conductor is in anticlockwise direction. If the conductor was held along the east-west direction, what will be the direction of current through it? Name and state the rule applied to determine the direction of current. **Answer.** Direction of current – east to west as determined by Right-hand thumb rule. **Right Hand Thumb Rule:** If we hold a current-carrying conductor by right hand in such a way that the stretched thumb is along the direction of current, then the curly fingers around the conductor represents the direction of field lines of magnetic field.

6. Two circular coils A and B are placed close to each other. If the current in the coil A is changed, will some current be induced in the coil B? Give reason.

Answer. Yes, when a current in coil A changes, magnetic field lines linked with coil B also change. Hence, due to change in number of magnetic field lines, there is an induced current in coil B.

7. A coil of insulated wire is connected to a galvanometer. What would be seen if a bar magnet with its north pole towards one face of the coil is

(i) moved quickly towards it,

(ii) moved quickly away from the coil and

(iii) placed near its one face?

(i) Deflection in the galvanometer needle will be more on right-side.

(ii) Larger deflection in opposite direction as compared to the case (i) will be seen.

(Hi) No deflection.

The phenomenon involved is electromagnetic induction.

8. Two coils A and B of insulated wires are kept close to each other. Coil A is connected to a galvanometer while coil B is connected to a battery through a key. What would happen if

(i) a current is passed through coil B by plugging the key, and (ii) the current is stopped by removing the plug from the key?

Explain your answer mentioning the name of the phenomenon involved.

Answer. In both the given cases, galvanometer shows momentary deflection but in opposite direction. In coil A, magnetic field lines [increased in case (i) and decreased in case (ii)] induce a potential difference across the coil A which sets up induced

electric current in coil A. It is shown by the deflection in galvanometer. This is known as electromagnetic induction.

9. Why and when does a current carrying conductor kept in a magnetic field experience force? List the factors on which direction of this force depends?

Answer. The drifting of free electrons of a conductor in a definite direction causes the current to flow through it. When such conductor is placed in a uniform magnetic field, each drifted electron of a conductor experience a magnetic force. This force is collectively experience by a conductor as a whole. Hence a current carrying conductor kept in a magnetic field experience a force. The direction of magnetic force depends on

- (i) direction of current through the conductor, and
- (ii) direction of magnetic field.

10. How is the strength of magnetic field near a straight current-conductor (i) related to the strength of current in the conductor?

(ii) is affected by changing the direction of flow of current in the conductor?

Answer: (i) The strength of magnetic field around a straight current conductor increases on increasing the strength of current in the conductor or vice versa.

(ii) The direction of magnetic field around a straight current carrying conductor gets reversed if the direction of current through that conductor is reversed.

SHORT ANSWER TYPE QUESTIONS [II] [3 MARKS]

1. Write one application of each of the following:

(a) Right-hand thumb rule (b) Fleming's left hand rule (c) Fleming's right hand rule **Answer.**

(a) Right-hand thumb rule is used to find the direction of magnetic field in a coil of wire and the electric current in a straight conductor.

(b) Fleming's left hand rule is used to find the direction of force exerted on a current-carrying conductor placed in a magnetic field as in electric motor.

(c) Fleming's right hand rule is used to find the direction of induced current in a closed circuit placed in changing magnetic field as in electric generator.

2. How will the magnetic field produced at a point due to a current-carrying circular coil change if we:

(i) increase the current flowing through the coil?

(ii) reverse direction of current through the coil?

(iii) increase the number of turns in the coil?

(i) increases if the current is increased as $B \propto I$

(ii) reverses on reversing the current. .

(iii) increases if the number of turns in the coil increases as field is directly proportional to the number of turns.

3. (a) Mention the factors on which the direction of force experienced by a current-carrying conductor placed in a magnetic field depend.

(b) Under what condition is the force experienced by a current-carrying conductor placed in a magnetic field maximum?

(c) A proton beam is moving along the direction of a magnetic field. What force is acting on proton beam?

Answer. (a) The direction of force experienced by the current-carrying conductor depends on:

- (i) direction of current and

(ii) direction of magnetic field.

(b) When the direction of current is at right angle to the direction of magnetic field, the force is maximum.

(c) No force is experienced by the proton beam. As proton beam is moving along the direction of magnetic field.

4. A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is (a) pushed into the coil, (b) withdrawn from inside the coil, (c) held stationary inside the coil?

(a) When a bar magnet is pushed into the coil, magnetic field lines linked with the coil changes (increases). It causes the electric current to get induced in it. The needle of galvanometer will move momentarily in one direction.

(b) When a bar magnet is withdrawn from inside the coil, the magnetic field lines linked with the coil changes but in decreasing order. Current will be induced in the coil which will be indicated by deflection of needle in the galvanometer. The deflection is opposite to that in case (a). This indicates that the direction of induced current is now opposite to the direction of induced current in case (a).

(c) When bar magnet is held stationary inside the coil, there is no deflection in the galvanometer. This is because there is no change in magnetic field lines linked with the coil. Hence, no induced current will flow through the coil.

5. State the rule to determine the direction of a

(a) magnetic field produced around a straight conductor carrying current,

(b) force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it.

Answer.

(a) Direction of magnetic field produced around a straight current-carrying conductor is given by right-hand thumb rule.

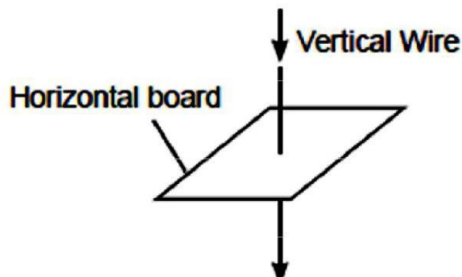
If we hold a current-carrying conductor in a right hand in such a way that the stretched thumb is along the direction of current, then the curly fingers around the conductor represent the direction of magnetic field lines.

(b) Direction of force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it, is given by Fleming's left hand rule.

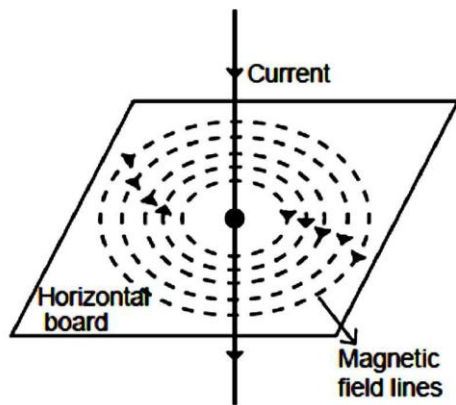
Stretch the thumb, forefinger and middle finger of left hand in such a way that they are mutually perpendicular to each other. If the forefinger points to the direction of magnetic field and the

middle finger points to the direction of current, then the thumb will point to the direction of motion or the force acting on the conductor.

6. The direction of electric current passed through a vertical wire and through a horizontal card is shown below:

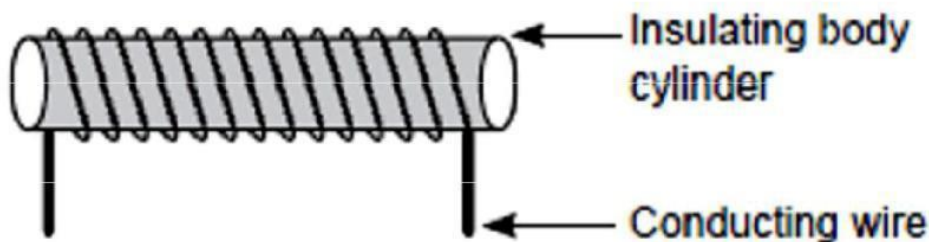


Sketch the pattern of the magnetic field on the card around the wire. Indicate the direction of the magnetic field at any one point. How would you check this direction experimentally? Answer. The pattern of magnetic field lines on the card around the current carrying conductor for the downward direction of current is shown. They are concentric in circle with their centre lies on the axis of wire. Direction:



7. What is meant by solenoid? How does a current carrying solenoid behave? Give its main use.

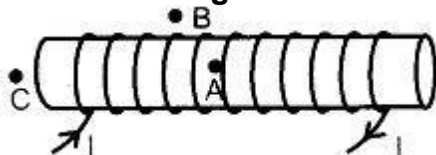
Answer. Solenoid: A coil of many circular turns of insulated copper wire wound on a cylindrical insulating body (i.e., cardboard etc.) such that its length is greater than its diameter is called solenoid.



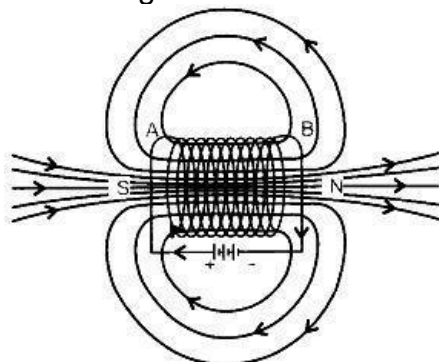
When current is flowing through the solenoid, the magnetic field line pattern resembles exactly with those of a bar magnet with the fixed polarity, i.e. North and South pole at its ends and it acquires the directive and attractive properties similar to bar magnet. Hence, the current carrying solenoid behave as a bar magnet.

Use of current carrying solenoid: It is used to form a temporary magnet called electromagnet as well as permanent magnet.

8. For the current carrying solenoid as shown below, draw magnetic field lines and giving reason explain that out of the three points A, B and C at which point the field strength is maximum and at which point it is minimum.



Answer. Outside the solenoid magnetic field is minimum. At the ends of solenoid, magnetic field strength is half to that inside it. So Minimum – at point B; Maximum –



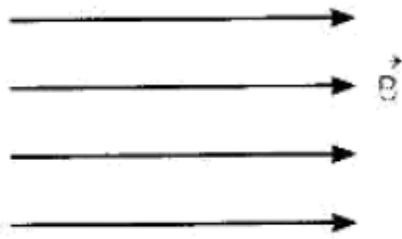
at point A

9. a) Draw a diagram to represent a uniform magnetic field in a given region.

(b) List two properties of magnetic field lines.

Answer.

(a) Equidistant parallel line indicates a uniform magnetic field in a given region.



(b) Properties of magnetic field lines are:

The magnetic field lines of a magnet form continuous closed loops, i.e. outside the magnet, they emerge from north pole and merge at the south pole and inside the magnet, the direction of field lines is from its south pole to its north pole.

The degree of closeness of field lines indicates the strength of magnetic field.

Field lines never cross each other.

10. What are magnetic field lines? Justify the following statements

(a) Two magnetic field lines never intersect each other.

(b) Magnetic field lines are closed curves.

Magnetic field lines: It is defined as the path along which the unit North pole (imaginary) tends to move in a magnetic field if free to do so.

(a) The magnetic lines of force do not intersect (or cross) one another. If they do so then at the point of intersection, two tangents can be drawn at that point which indicates that there will be two different directions of the same magnetic field, i.e. the compass needle points in two different directions which is not possible.

(b) Magnetic field lines are closed continuous curves. They diverge from the north pole of a bar magnet and converge its south pole. Inside the magnet they move from south pole to north pole.

LONG ANSWER TYPE QUESTION [5 MARKS]

1. **(a) Describe an activity to demonstrate the pattern of magnetic field lines around a straight conductor carrying current.**

(b) State the rule to find the direction of magnetic field associated with a current carrying conductor.

(c) What is the shape of a current carrying conductor whose magnetic field pattern resembles that of a bar-magnet ?

Answer.

(a) Aim : To study the magnetic field due to a straight current carrying conductor.

Apparatus Required : A thick conducting wire, battery, rheostat, magnetic needle, ammeter (0-5 A), key, a cardboard, a stand to hold the wire, iron filings and sprinkler of iron filings.

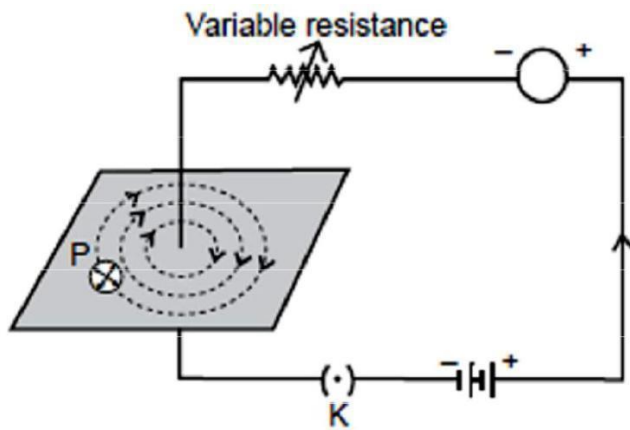
Procedure :

i) Attach the thick wire through a hole at the middle of the cardboard and clamp it in a stand.

ii) Attach the ends of the wire through a key, variable resistor and an ammeter on either side of a battery and hold it vertically and perpendicularly to the board.

iii) Spread the iron filings uniformly on the cardboard and place the magnetic needle on the board.

iv) Close the key and tap the cardboard slightly and observe the orientation of iron filings.



Magnetic field around a straight conducting wire.

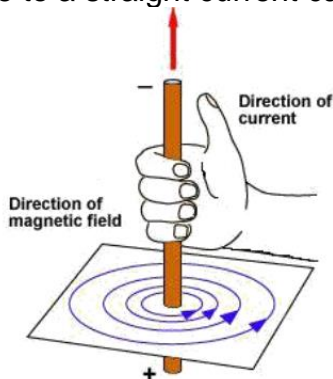
Concentric circles indicate the field lines

Observation :

Just on closing the key, the iron filings are aligned in the pattern of concentric circles around the wire.

Conclusion :

- i) Current carrying conductor is a source of magnetic field.
 - ii) The magnetic field is in the form of concentric circles whose centre lies on the wire.
- (b) Right-Hand Thumb Rule. This rule is used to find the direction of magnetic field due to a straight current carrying wire.

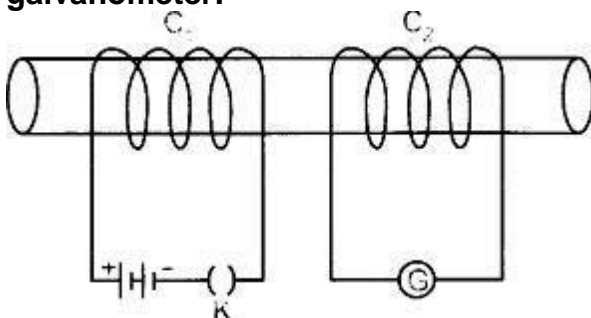


It states that if we hold the current carrying-conductor in the right hand in such a way that the thumb is stretched along the direction of current, then the curly finger around the conductor represent the direction of magnetic field produced by it. This is known as right-hand thumb rule.

Direction of Field Lines due to current carrying straight conductor is as shown in figure.

(c) Solenoid.

2. Two coils C₁ and C₂ are wrapped around a non conducting cylinder. Coil C₁ is connected to a battery and key and C₂ with galvanometer G. On pressing the key (K), current starts flowing in the coil C₁. State your observation in the galvanometer:



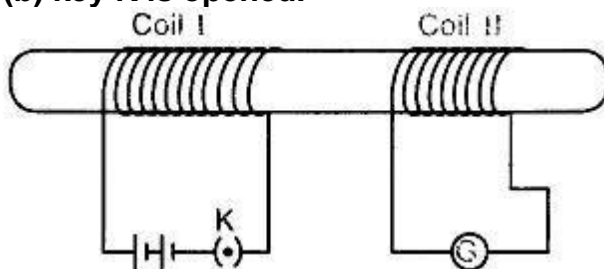
- (i) When key K is pressed on
- (ii) When current in the coil C₁ is switched off.
- (iii) When the current is passed continuously through coil C₁

(iv) Name and state the phenomenon responsible for the above observation. Write the name of the rule that is used to determine the direction of current produced in the phenomena. Answer.

- (i) When key is pressed on, the galvanometer needle deflects momentarily in one direction.
- (ii) When the current in the coil C1 is switched off, the galvanometer needle deflects again momentarily but in opposite direction to that in the previous case.
- (iii) When current is passed continuously through coil C1, no deflection is observed in the galvanometer.
- (iv) The phenomenon responsible for the above observations is electromagnetic induction. Electromagnetic Induction: The process, by which a changing magnetic field in a conductor induces a current in another conductor placed nearby, is called electromagnetic induction.
- Fleming's right hand rule is used to determine the direction of current produced in the phenomena of electroymagnetic induction.

3. Two coils of insulated copper wire are wound over a non -conducting cylinder as shown. Coil I has larger number of turns.

- (i) Write your observations when,**
- (a) key K is closed,**
- (b) key K is opened.**



(ii)When the current is passed continuously through coil I.

Give reason for your observations.

(iii)Name and state the phenomenon responsible for the above observation.

(iv) Write the name of the rule that is used to determine the direction of current produced in the phenomenon.

(v) Name the two coils used in this experiment.

Answer.

(i) (a) When key is closed, the galvanometer needle deflects momentarily in one direction. **Reason:** When key is closed, magnetic field lines around coil 2 increases momentarily. This causes an induced current to flow through it and hence deflection occurs in one direction.

(b) When key is opened, the galvanometer needle deflects again momentarily but in opposite direction.

Reason: When key is open, magnetic field lines around coil 2 decreases momentarily. This causes an induced current to flow in opposite direction. Hence, deflection occurs in opposite direction.

(ii) When current is passed continuously through coil I, no deflection is observed in the galvanometer.

Reason: There will be no change in magnetic field lines passing through the coil 2. Hence, no induced current will be set up in coil 2.

(iii) The phenomenon observed in above cases is electromagnetic induction. It is a process by which a changing magnetic field in a conductor induces a current in another conductor placed nearby.

(iv) Fleming's right hand rule

(v) Coil I – Primary coil Coil II – Secondary coil

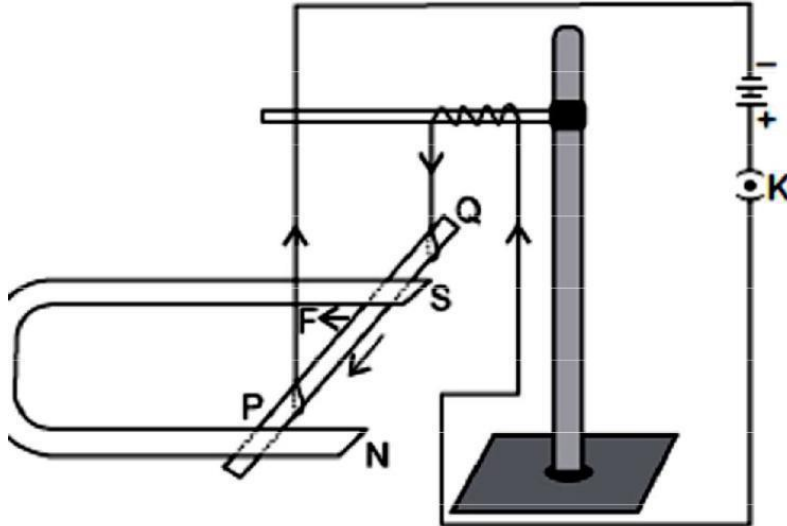
4. With the help of a diagram of experimental setup describe an activity to show that the force acting on a current carrying conductor placed in a magnetic field increases with increase in field strength.

Answer.

Aim : To show that force acting on a current carrying conductor placed in a magnetic field increases with the field strength.

Apparatus Required : Aluminium rod, stand horse shoe magnet of different intensity, cell, key and connecting wires.

Procedure : i) Arrange the set-up as shown in figure.



A current carrying rod, PQ is experiencing force F

ii) Plug the key, the current flowing through the rod from Q to P observe the displacement of rod.

iii) Now unplug the key and remove the first horse shoe magnet and place the second horse shoe magnet of higher magnetic field strength in a similar manner to that of first.

iv) Plug the key, the current again flow through the rod from Q to P. Again observe the deflection of rod.

v) Now bring both the magnet closer together (to ensure greater magnetic field than that of previous case). Again observe the motion of rod.

Observations : Each time, the conductor moves faster than that of previous one. It is possible only when conductor gets accelerated more each time which required more force. ($F = ma$) Thus, if the magnetic field strength is increased, the rod will experience a greater force and move faster.

Conclusion : The force acting on a current carrying conductor placed in a magnetic field increases with increase in field strength.

5. With the help of a suitable diagram explain principle, working of a electric Motor.

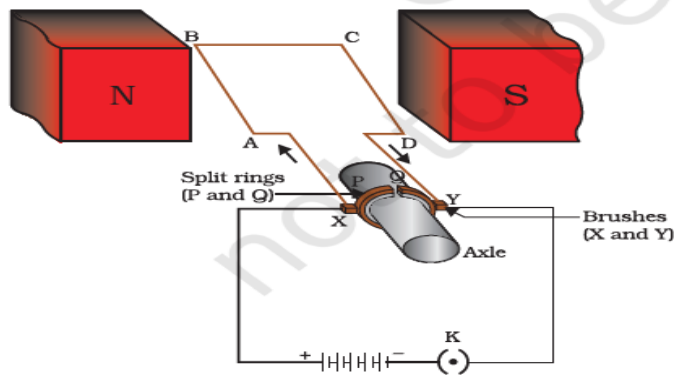
Principle of Electric motor: When a rectangular coil is placed in a magnetic field and a current is passed through it, force acts on the coil, which rotates it continuously. With the rotation of the coil, the shaft attached to it also rotates.

Working: Current in the coil ABCD enters from the source battery through conducting brush

X and flows back to the battery through brush Y. Using Fleming's left Hand rule We find that the force acting on arm AB pushes it downwards while the force acting on arm CD pushes it upwards. Thus the coil and the axle O, mounted free to turn about an axis, rotate anti-clockwise. At half rotation, Q makes contact with the brush X and P with brush Y. Therefore the current in

the coil gets reversed and flows along the path DCBA. A device that reverses the direction of flow of current through a circuit is called a commutator. In electric motors, the split ring acts as a commutator. The reversal of current also reverses the direction of force acting on the two arms AB and CD. Thus the arm AB of the coil that was earlier pushed down is now pushed up and the arm CD previously pushed up is now pushed down. Therefore, the coil and the axle rotate half a turn more in the same direction. The reversing of the current is repeated at each half rotation, giving rise to a continuous rotation of the coil and to the axle.

Diagram:



CH 15: OUR ENVIRONMENT

VERY SHORT ANSWER TYPE QUESTIONS [1 Mark]

1. Name the phenomenon in which non-biodegradable chemicals get accumulated progressively at each trophic level of a food chain.

Answer. Biological magnification.

2. How is the increase in demand for energy affecting our environment adversely?

Answer. The increase in demand for energy affects our environment adversely. Due to this increase, pollutants like CO, CO₂, SO₂, etc., are released in to the atmosphere which leads to greenhouse effect.

3. Why is ozone layer getting depleted at the higher levels of the atmosphere?

Answer. Ozone layer is getting depleted at the higher levels of the atmosphere due to effect of chlorofluorocarbons (CFC_s) which are used as refrigerants and in fire extinguishers.

4. Name any two abiotic components of an environment.

Answer. Two abiotic components of an environment are temperature and rainfall.

5. What are the two main components of our environment?

Answer. The two main components of our environment are the biotic or living components and abiotic or non-living components.

6. Why are green plants called 'producers'?

Answer. Green plants are called 'producers' because they can produce food by photosynthesis in the presence of sunlight.

7. Which disease is caused in human beings due to depletion of ozone layer in the atmosphere?

Answer. Skin cancer is caused in human beings due to the depletion of ozone layer in the atmosphere.

8. What will happen if we kill all the organisms in one trophic level?

Answer. If we kill all the organisms in one trophic level, the following effects will take place:

1. The population of organisms in previous trophic level will increase.
2. The organisms in next trophic level will not be able to get the food, so they will migrate to some other ecosystem or die.
3. It will cause an ecological imbalance in the food chain.

9. Why did United Nations act to control the production of chlorofluorocarbons (CFC_s) use in refrigerators?

Answer. CFC_s deplete the ozone layer around the earth; hence their production is controlled by United Nations.

10. Which compounds are responsible for the depletion of ozone layer?

Answer. The compounds responsible for the depletion of ozone layer are chlorofluorocarbons (CFCs).

11. Define 'trophic level'.

Answer. Trophic level is the position that an organism occupies in a food chain, where transfer of food or energy takes place.

12. What are the various steps in a food chain called?

Answer. The various steps in a food chain are called trophic levels.

13. What is the important function of presence of ozone in earth's atmosphere?

Answer. The important function of presence of ozone in earth's atmosphere is that it shields the surface of the earth from ultraviolet (UV) radiations of the sun.

14. Give an example to illustrate that indiscriminate use of pesticides may result-in the degradation of the environment.

Answer. The pesticides used in crop field are washed down into the water bodies. From water bodies, these are absorbed by aquatic plants and animals of a food chain and thereby degrade the environment.

15. Why is it necessary to conserve our environment?

Answer. It is necessary to conserve our environment to prevent depletion of natural resources and environmental damage, thereby sustaining life.

16. What is meant by a biodegradable waste?

Answer. Biodegradable wastes are those substances which are broken down into simpler, harmless substances in nature in due course of time by the biological processes such as action of microorganisms like certain bacteria.

Examples: Urine and faecal matter, sewage, agricultural residue, paper, wood, cloth and cattle dung.

17. What is the role of decomposers in the ecosystem?

Answer. Role of decomposers in the environment:

1. They return the nutrients to the nutrient pool.
2. They help in completing the different bio-geochemical cycles, thus they maintain the balance in the ecosystem.

18. What step is being taken to limit the damage to the ozone layer?

Answer. 1. Judicious use of aerosol sprays propellants such as fluorocarbon and chlorofluorocarbons which cause depletion or hole in ozone layer.

2. Control over large scale nuclear explosions and limited use of supersonic planes.

19. Why are some substances non- biodegradable?

Answer. Some substances are non-biodegradable because they cannot be broken down into simpler harmless substances in nature.

20. Which class of chemicals is linked to the decrease in the amount of ozone in the upper atmosphere of the earth?

Answer. The chemical compound Chlorofluorocarbon is responsible for decrease of ozone in the upper atmosphere of the earth.

21. Name two decomposers operating in our ecosystem.

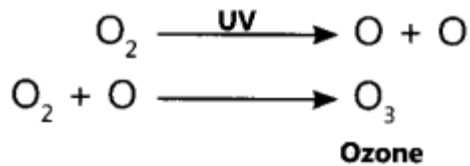
Answer. Bacteria and fungi.

22. Select two non-biodegradable substances from the following waste generated in a kitchen: spoilt food, paper bags, milk bags, vegetable peels, tin cans, used tea leaves.

Answer. Milk bags and tin cans.

23. What happens when higher energy ultraviolet radiations act on the oxygen at the higher level of the atmosphere?

Answer. When high energy ultraviolet radiations act on oxygen, ozone is produced:



24. In a food chain, 10,000 joules of energy is available to the producer. How much energy will be available to the secondary consumer to transfer it to the tertiary consumer?

Answer. 10 J will be available to the secondary consumer to transfer to the tertiary consumer.

25. Write the name and formula of a molecule made up of three atoms of oxygen.

Answer. Ozone and its chemical formula is O₃.

26. List two man-made ecosystems.

Answer. Garden and Pond are man-made ecosystems.

27. 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?

Answer. 10 J energy would be available to deer to transfer to lion.

28. Which of the following belong to the first trophic level of a food chain?
Grass, Grasshopper, Plants, Rat, Tiger

Answer. Grass and plants belong to the 1st trophic level of a food chain.

29. Name the phenomenon in which non-biodegradable chemicals get accumulated progressively at each trophic level of a food chain.

Answer. Biological magnification.

SHORT ANSWER TYPE QUESTIONS [3 Marks]

1. (a) What is 'environmental pollution'?

(b) Distinguish between biodegradable and non-biodegradable pollutants.

(c) Choose the biodegradable pollutants from the list given below:

Sewage, DDT, radioactive waste, agricultural waste.

Answer. (a) Environmental pollution is an undesirable change in the physical, chemical or biological

characteristics of the natural environment, brought about by man's activities. This pollution may affect the soil, rivers, seas or the atmosphere.

(b)

Biodegradable pollutants	Non-biodegradable pollutants
(i) These pollutants can be broken down into non-poisonous substances in nature by the action of microorgan-	(i) These pollutants cannot be broken down into non-poisonous substances by microorganisms

(c) Biodegradable pollutants are sewage and agricultural waste.

2. Why are bacteria and fungi called decomposers? List any two advantages of decomposers to the environment.

Answer. Bacteria and fungi breakdown the dead remains and waste products of organisms. These microorganisms are called the decomposers as they breakdown the complex organic substances into simple inorganic substances that go into the soil and are used up once more by the plants.

Two advantages of decomposers to the environment are as follows:

1. Decomposers feed, on the dead bodies of plants and animals. They return the simple components to soil and help in making the steady state of ecosystem by recycling of nutrients. They, therefore, create a balance in the environment.
2. They also act as scavengers or cleansing agents of the atmosphere.

3. Explain the phenomenon of “biological magnification” How does it affect organisms belonging to different trophic levels particularly the tertiary consumers?

Answer. The process in which harmful chemicals enter a food chain and get accumulated progressively at each trophic level is called biological magnification. Harmful and toxic chemicals enter our bodies when they are added to soil and water. Use of pesticides to protect the food crops from diseases and pests and chemical wastes of factories are dumped in open or disposed off into rivers. These chemicals are washed down into the soil and ultimately to water table or get absorbed or taken up from the soil by the plants along with water and minerals and in this way harmful chemicals enter the food chain. The quantity of these harmful chemicals increase with increase in trophic level of the food chain because these substances are not degradable. Man is at the top of the food chain, so concentration is maximum in human beings.

Thus, accumulation of DDT has been maximum in man as DDT is used to destroy pests. DDT is accumulated in the following way in this food chain:

This is the reason why our food grains such as wheat and rice, vegetables and fruits and even meat contain varying amounts of pesticides residues. So, the highest trophic level at the extreme right of food chain has the maximum concentration of harmful chemicals in a food chain.

