CHAPTER 2 – ACIDS, BASES AND SALTS

Question 1: You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic solution and a basic solution, respectively. If you are given only red litmus paper, how will you identify the contents of each test tube?

Answer- We will put one-one drop from each test tube on red litmus paper. The solution which change the colour of red litmus paper to blue, it is a base. Now we put one-one drop from other two test tubes on blue litmus paper (turned blue earlier), the solution which will turn it red is an acidic solution and which will not change colour is a neutral solution.

Question 2: Why should curd and sour substances not be kept in brass and copper vessels?

Answer- Curd and other sour substances contain acids. Therefore, when they are kept in brass and copper vessels, the metal reacts with the acid to liberate hydrogen gas and harmful products, thereby spoiling the food.

Question 3: Which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas?

Answer- Hydrogen gas is usually liberated when an acid reacts with a metal. Take few pieces of zinc granules and add 5 ml of dilute H_2SO_4 . In this reaction hydrogen gas will be produced. We can test the evolved hydrogen gas by its burning with a pop sound when a burning candle is brought near.

Question 4: Metal compound A reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle. Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride.

Answer- $CaCO_3 + 2HCl \longrightarrow CaCl_2 + CO_2 + H_2O$

Calcium carbonate — hydrochloric acid — calcium chloride — carbon dioxide — water

Question 5: Why do HCl, HNO_3 , etc., show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

Answer- Because HCl, HNO_3 etc dissociate in water to form hydrogen ions (H^+), but glucose and alcohol do not dissociate.

Question 6: Why does an aqueous solution of an acid conduct electricity?

Answer- Acids dissociate in aqueous solutions to form ions. These ions are responsible for conduction of electricity.

Question 7: Why does dry HCl gas not change the colour of the dry litmus paper?

Answer- Because dry HCl does not give hydrogen ions (H^+) without water. Hence it does not act as acid.

Question 8: While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

Answer- Since the process of dissolving an acid in water is exothermic, it is always recommended that acid should be added to water. If it is done the other way, then it is possible that because of the large amount of heat generated, the mixture splashes out and causes burns.

Question 9: How is the concentration of hydronium ions (H_3O^+) affected when a solution of an acid is diluted?

Answer- When an acid is diluted, the concentration of hydronium ions (H_3O^+) per unit volume decreases.

Question 10: How is the concentration of hydroxide ions (OH^-) affected when excess base is dissolved in a solution of sodium hydroxide?

Answer- The concentration of hydroxide ions (OH^-) would increase when excess base is dissolved in a solution of sodium hydroxide.

Question 11: You have two solutions, A and B. The pH of solution A is 6 and pH of solution B is 8. Which solution has more hydrogen ion concentration? Which of this is acidic and which one is basic?

Answer- A pH value of less than 7 indicates an acidic solution, while greater than 7 indicates a basic solution. Therefore, the solution with pH = 6 is acidic and has more hydrogen ion concentration than the solution of pH = 8 which is basic.

Question 12: What effect does the concentration of hydrogen ions (H^+) have on the nature of the solution?

Answer- With an increase in H^+ ion concentration, the solution becomes more acidic, while a decrease of H^+ ion causes an increase in the basicity of the solution.

Question 13: Do basic solutions also have H^+ (aq) ions? If yes, then why are these basic?

Answer- Yes, basic solution also has H^+ ions. However, their concentration is less as compared to the concentration of OH^- ions that makes the solution basic.

Question 14: Under what soil condition do you think a farmer would treat the soil of his fields with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate) ?

Answer- If the soil is acidic and improper for cultivation, then to increase the basicity of soil, the farmer would treat the soil with quick lime or slaked lime or chalk.

Question 15: What is the common name of the compound $CaOCl_2$?

Answer- The common name of the compound $CaOCl_2$ is bleaching powder.

Question 16: Name the substance which on treatment with chlorine yields bleaching powder?

Answer- Calcium hydroxide [$Ca(OH)_2$].

Question 17: Name the sodium compound which is used for softening hard water.

Answer- Washing soda ($Na_2CO_3 .10H_2O$) is used for softening hard water.

Question 18:- What will happen if a solution of sodium hydrogencarbonate is heated? Give the equation of the reaction involved.

Answer- When a solution of sodium hydrocarbonate (sodium hydrogencarbonate-$NaHCO_3$) is heated, sodium carbonate and water are formed with the evolution of carbon dioxide gas.

$$\underset{\text{(Sodium hydrogencarbonate)}}{2NaHCO_3} \xrightarrow{\text{Heat}} \underset{\text{(Sodium carbonate)}}{Na_2CO_3} + H_2O + CO_2$$

Question 19: Write an equation to show the reaction between Plaster of Paris and water.

Answer- POP react with water to form gypsum.

$$\underset{\text{(Plaster of Paris)}}{CaSO_4 . \frac{1}{2} H_2O} + 1\frac{1}{2} H_2O \rightarrow \underset{\text{(Gypsum)}}{CaSO_4 . 2H_2O}$$

EXERCISE

Question 1: A solution turns red litmus blue, its pH is likely to be

(a) 1 **(b) 4** **(c) 5** **(d) 10 ✓**

Question 2: A solution reacts with crushed egg-shells to give a gas that turns lime-water milky. The solution contains

(a) NaCl **(b) HCl ✓** **(c) LiCl** **(d) KCl**

Question 3: 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount of HCl solution (the same solution as before) required to neutralise it will be

(a) 4 mL **(b) 8mL** **(c) 12 mL** **(d) 16 mL ✓**

Question 4: Which one of the following types of medicines is used for treating indigestion?

(a) Antibiotic **(b) Analgesic** **(c) Antacid ✓** **(d) Antiseptic**

Question 5: Write word equations and then balanced equations for the reaction taking place when –

(a) dilute sulphuric acid reacts with zinc granules.

(b) dilute hydrochloric acid reacts with magnesium ribbon.

(c) dilute sulphuric acid reacts with aluminium powder.

(d) dilute hydrochloric acid reacts with iron filings.

Answewr- (a) Sulphuric acid + Zinc → Zinc sulphate + Hydrogen

$H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2$

(b) Hydrochloric acid + Magnesium → Magnesium chloride + Hydrogen

$2HCl + Mg \rightarrow MgCl_2 + H_2$

(c) Sulphuric acid + Aluminium → Aluminium sulphate + Hydrogen

$3H_2SO_4 + 2Al \rightarrow Al_2(SO_4)_3 + 3H_2$

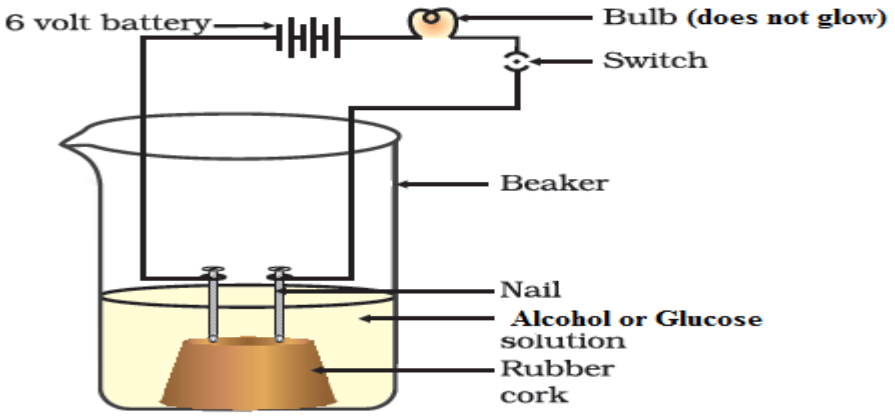
(d) Hydrochloric acid + Iron → Iron (II) chloride + Hydrogen

$$HCl + Fe \rightarrow FeCl_2 + H_2$$

Question 6: Compounds such as alcohols and glucose also contain hydrogen but are not categorized as acids. Describe an activity to prove it.

Answer- Because alcohols and glucose do not dissociate into hydrogen ions, hence these cannot be categorized as acids.

Activity- Make a circuit as shown in figure. When we pour HCl in beaker then bulb glows, but when we pour alcohol or glucose solution in beaker then bulb do not glow. This is because of absence of ions in alcohol and glucose solutions.



Question 7: Why does distilled water not conduct electricity, whereas rain water does?

Answer- Distilled water is a pure form of water and is devoid of any ionic species. Therefore, it does not conduct electricity. Rain water, being an impure form of water, contains many ionic species such as acids and therefore it conducts electricity.

Question 8: Why do acids not show acidic behaviour in the absence of water?

Answer- Acids do not show acidic behaviour in the absence of water, because acids dissociate into hydrogen ions only in the presence of water. It is the hydrogen ions that are responsible for the acidic behaviour.

Question 9: Five solutions A, B, C, D and E when tested with universal indicator showed pH as 4, 1, 11, 7 and 9, respectively. Which solution is

(a) neutral ?

(b) strongly alkaline?

(c) strongly acidic?

(d) weakly acidic?

(e) weakly alkaline?

Arrange the pH in increasing order of hydrogen-ion concentration.

Answer- (a) Neutral → Solution D with pH 7

(b) Strongly alkaline → Solution C with pH 11

(c) Strongly acidic → Solution B with pH 1

(d) Weakly acidic → Solution A with pH 4

(e) Weakly alkaline → Solution E with pH 9.

The pH can be arranged in the increasing order of the concentration of hydrogen ions as: 11 < 9 < 7 < 4 < 1

Question 10: Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH_3COOH) is added to test tube B. In which test tube will the fizzing occur more vigorously and why?

Answer- The fizzing will occur strongly in test tube A, in which hydrochloric acid (HCl) is added. This is because HCl is a stronger acid than CH_3COOH and therefore produces hydrogen gas at a faster speed due to which fizzing occurs.

Question 11: Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.

Answer- The pH of milk is 6. As it changes to curd, the pH will reduce because curd is acidic in nature. The acids present in it decrease the pH.

Question 12: A milkman adds a very small amount of baking soda to fresh milk.

(a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?

(b) Why does this milk take a long time to set as curd?

Answer- (a) The milkman shifts the pH of the fresh milk from 6 to slightly alkaline because in alkaline condition, milk does not set as curd easily.

(b) Since this milk is slightly basic than usual milk, acids produced to set the curd are neutralized by the base. Therefore, it takes a longer time for the curd to set.

Question 13: Plaster of Paris should be stored in a moisture-proof container. Explain why?

Answer- Plaster of Paris (POP) should be stored in a moisture-proof container because Plaster of Paris, a powdery mass, absorbs water (moisture) to form a hard solid known as gypsum.

Question 14: What is a neutralization reaction? Give two examples.

Answer- When an acid mixed with a base then they react with each other to form the salt and water with the release of energy and cancel each other's effect. This process is neutralization process.

Acid + Base → Salt + Water + Heat

Example: (1) $NaOH + HCl \rightarrow NaCl + H_2O$ + Heat

(2) During **indigestion** (caused due to the production of excess of hydrochloric acid in the stomach), we take an antacid (generally milk of magnesia, which is basic in nature). The antacid neutralizes the excess of acids and thus gives relief from indigestion.

Question 15: Give two important uses of washing soda and baking soda.

Answer- (1) Important uses of Washing soda: (a) It is used in glass, soap, and paper industries.

(b) It is used to remove permanent hardness of water.

(2) Important uses of Baking soda: (a) It is used as baking powder. (Baking powder is a mixture of baking soda and a mild acid known as tartaric acid. When it is heated or mixed in water, it releases CO_2 that makes bread or cake fluffy.)

(b) It is used in soda-acid fire extinguishers.

Some Important things to remember

Table 2.3 Some naturally occurring acids

Natural source	Acid	Natural source	Acid
Vinegar	Acetic acid	Sour milk (Curd)	Lactic acid
Orange	Citric acid	Lemon	Citric acid
Tamarind	Tartaric acid	Ant sting	Methanoic acid
Tomato	Oxalic acid	Nettle sting	Methanoic acid

Sr. No.	Chemical Formula	Common Name Of Compound	Chemical Name Of Compound
1	NaCl	Common Sat	Sodium Chloride
2	NaOH	Caustic Soda	Sodium Hydroxide
3	CaO	Quick Lime	Calcium Oxide
4	$Ca(OH)_2$	Slaked Lime	Calcium Hydroxide
5	$CaCO_3$	Lime Stone	Calcium Carbonate
6	CH_3COOH	Vinegar or Acetic Acid	Ethanoic Acid
7	$CaOCl_2$	Bleaching Powder	Calcium hypo Chloride
8	$NaHCO_3$	Baking Soda	Sodium Bicarbonate or Sodium Hydrogen Carbonate
9	Na_2CO_3-$10H_2O$	Washing Soda	Sodium Carbonate
10	$CuSO_4$-$5H_2O$	Blue Vitriol	Copper Sulphate
11	$CaSO_4$-$\frac{1}{2}$ H_2O	Plaster of Paris (POP)	Calcium Sulphate
12	$CaSO_4$-2 H_2O	Gypsum	Calcium Sulphate

CHAPTER 3 – METALS AND NON-METALS

Question 1: Give an example of a metal which:

(i) Is a liquid at room temperature?

Answer- Mercury

(ii) Can be easily cut with a knife?

Answer- Sodium and potassium.

(iii) Is the best conductor of heat?

Answer- Silver.

(iv) Is a poor conductor of heat?

Answer- Mercury

Question 2: Explain the meanings of malleable and ductile.

Answer- (i) Metals can be beaten to form sheets,they are said to be malleable

(ii) Metals can be drawn into thin wires,they are said to be ductile

Question 3: Why is sodium kept immersed in kerosene oil?

Answer- Sodium and potassium are very reactive metals, if kept open these can react with oxygen and water and may catch fire. Hence Sodium and potassium are kept immersed in kerosene to prevent their reaction with oxygen and moisture.

Question 4: Write equations for the reactions of:

(i) Iron with steam

(ii) Calcium and potassium with water

Answer- (i) Iron reacts with steam to form a magnetic oxide of Fe with the liberation of Hydrogen gas.

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

(ii) Calcium reacts with water to form calcium hydroxide and hydrogen gas.

$$Ca(s) + 2H_2O(l) \rightarrow Ca(OH)_2\ (aq) + H_2\ (g)$$

Potassium reacts with cold water violently immediately with evolution of hydrogen gas, which catches fire.

$$2K(s) + 2H_2O(l) \rightarrow 2KOH(aq) + 2H_2\ (g)$$

Question 5: Samples of four metals A, B, C and D were taken and added to the following solution one by one. The results obtained have been tabulated as follows:

Metal	Iron(II) sulphate	Copper(II) sulphate	Zinc sulphate	Silver Nitrate

A	**No reaction**	**Displacement**	**-**	**-**
Because	**Displacement**	**-**	**-**	**-**
C	**No reaction**	**No reaction**	**No reaction**	**Displacement**
D	**No reaction**	**No reaction**	**No reaction**	**No reaction**

Use the Table above to answer the following questions about metals A, B, C and D.

(i) Which is the most reactive metal?

Answer- Metal B.

(ii) What would you observe if B is added to a solution of Copper (II) sulphate?

Answer- If B is added to a solution of copper (II) sulphate, then it would displace copper and blue colour of copper sulphate will disappear.

(iii) Arrange the metals A, B, C and D in the order of decreasing reactivity.

Answer- B > A > C > D

Question 6: Which gas is produced when dilute hydrochloric acid is added to a reactive metal? Write the chemical reaction when iron reacts with dilute H_2SO_4

Answer- Hydrogen gas is liberated when dilute HCl is added to a reactive metal.

$$Fe(s) + H_2SO_4\,(aq) \rightarrow FeSO_4\,(aq) + H_2\,(g)$$

Question 7: What would you observe when zinc is added to a solution of iron (II) sulphate? Write the chemical reaction that takes place.

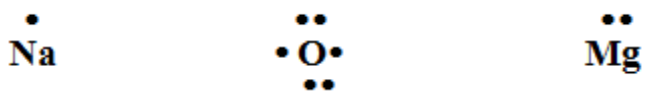
Answer- Zinc is more reactive (more electro positive) than iron. Therefore Zinc displaces Iron from its salt solution. The colour of ferrous sulphate is light green, which turns colourless.

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

Light green Zinc sulphate (Colourless)

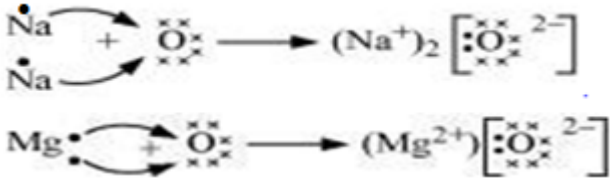
Question 8: (i) Write the electron-dot structures for sodium, oxygen and magnesium.

Answer- **Sodium** **Oxygen** **Magnesium**



(ii) Show the formation of Na_2O and MgO by the transfer of electrons.

Answer-



(iii) What are the ions present in these compounds?

Answer- The ions present in Magnesium oxide compound (MgO) are magnesium ions Mg^{2+} (cation) and oxide ions (O^{2-}) (anion).The ions present in Sodium oxide compound(Na_2O) are sodium(Na+) cation and oxide ions (O^{2-}) (anion).

Question 9: Why do ionic compounds have high melting points?

Answer- Ionic compounds have strong electrostatic forces of attraction between the ions. Therefore, it requires a lot of energy to overcome these forces. That is why ionic compounds have high melting points

Question 10: Define the following terms.

(i) Mineral (ii) Ore (iii) Gangue.

Answer- (i) Mineral: Most of the elements occur in nature as in combined state as minerals. The chemical composition of minerals is fixed.

(ii) Ore: Minerals from which metals can be extracted profitably are known as ores.

(iii) Gangue: The impurities (sand, silt, soil, gravel, etc.) present in the ore are called gangue.

Question 11: Name two metals which are found in nature in the free state.

Answer- Gold, silver, and platinum.

Question 12: What chemical process is used for obtaining a metal from its oxide?

Answer- The chemical process used for obtaining a metal from its oxide is reduction. In this process, metal oxides are reduced by using suitable reducing agents such as carbon or by highly reactive metals to displace the metals from their oxides.

Question 13: Metallic oxides of zinc, magnesium and copper were heated with the following metals.

Metal	**Zinc**	**Magnesium**	**Copper**
Zinc Oxide			
Magnesium Oxide			
Copper Oxide			

In which cases will you find displacement reactions taking place?

Answer- Order of reactivity of these metals is as: Mg > Zn > Cu

Metal	Zinc	Magnesium	Copper
Zinc Oxide	-	Displacement	-
Magnesium Oxide	-	-	-
Copper Oxide	Displacement	Displacement	-

Question 14: Which metals do not corrode easily?

Answer- Gold and platinum are the metals which do not corrode easily.

Question 15: What are alloys?

Answer- An alloy is a homogeneous mixture of two or more metals, or a metal and a non- metal.

EXERCISE QUESTION-ANSWERS

Question 1: Which of the following pairs will give displacement reactions?

(a) NaCl solution and copper metal

(b) $MgCl_2$ solution and aluminium metal

(c) $FeSO_4$ solution and silver metal

(d) $AgNO_3$ solution and copper metal ✓

Question 2: Which of the following methods is suitable for preventing an iron frying pan from rusting?

a) Applying grease

b) Applying paint

c) Applying a coating of zinc ✓

d) All of the above

Question 3: An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be

(a) Calcium ✓

(b) Carbon

(c) Silicon

(d) Iron

Question 4: Food cans are coated with tin and not with zinc because

(a) Zinc is costlier than tin.

(b) Zinc has a higher melting point than tin.

(c) Zinc is more reactive than tin. ✓

(d) Zinc is less reactive than tin.

Question 5: You are given a hammer, a battery, a bulb, wires and a switch.

(a) How could you use them to distinguish between samples of metals and non- metals?

(b) Assess the usefulness of these tests in distinguishing between metals and non- metals.

Answer- (a) With the hammer, we can beat the sample and if it can be beaten into thin sheets (that is, it is malleable), then it is a metal otherwise a non-metal. Similarly, we can use the battery, bulb, wires, and a

switch to set up a circuit with the sample. If the sample conducts electricity, then it is a metal otherwise a non-metal.

(b) These experiments can be helpful to demonstrate the malleability and electric conductivity of the metals and non-metals.

Question 6: What are amphoteric oxides? Give two examples of amphoteric oxides

Answer- Oxides that react with both acids and bases to form salt and water are known as amphoteric oxides. Amphoteric oxides show properties of both acids and bases. Examples: PbO and Al_2O_3 .

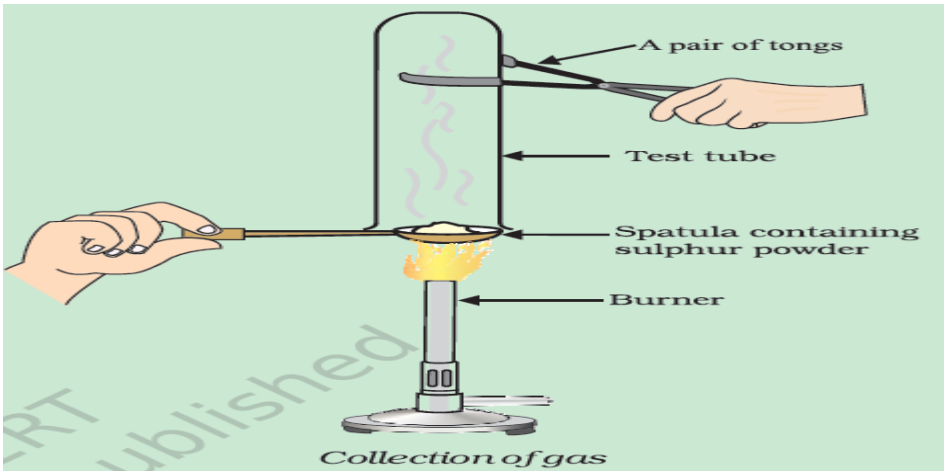
Question 7: Name two metals which will displace hydrogen from dilute acids, and two metals which will not.

Answer- Zinc (Zn) and Magnesium (Mg) are the two metals which will displace Hydrogen from dilute acids as they are very reactive metals. Gold (Au) and Silver (Ag) are the metals which will not replace Hydrogen from dilute acids as these metals are less reactive.

Question 8: In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte?

Answer- In the process of electrolytic refining of metal called 'M', An impure and thick block of metal M is considered as anode, Thin strip or wire of pure metal M is taken as cathode. A suitable salt solution of metal M is considered as the electrolyte.

Question 9: Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it, as shown in figure below.



(a) What will be the action of gas on:

(i) dry litmus paper?

(ii) moist litmus paper?

(b) Write a balanced chemical equation for the reaction taking place.

Answer- a) When sulphur powder is burnt in the air sulphur dioxide is formed.

(i) Sulphur dioxide does not have any effect on dry litmus paper.

(ii) Sulphur dioxide turn the moist litmus paper from blue to red because contact of SO_2 with water turns to sulfurous acid.

(b) $S(s) + O_2(g) \rightarrow SO_2(g)$

$SO_2(g) + H_2O \rightarrow H_2SO_3$

Question 10: State two ways to prevent the rusting of iron.

Answer- Iron can be prevented from rusting by:

(1) Painting.

(2) Greasing.

(3) Galvanization (Coating with zinc).

(4) By connecting with another active metal.

Question 11: What types of oxides are formed when non-metals combine with oxygen?

Answer- When non-metals combine with oxygen it forms either acidic or neutral oxides. Ex: SO_2 is an acidic oxide; CO is a neutral oxide.

Question 12: Give reasons:

(a) Platinum, gold and silver are used to make jewellery.

Answer- Platinum, gold and silver are used to make jewellery as these metals are very less reactive hence they are not affected by air, water or most chemicals. These metals have a lot of lustre and they are malleable and ductile in nature.

(b) Sodium, potassium and lithium are stored under oil.

Answer- Sodium and potassium are very reactive metals, if kept open these will react with oxygen and water to catch fire. Hence Sodium and potassium are kept immersed in kerosene to prevent their reaction with oxygen and moisture.

(c) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.

Answer- This is because aluminium reacts with oxygen present in air to form a thin layer of aluminium oxide. This oxide layer is very stable and prevents further reaction of aluminium with oxygen. Also, it is light in weight and a good conductor of heat. Hence, it is used to make cooking utensils.

(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction

Answer- Because metals can be easily extracted from their oxides rather than from their carbonates and sulphides.

Question 13: You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.

Answer- Tarnished copper vessels being cleaned with lemon or tamarind because these sour substances contains acids which dissolve the layer of copper oxides and basic copper carbonate present on the surface of tarnished copper vessels. This makes them shining red-brown again. Hence they are very effective in cleaning tarnished copper vessels.

Question 14: Differentiate between metal and non-metal on the basis of their chemical properties.

Answer-

Metals	**Non-metals**
On the basis of Chemical properties	
When metals are heated with oxygen, they form ionic oxides which are basic in nature.	When non-Metals are heated with oxygen, they form covalent oxides which are acidic in nature.
They are electro positive, lose electrons readily and become a positive ion.	They are electro negative, gain electrons and become negative ions.
Metals are reducing agents.	Non-metals are oxidizing agents.
On the basis of Physical properties	
Metals are lustrous.	Non-metals are non-lustrous; graphite is the exception.
Metals are the good conductors of electricity and heat.	Non-metals are non-conductors of electricity and heat; graphite is the exception
All metals are solids except mercury.	Non-metals are in solid, liquid and gaseous states

Question 15: A man went door to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty retreat. Can you play the detective to find out the nature of the solution he had used?

Answer- Goldsmith used the solution called Aqua regia. It is the mixture of concentrated Hydrochloric acid and concentrated nitric acid in the ratio of 3:1. Aqua regia is capable of dissolving noble metals like gold and platinum. When upper-layer of dull gold ornament is dissolved they lose their weight.

Question 16: Give reasons why copper is used to make hot water tanks and not steel (an alloy of iron).

Answer- Because copper does not reacts with either water or steam whereas iron reacts with steams to corrode the tank.

CHAPTER 6 -LIFE PROCESSES

Question 1: Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans?

Answer- In multi-cellular organisms, all the cells may not be in direct contact with the surrounding environment. Thus, simple diffusion will not meet the requirements of all the cells.

Question 2: What criteria do we use to decide whether something is alive?

Answer- Living objects (organisms) have many properties like respiration, growth, reproduction, excretion etc.

Question 3: What are outside raw materials used for by an organism?

Answer- Hetrotrophs use food, water and oxygen gas from outside as raw material, But Autotrophs use carbon dioxide gas, water, minerals and oxygen from outside as raw material.

Question 4: What processes would you consider essential for maintaining life?

Answer – Life processes such as nutrition, respiration, transportation, excretion, etc. are essential for maintaining life.

Question 5 : What are the differences between autotrophic nutrition and heterotrophic nutrition?

Answer-

	Autotrophic nutrition		*Heterotrophic nutrition*
1.	Food is synthesised from simple inorganic raw materials such as CO_2 and water.	1.	Food is obtained directly or indirectly from autotrophs. This food is broken down with the help of enzymes.
2.	Presence of green pigment (chlorophyll) is necessary.	2.	No pigment is required in this type of nutrition.
3.	Food is generally prepared during day time.	3.	Food can be prepared at all times.
4.	All green plants and some bacteria have this type of nutrition.	4.	All animals and fungi have this type of nutrition.

Question 6: Where do plants get each of the raw materials required for photosynthesis?

Answer- Plants take CO_2 from the atmosphere, water is absorbed from the soil and sunlight from Sun.

Question 7: What is the role of the acid in our stomach?

Answer-In our stomach, acid (HCl) kills germs present in the food and makes the food acidic, so that pepsin enzyme can digest protein.

Question 8: What is the function of digestive enzymes?

Answer- Digestive enzymes such as amylase, lipase, pepsin, trypsin, etc. help in the breaking down of complex food particles into simple ones.

Question 9: How is the small intestine designed to absorb digested food?

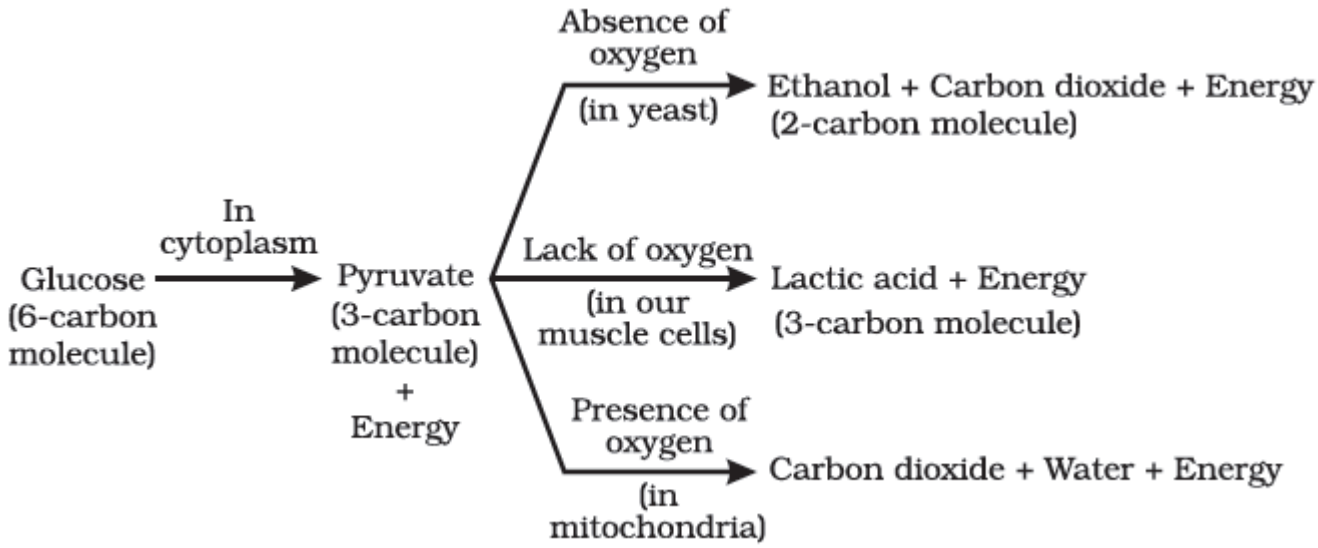
Answer- The small intestine has millions of tiny finger-like projections called villi. These villi increase the surface area for food absorption. Within these villi, many blood vessels are present that absorb the digested food and carry it to the blood stream. From the blood stream, the absorbed food is delivered to each and every cell of the body.

Question 10- What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration?

Answer- Since the amount of dissolved oxygen in water is very low as compared to the amount of oxygen in the air, the rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms.

Question 11: What are the different ways in which glucose is oxidised to provide energy in various organisms?

Answer- Glucose is first broken down in the cell cytoplasm into a three carbon molecule called pyruvate. Pyruvate is further broken down in the following ways to provide energy:



Question 12: How is oxygen and carbon dioxide transported in human beings?

Answer- (1) Haemoglobin transports oxygen from lungs to different cells through arteries.

(2) Being more soluble in blood, carbon dioxide dissolves in blood and go from different body parts to lungs. Carbon dioxide is also transported by haemoglobin.

Question 13: How are the lungs designed in human beings to maximise the area for exchange of gases?

Answer- The exchange of gases takes place between the blood capillaries that surround the alveoli. Each lung contains 300-350 million alveoli. These numerous alveoli increase the surface area for gaseous exchange making the process of respiration more efficient.

Question 14: What are the components of the transport system in human beings? What are the functions of these components?

Answer- The main components of the transport system in human beings are the heart, blood, and blood vessels.

(1) Heart pumps oxygenated blood throughout the body. It receives deoxygenated blood from the various body parts and sends this impure blood to the lungs for oxygenation.

(2) Blood is a fluid connective tissue, it helps in the transport of oxygen, nutrients, CO_2 and nitrogenous wastes.

(3) Blood vessels (arteries, veins, and capillaries) carry blood either away from the heart to various organs or from various organs back to the heart.

Question 15: Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?

Answer- To keep body temperature normal and to fulfill high energy needs, it necessary to separate oxygenated and deoxygenated blood in mammals and birds.

Question 16: What are the components of the transport system in highly organised plants?

Answer- Xylem and phloem.

(1) Xylem conducts water and minerals obtained from the soil (via roots) to the rest of the plant.

(2) Phloem transports amino acids and food materials from the leaves to different parts of the plant body.

Question 17: How are water and minerals transported in plants?

Answer- Transpiration creates a suction pressure, as a result of which water is forced into the xylem cells of the roots. Then there is a steady movement of water from the root xylem to all the plant parts through the interconnected water – conducting channels.

Question 18: How is food transported in plants?

Answer- Phloem transports food materials from the leaves to different parts of the plant body by utilizing energy from ATP. As a result of this, the osmotic pressure in the tissue increases causing water to move into it. This pressure moves the material in the phloem to the tissues which have less pressure. This is helpful in moving materials according to the needs of the plant.

Question 19: Describe the structure and functioning of nephrons.

Answer- Nephrons are the basic filtering units of kidneys. Each kidney possesses large number of nephrons, approximately 1-1.5 million. The main components of the nephron are glomerulus, Bowman's capsule, and a long renal tubule.

Functioning of a nephron:

(1) The water and solute are transferred to the nephron at Bowman's capsule through with glomerulus

(2) In the proximal tubule, some substances such as amino acids, glucose, and salts are selectively reabsorbed and unwanted molecules are added in the urine.

(3) The filtrate then moves down into the loop of Henle, where more water is absorbed.

(4) From here, the filtrate moves upwards into the distal tubule and finally to the collecting duct. Collecting duct collects urine from many nephrons.

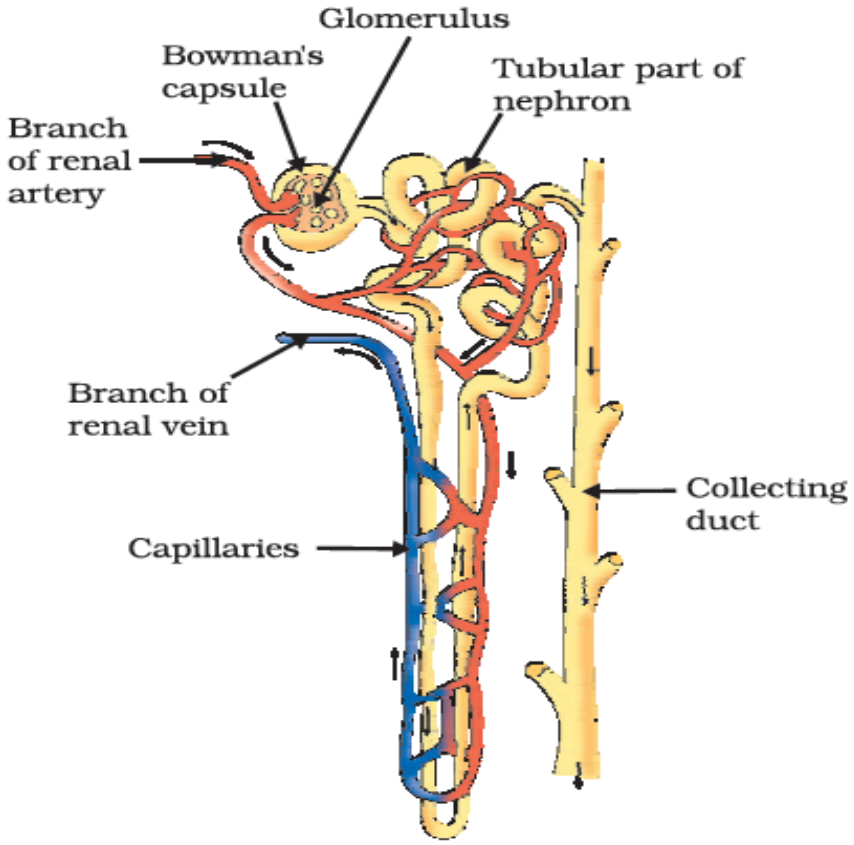


Figure 6.14
Structure of a nephron

Question 20: What are the methods used by plants to get rid of excretory products?

Answer- (1) Plants can get rid of excess water by transpiration.

(2) They can even lose some parts such as leaves.

(3) Other waste products are stored as resins and gums, especially in old xylem.

(4) Plants excrete waste gasses through stomata

Question 21: How is the amount of urine produced regulated?

Answer- The amount of urine produced depends on the amount of excess water and dissolved wastes present in the body. Some other factors such as habitat of an organism and hormone such as Antidiuretic hormone (ADH) also regulates the amount of urine produced.

EXERCISE QUESTION-ANSWERS

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

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

Question 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.

Question 3: The autotrophic mode of nutrition requires

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

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

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

Question 5: How are fats digested in our bodies? Where does this process take place?

Answer- Fats are present in the form of large globules in the small intestine. The small intestine gets the secretions in the form of bile juice and pancreatic juice respectively from the liver and the pancreas. The bile salts (from the liver) break down the large fat globules into smaller globules so that the pancreatic enzymes can easily act on them. This is referred to as emulsification of fats. It takes place in the small intestine.

Question 6: What is the role of saliva in the digestion of food?

Answer- Saliva makes the food soft for easy swallowing. It contains a digestive enzyme called salivary amylase, which breaks down starch into sugar.

Question 7: What are the necessary conditions for autotrophic nutrition and what are its by-products?

Answer- Autotrophic nutrition takes place through the process of photosynthesis. Carbon dioxide, water, chlorophyll pigment, and sunlight are the necessary conditions required for autotrophic nutrition. Carbohydrates (food) and O_2 are the by-products of photosynthesis.

$$6CO_2 + 6H_2O \xrightarrow{\text{Chlorophyll and Sunlight}} C_6H_{12}O_6 + 6O_2$$

Question 8: What are the differences between aerobic and anaerobic respiration? Name some organisms that use the anaerobic mode of respiration.

Answer-

	Aerobic respiration		*Anaerobic respiration*
1.	It occurs in the presence of O_2.	1.	It occurs in the absence of O_2
2.	It involves the exchange of gases between the organism and the outside environment.	2.	Exchange of gases is absent.
3.	It occurs in cytoplasm and mitochondria.	3.	It occurs only in cytoplasm.
4.	It always releases CO_2 and H_2O.	4.	It produces alcohols and CO_2.
5.	It yields large amount of energy.	5.	Energy released is very low.

Anaerobic respiration occurs in the roots of some waterlogged plants, some parasitic worms, animal muscles and some micro-organisms such as yeasts.

Question 9- How are the alveoli designed to maximize the exchange of gases?

Answer- The alveoli are the small balloon-like structures present in the lungs. The walls of the alveoli consist of extensive network of blood vessels. Each lung contains 300−350 million alveoli. This makes large surface area for maximize the gaseous exchange.

Question 10: What would be the consequences of a deficiency of haemoglobin in our bodies?

Answer- Deficiency of haemoglobin in blood can decrease the oxygen supply. This can lead to deficiency of oxygen in the body cells. It can also lead to a disease called anaemia.

Question 11: Describe double circulation in human beings. Why is it necessary?

Answer- Blood in the form of oxygen-rich blood and de-oxygenated blood moves through heart two times, this is known as double circulation. Oxygen rich blood from the lungs comes to the thin-walled upper chamber of the heart, the left atrium. It then contracts, while the next chamber, the left ventricle, expands, so that the blood is transferred to it. When the muscular left ventricle contracts in its turn, the blood is pumped out to the body.

De-oxygenated blood comes from the body to the upper chamber, the right atrium, as it expands. As the right atrium contracts, the corresponding lower chamber, the right ventricle, dilates. This transfers blood to the right ventricle, which in turn pumps it to the lungs for oxygenation.

Double circulation is necessary so that oxygen rich and de-oxygenated blood do not mix.

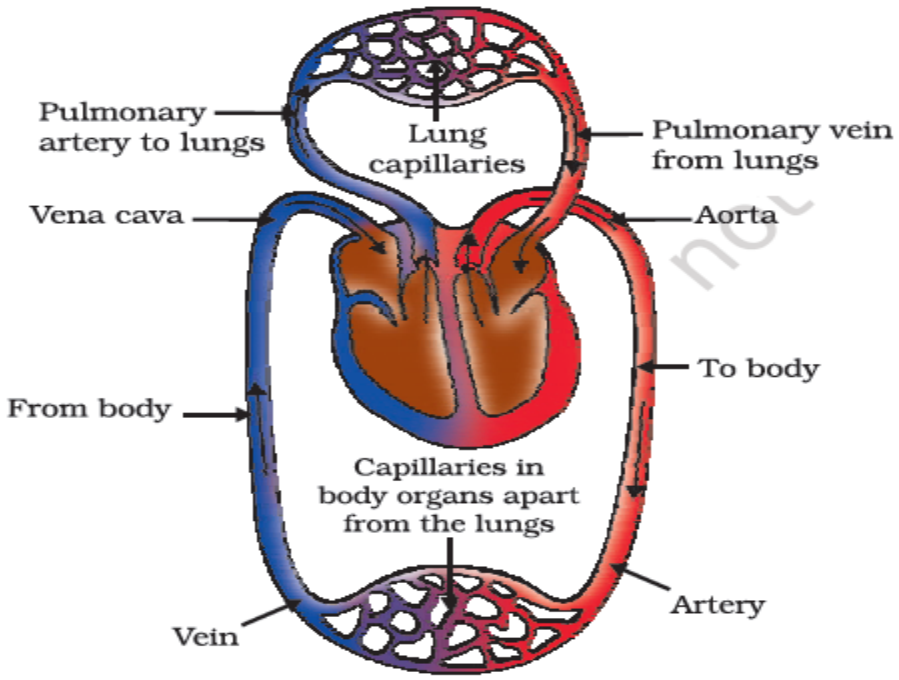


Figure 6.11
Schematic representation of transport and exchange of oxygen and carbon dioxide

Question 12: What are the differences between the transport of materials in xylem and phloem?

Answer-

	Xylem		*Phloem*
1.	Xylem tissue helps in the transport of water and minerals.	1.	Phloem tissue helps in the transport of food.
2.	Water is transported upwards from roots to all other plant parts.	2.	Food is transported in both upward and downward directions.
3.	Transport in xylem occurs with the help of simple physical forces such as transpiration pull.	3.	Transport of food in phloem requires energy in the form of ATP.

Question 13: Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.

Answer-

Alveoli in the lungs	**Nephrons in the kidneys**
1. This is a functioning unit of lungs.	1. This is a functioning unit of kidneys.
2. There are approximately 30 crores alveoli in each lung.	2. There are approximately 10 lakh nephron in each kidney.
3. Alveoli provide a large area for exchange of gasses.	3. It do not have large area.
4. It exchanges oxygen and carbon dioxide gasses.	4. It controls the amount of water and minerals.

CHAPTER 7 –CONTROL AND COORDINATION

Question 1: What is the difference between a reflex action and walking?

Answer- A reflex action is voluntary action which is a rapid and automatic response to stimuli while walking is a voluntary action which requires our thinking and in our control.

Question 2: What happens at the synapse between two neurons?

Answer- A synapse is the gap between the two neurons. At synapse the electrical signals converted into chemicals that can easily cross over the gap and pass on to the next neurons where it again converted into electrical signals.

Question 3: Which part of the brain maintains posture and equilibrium of the body?

Answer-Cerebellum

Question 4: How do we detect the smell of an agarbatti (incense stick)?

Answer- When the smell of the incense stick reaches to our nose then the olfactory receptors present in our nose detect it and send this information in fore brain in the form of electrical signals. Fore brain interprets this information as the smell of incense stick where it is already stored.

Question 5: What is the role of the brain in reflex action?

Answer- Brain has no direct involvement in reflex action. It is mainly controlled by Spinal Cord as this action not requires thinking and is very quick action.

Question 6: What are plant hormones?

Answer- Plant hormones are the fluids which are secreted within the plant, also known as phytohormones. Plant hormones regulate the growth and development of the plant. Examples of plant hormones are auxins, gibberellins, cytokinins, Abscisic acid and ethylene.

Question 7: How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light?

Answer- The movements of the leaves of the sensitive plant are touch sensitive and independent of growth, while the movement of the shoot towards light is growth related and known as phototropism.

Question 8: Give an example of a plant hormone that promotes growth.

Answer- Auxins.

Question 9: How do auxins promote the growth of a tendril around a support?

Answer- When tendrils come in contact with any support, the part of the tendril in contact with the object does not grow as rapidly as the part of the tendril away from the object. This is caused by the action of auxin hormone. Less auxin occurs on the side of contact as compared to the free side as a result, auxin promotes growth on the free side and the tendrils coil around the support.

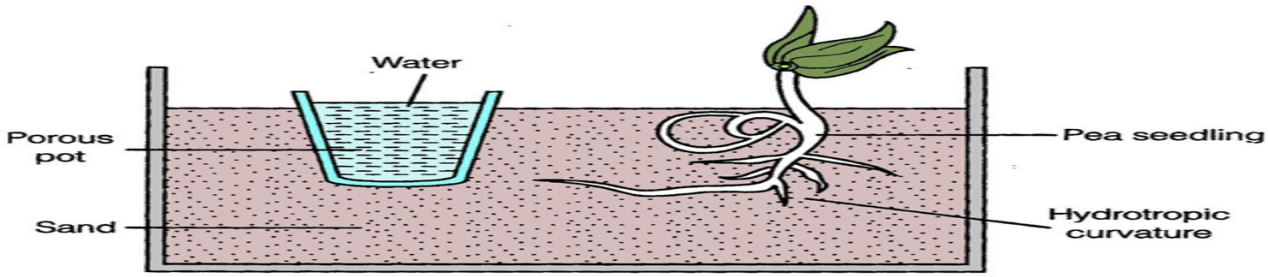
Question 10: Design an experiment to demonstrate hydrotropism.

Answer- Procedure: (i) Plant a seedling in a vessel containing soil.

(ii) Adjacent to the seedling put a porous pot containing water.

(iii) Leave the set up for few days.

Observation : On examining the roots it is observed that the roots bend towards the source of water and do not grow straight. This experiment demonstrates the phenomenon of hydrotropism.



Question 11: How does chemical coordination take place in animals?

Answer- Chemical coordination takes place in animals with the help of hormones. Hormones are the chemical fluids that are secreted by the glands of the endocrine system. Hormones travel through the blood and regulate the overall growth and development of the animals.

Question 12: Why is the use of iodized salt advisable?

Answer- Because iodine stimulates the thyroid gland to produce thyroxin hormone. It regulates carbohydrate, fat, and protein metabolism in our body. Deficiency of this hormone results in the enlargement of the thyroid gland. This can lead to goitre, a disease characterized by swollen neck.

Question 13: How does our body respond when adrenaline is secreted into the blood?

Answer- When someone is in danger or in emergency then adrenal gland secrete adrenaline hormone. It is secreted directly into the blood and is transported to different parts of the body. It speeds up the heartbeat and hence supplies more oxygen to the muscles. This results in increasing breathing rate and blood pressure which enable them to fight with such urgent situation.

Question 14: Why are some patients of diabetes treated by giving injections of insulin?

Answer- Diabetes is caused due to less or no secretion of hormone insulin by pancreas. In such a person, blood sugar level is high. Insulin converts extra sugar present in blood into glycogen. Thus, patients suffering from diabetes are given insulin injection to control their blood sugar level.

EXERCISE QUESTION-ANSWERS

Question 1: Which of the following is a plant hormone?

(a) Insulin

(b) Thyroxin

(c) Oestrogen

(d) Cytokinin ✓

Question 2: The gap between two neurons is called a

(a) dendrite.

(b) synapse. ✓

(c) axon.

(d) impulse.

Question 3: The brain is responsible for:

(a) thinking.

(b) regulating the heart beat.

(c) balancing the body.

(d) all of the above. ✓

Question 4: What is the function of receptors in our body? Think of situations where receptors do not work properly. What problems are likely to arise?

Answer- Functions of receptors:

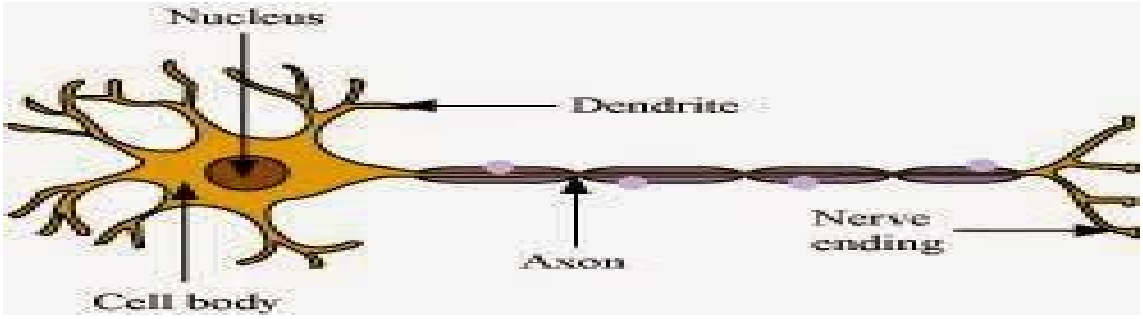
(1) They sense the external stimuli such as heat or pain.

(2) They also trigger an impulse in the sensory neuron which sends message to the spinal cord.

When the receptors are damaged, the external stimuli transferring signals to the brain are not felt. For example, in the case of damaged receptors, if we accidentally touch any hot object, then our hands might get burnt as damaged receptors cannot perceive the external stimuli of heat and pain.

Question 5: Draw the structure of a neuron and explain its function.

Answer-



Neurons is the fundamental unit of nervous system. Neuron consists of main three parts : Axon, Dendrite and Cell body.

(1) **Axon**: It conducts messages away from the cell body.

(2) **Dendrite**: It receives information from axon of another cell and conducts the messages towards the cell body.

(3) **Cell body**: It contains nucleus, mitochondria, and other organelles. It is mainly concerned with the maintenance and growth.

Question 6: How does phototropism occur in plants?

Answer- The growth movement in plants in response to light stimulus due to auxin plant hormone is known as phototropism. The shoots show positive phototropism and the roots show negative phototropism. This means that the shoots bend towards the source of light whereas the roots bend away from the light source.

Question 7: Which signals will get disrupted in case of a spinal cord injury?

Answer- In case of the spinal cord injury, the signals coming from the nerves as well as the signals coming to the receptors will be disrupted.

Question 8: How does chemical coordination occur in plants?

Answer- Chemical coordination occurs in plants with the help of plant hormones. Different plant hormones help to coordinate growth, development, and responses to the environment. For example, auxin promotes cell growth, gibberellins promote stem growth, cytokinins promote cell division and abscisic acid inhibits growth and its effects include wilting of leaves.

Question 9: What is the need for a system of control and coordination in an organism?

Answer- There are various organs in an organism. These organs must be carefully controlled and coordinated for the survival of an organism. All daily decisions that include voluntary and involuntary actions are controlled by central nervous system (CNS).

Question 10: How are involuntary actions and reflex actions different from each other?

Answer- Involuntary action is the set of muscle movement which do not require thinking. But it is controlled by brain for example heart beat. While on the other hand, the reflex action is rapid and spontaneous action in response to any stimulus. For example closing of eyes immediately, when bright light is focused.

Question 11: Compare and contrast nervous and hormonal mechanisms for control and coordination in animals.

Answer

	Nervous control		**Hormonal Control**
1	It is consist of nerve impulses in the form of electric signals.	1	It consists of endocrine system which secretes hormones directly into blood in the form of chemical signal.
2	Here response time is very short.	2	Here response time is very long.

3	Nerve impulses are not specific in their action.	3	Each hormone has specific actions.
4	The flow of information is rapid.	4	The flow of information is very slow.

Question 12: What is the difference between the manner in which movement takes place in a sensitive plant and the movement in our legs?

Answer-

	Movement in sensitive plants		**Movement in our legs**
1	The movement in a sensitive plant is a response to stimulus (touch) which is an involuntary action.	1	Movement in our legs is a voluntary action.
2	No special tissue is there for the transfer of information	2	A complete system CNS and PNS is there for the information exchange.
3	Plant cells do not have specialized protein for movements.	3	Animal cells have specialized protein which help muscles to contract.

CHAPTER 8 –HOW DO ORGANISMS REPRODUCE?

Question 1: What is the importance of DNA copying in reproduction?

Answer- DNA (Deoxyribonucleic acid) determines the body design of an individual. DNA transfers inherited properties from parents to offsprings. DNA copying is also responsible for variations, which are necessary for development.

Question 2: Why is variation beneficial to the species but not necessarily for the individual?

Answer- Because sometimes for a species, the environmental conditions change so drastically that their survival becomes difficult. So due to variations some individuals will adapt according to the conditions, and will survive. Thus, these variants help in the survival of the species. However, all variations are not necessarily beneficial for the individual organisms.

Question 3: How does binary fission differ from multiple fission?

Answer- In **binary fission**, a single cell divides into two equal halves. Amoeba and Paramecium divide by binary fission.

In **multiple fission**, a single cell divides into many daughter cells simultaneously. Plasmodium divide by multiple fission.

Question 4: How will an organism be benefited if it reproduces through spores?

Answer- Spores are distributed easily by air to far-off places to avoid competition at one place. Spores are covered by thick walls to prevent dehydration under unfavourable conditions.

Question 5: Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?

Answer- complex organisms have organ-system level of organization. All the organ systems of their body work together as an interconnected unit. So new complete organism cannot be regenerated from any body part.

Question 6: Why is vegetative propagation practised for growing some types of plants?

Answer- Some plants which cannot produce seeds or produce dormant seeds are produced by vegetative propagation

Question 7: Why is DNA copying an essential part of the process of reproduction?

Answer- DNA (Deoxyribonucleic acid) determines the body design of an individual. DNA transfers inherited properties from parents to offsprings. DNA copying is also responsible for variations, which are necessary for development.

Question 8: How is the process of pollination different from fertilization?

Answer-

Pollination	Fertilization
1. Pollination is the process of transfer of pollens from anther to stigma.	1. Fertilization is the fusion of the male and female gametes.
2. It is of two types: Self- pollination and cross-Pollination	2. It is of two types: Internal and external fertilization.

Question 9: What is the role of the seminal vesicles and the prostate gland?

Answer- The secretions from seminal vesicles and prostate glands lubricate the sperms and provide a fluid medium for easy transport of sperms. Their secretion also provides nutrients to sperms.

Question 10: What are the changes seen in girls at the time of puberty?

Answer- (1) Increase in breast size and darkening of skin of the nipples present at the tips of the breasts.

(2) Appearance of hair in the genital area.

(3) Appearance of hair in other areas of skin like underarms, face, hands, and legs.

(4) Maturity in the reproductive organs.

(4) Beginning of menstrual cycle.

(5) More secretion of oil from the skin, which results in the appearance of pimples.

Question 11: How does the embryo get nourishment inside the mother's body?

Answer- Embryo get nutrients from blood of mother. Inside the uterus, the outer tissue surrounding the embryo develops finger-like projections called villi. These villi are surrounded by uterine tissue and maternal blood. Also, there is a special tissue called placenta, which is embedded in the uterine wall. The embryo receives the oxygen and nutrients from the mother's blood via the placenta. The waste materials produced by the embryo are also removed through the placenta.

Question 12: If a woman is using a copper-T, will it help in protecting her from sexually transmitted diseases?

Answer- No, because it is only contraceptive. It does not prevent the entry of semen.

EXERCISE

Question1: Asexual reproduction takes place through budding in

(a) amoeba. (b) yeast. ✓ (c) plasmodium. (d) leishmania.

Question 2: Which of the following is not a part of the female reproductive system in human beings?

(a) Ovary (b) Uterus (c) Vas deferens ✓ (d) Fallopian tube

Question 3: The anther contains

(a) sepals. (b) ovules. (c) carpel. (d) pollen grains. ✓

Question 4: What are the advantages of sexual reproduction over asexual reproduction?

Answer- (1) In sexual reproduction, more variations are produced. Thus, it ensures survival of species in a population.

(2) The new formed individual has characteristics of both the parents.

Question 5: What are the functions performed by the testis in human beings?

Answer- Testes produce sperms and a hormone called testosterone, which brings about secondary sexual characters in boys.

Question 6: Why does menstruation occur?

Answer- Menstruation is a process in which blood and mucous flows out every month through the vagina. This process occurs every month because one egg is released from the ovary every month and at the same time, the uterus (womb) prepares itself to receive the fertilized egg. Thus, the inner lining of the uterus gets thickened and is supplied with blood to nourish the embryo. If the egg does not get fertilized, then the lining of the uterus breaks down slowly and gets released in the form of blood and mucous from the vagina.

Question 7: Draw a labelled diagram of the longitudinal section of a flower.

Answer-

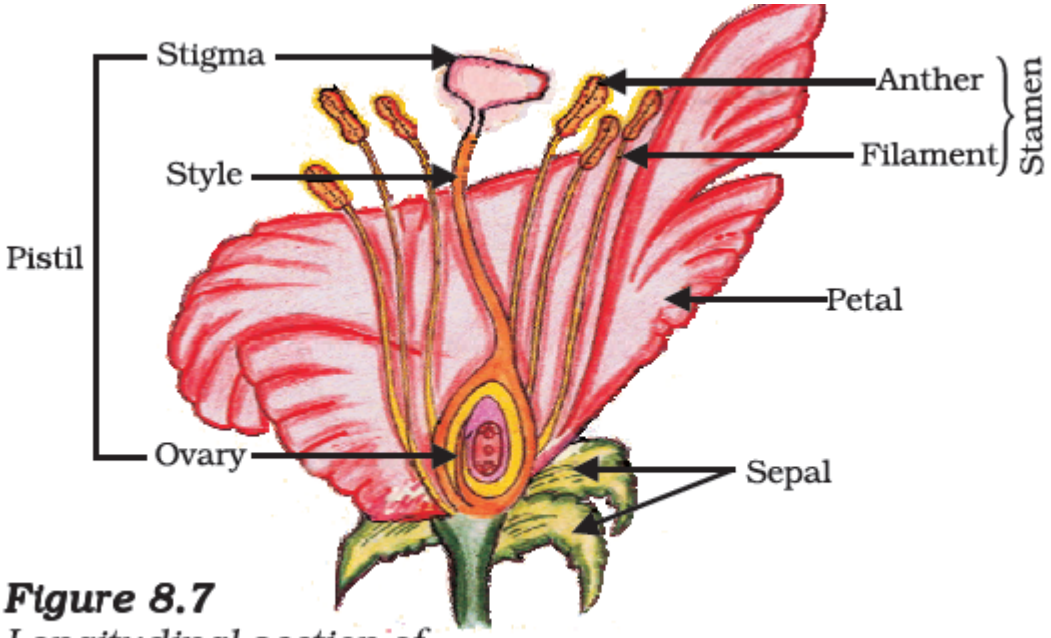


Figure 8.7
Longitudinal section of flower

Question 8- What are the different methods of contraception?

Answer- Contraceptive methods-

(1) **Physical methods** like condom, copper-T and loop etc can prevent fertilization.

(2) **Oral contraceptive** tablets or drugs can prevent the release of egg, thus can stop fertilization.

(3) **Surgical methods** like vasectomy in man and tubectomy in woman can stop fertilization.

Question 9: How are the modes for reproduction different in unicellular and multicellular organisms?

Answer- Unicellular organism reproduce only by asexually reproduction, but most of multicellular organism reproduce by sexual reproduction.

Question 10: How does reproduction help in providing stability to populations of species?

Answer- With reproduction an organism produce new individuals that resemble the parents. Also sexua reproduction causes variations, which are necessary for the survival of a species in drastic environmental changes.

Question 11: What could be the reasons for adopting contraceptive methods?

Answer- Contraceptive methods are mainly adopted because of the following reasons:

(i) To prevent unwanted pregnancies.

(ii) To control population rise or birth rate.

(iii) To keep appropriate gap between children for good health.

(iv) To prevent the transfer of sexually transmitted diseases.