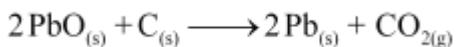


Chemical Reactions and Equations

Exercises solution

Question 1:

Which of the statements about the reaction below are incorrect?



- (a) Lead is getting reduced.
- (b) Carbon dioxide is getting oxidised.
- (c) Carbon is getting oxidised.
- (d) Lead oxide is getting reduced.
- (i) (a) and (b)
- (ii) (a) and (c)
- (iii) (a), (b) and (c)
- (iv) all

Answer 1:

- (i)(a) and (b)

Question 2:

The above reaction is an example of a

- (a) combination reaction.
- (b) double displacement reaction.
- (c) decomposition reaction.
- (d) displacement reaction.

Answer 2:

- (d) The given reaction is an example of a displacement reaction.

Question 3:

What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer.

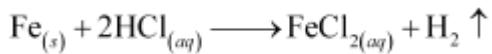
- (a) Hydrogen gas and iron chloride are produced.
- (b) Chlorine gas and iron hydroxide are produced.
- (c) No reaction takes place.
- (d) Iron salt and water are produced.

Chemical Reactions and Equations

Answer 3:

Class X

- (a) Hydrogen gas and iron chloride are produced. The reaction is as follows:

**Question 4:**

What is a balanced chemical equation? Why should chemical equations be balanced?

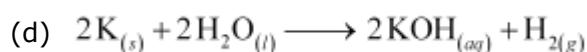
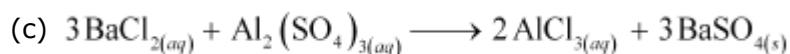
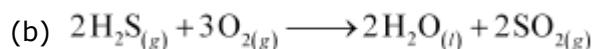
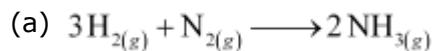
Answer 4:

A reaction which has an equal number of atoms of all the elements on both sides of the chemical equation is called a balanced chemical equation. The law of conservation of mass states that mass can neither be created nor destroyed. Hence, in a chemical reaction, the total mass of reactants should be equal to the total mass of the products. It means that the total number of atoms of each element should be equal on both sides of a chemical equation. Hence, it is for this reason that chemical equations should be balanced.

Question 5:

Translate the following statements into chemical equations and then balance them.

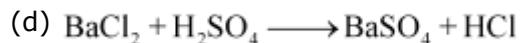
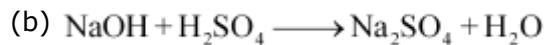
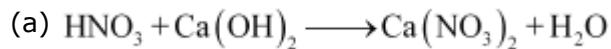
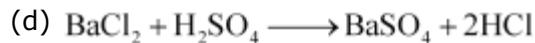
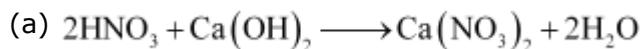
- (a) Hydrogen gas combines with nitrogen to form ammonia.
- (b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
- (c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
- (d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Answer 5:

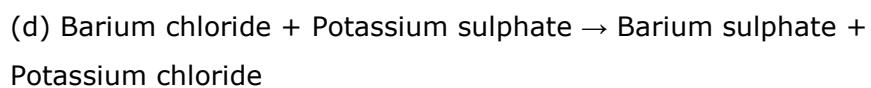
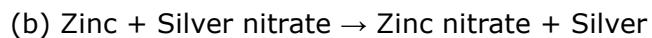
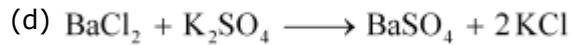
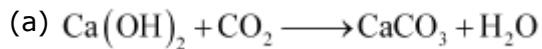
Chemical Reactions and Equations

Question 6:

Balance the following chemical equations.

**Answer 6:****Question 7:**

Write the balanced chemical equations for the following reactions.

**Answer 7:**

Chapter 1

Chemical Reactions and Equations

Class X

Question 8:

Write the balanced chemical equation for the following and identify the type of reaction in each case.

- (a) Potassium bromide $_{(aq)}$ + Barium iodide $_{(aq)}$ \rightarrow Potassium iodide $_{(aq)}$ + Barium bromide $_{(s)}$
- (b) Zinc carbonate $_{(s)}$ \rightarrow Zinc oxide $_{(s)}$ + Carbon dioxide $_{(g)}$
- (c) Hydrogen $_{(g)}$ + Chlorine $_{(g)}$ \rightarrow Hydrogen chloride $_{(g)}$
- (d) Magnesium $_{(s)}$ + Hydrochloric acid $_{(aq)}$ \rightarrow Magnesium chloride $_{(aq)}$ + Hydrogen $_{(g)}$

Answer 8:

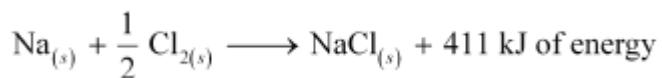
- (a) $2\text{KBr}_{(aq)} + \text{BaI}_{2(aq)} \longrightarrow 2\text{KI}_{(aq)} + \text{BaBr}_{2(s)}$; Double displacement reaction
- (b) $\text{ZnCO}_{3(s)} \longrightarrow \text{ZnO}_{(s)} + \text{CO}_{2(g)}$; Decomposition reaction
- (c) $\text{H}_{2(g)} + \text{Cl}_{2(g)} \longrightarrow 2\text{HCl}_{(g)}$; Combination reaction
- (d) $\text{Mg}_{(s)} + 2\text{HCl}_{(aq)} \longrightarrow \text{MgCl}_{2(aq)} + \text{H}_{2(g)}$; Displacement reaction

Question 9: What does one mean by exothermic and endothermic reactions? Give examples.

Answer 9:

Chemical reactions that release energy in the form of heat, light, or sound are called exothermic reactions.

Example: Mixture of sodium and chlorine to yield table salt



In other words, combination reactions are exothermic.

Reactions that absorb energy or require energy in order to proceed are called endothermic reactions.

For example: In the process of photosynthesis, plants use the energy from the sun to convert carbon dioxide and water to glucose and oxygen.



Chapter 1

Chemical Reactions and Equations

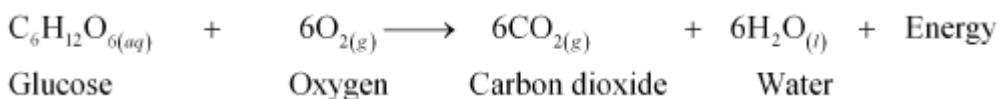
Class X

Question 10:

Why is respiration considered an exothermic reaction? Explain.

Answer 10:

Energy is required to support life. Energy in our body is obtained from the food we eat. During digestion, large molecules of food are broken down into simpler substances such as glucose. Glucose combines with oxygen in the cells and provides energy. The special name of this combustion reaction is respiration. Since energy is released in the whole process, it is an exothermic process.



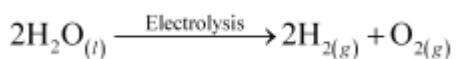
Question 11:

Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

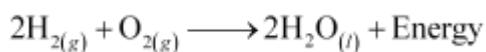
Answer 11:

Decomposition reactions are those in which a compound breaks down to form two or more substances. These reactions require a source of energy to proceed. Thus, they are the exact opposite of combination reactions in which two or more substances combine to give a new substance with the release of energy.

Decomposition reaction: $\text{AB} + \text{Energy} \longrightarrow \text{A} + \text{B}$



Combination reaction: $\text{A} + \text{B} \longrightarrow \text{AB} + \text{Energy}$



Question 12:

Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

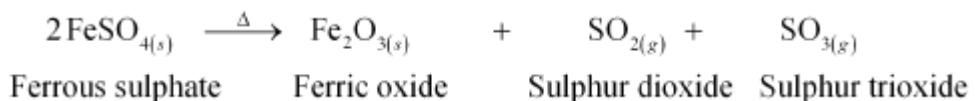
Answer 12:

(a) Thermal decomposition:

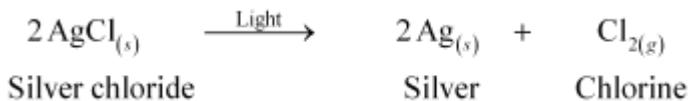
Chapter 1

Chemical Reactions and Equations

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(b) Decomposition by light:



(c) Decomposition by electricity:



Question 13:

What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Answer 13:

In a displacement reaction, a more reactive element replaces a less reactive element from a compound.



In a double displacement reaction, two atoms or a group of atoms switch places to form new compounds.



For example:

Displacement reaction:



Double displacement reaction:



Question 14:

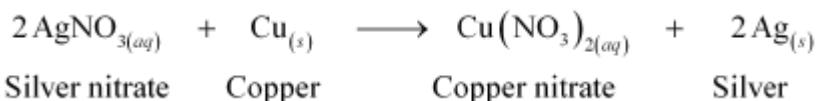
In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

Answer 14:

Chapter 1

Chemical Reactions and Equations

Class X



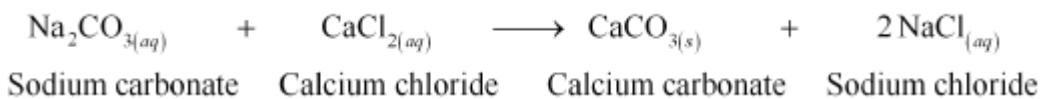
Question 15:

What do you mean by a precipitation reaction? Explain by giving examples.

Answer 15:

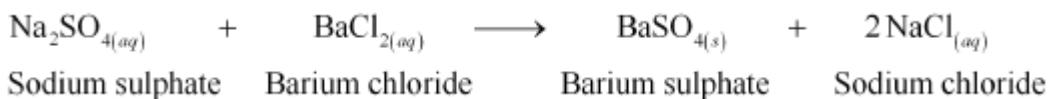
A reaction in which an insoluble solid (called precipitate) is formed is called a precipitation reaction.

For example:



In this reaction, calcium carbonate is obtained as a precipitate. Hence, it is a precipitation reaction.

Another example of precipitation reaction is:



In this reaction, barium sulphate is obtained as a precipitate.

Question 16:

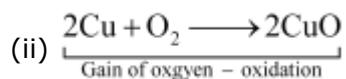
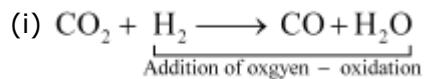
Explain the following in terms of gain or loss of oxygen with two examples each.

- (a) Oxidation
- (b) Reduction

Answer 16:

(a) Oxidation is the gain of oxygen.

For example:



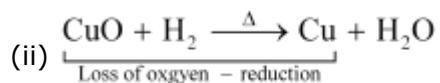
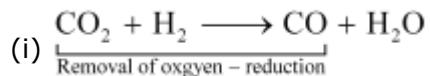
In equation (i), H₂ is oxidized to H₂O and in equation (ii), Cu is oxidised to CuO.

(b) Reduction is the loss of oxygen.

Chemical Reactions and Equations

Class X

For example:

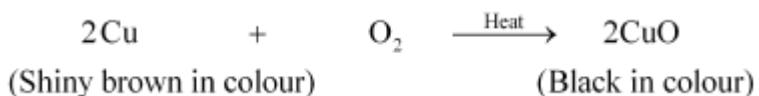


In equation (i), CO_2 is reduced to CO and in equation (ii), CuO is reduced to Cu .

Question 17: A shiny brown-coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

Answer 17:

'X' is copper (Cu) and the black-coloured compound formed is copper oxide (CuO). The equation of the reaction involved on heating copper is given below.



Question 18: Why do we apply paint on iron articles?

Answer 18:

Iron articles are painted because it prevents them from rusting. When painted, the contact of iron articles from moisture and air is cut off. Hence, rusting is prevented their presence is essential for rusting to take place.

Question 19: Oil and fat containing food items are flushed with nitrogen. Why?

Answer 19:

Nitrogen is an inert gas and does not easily react with these substances. On the other hand, oxygen reacts with food substances and makes them rancid. Thus, bags used in packing food items are flushed with nitrogen gas to remove oxygen inside the pack. When oxygen is not present inside the pack, rancidity of oil and fat containing food items is avoided.

Chemical Reactions and Equations

Question 20:

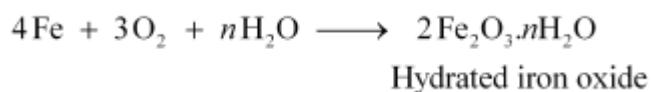
Explain the following terms with one example each.

- (a) Corrosion
- (b) Rancidity

Answer 20:

- (a) Corrosion:

Corrosion is defined as a process where materials, usually metals, deteriorate as a result of a chemical reaction with air, moisture, chemicals, etc. For example, iron, in the presence of moisture, reacts with oxygen to form hydrated iron oxide.



This hydrated iron oxide is rust.

- (b) Rancidity: The process of oxidation of fats and oils that can be easily noticed by the change in taste and smell is known as rancidity.

For example, the taste and smell of butter changes when kept for long. Rancidity can be avoided by:

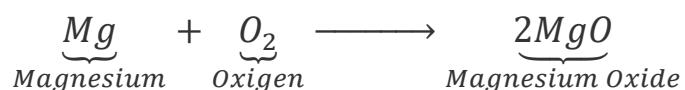
1. Storing food in air tight containers
2. Storing food in refrigerators
3. Adding antioxidants
4. Storing food in an environment of nitrogen

Question 1:

Why should a magnesium ribbon be cleaned before burning in air?

Answer 1:

Magnesium is very reactive metal like (Na, Ca, etc.). When it expose to air it reacts with oxygen to form a layer magnesium oxide (MgO) on its surface.



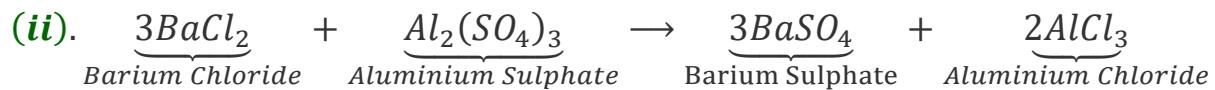
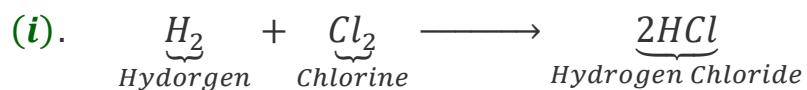
This layer of magnesium oxide is quite stable and prevents further reaction of magnesium with oxygen. The magnesium ribbon is cleaned by sand paper to remove this layer so that the underlying metal can be used for the reaction.

Question 2:

Write the balanced equation for the following chemical reactions.

- (i) Hydrogen + Chlorine \rightarrow Hydrogen chloride
- (ii) Barium chloride + Aluminium sulphate \rightarrow Barium sulphate + Aluminium chloride
- (iii) Sodium + Water \rightarrow Sodium hydroxide + Hydrogen

Answer 2:

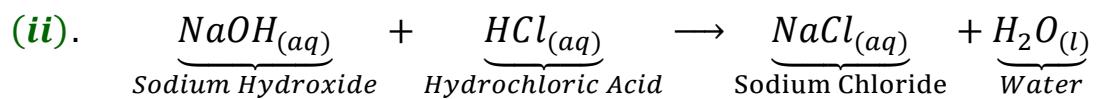
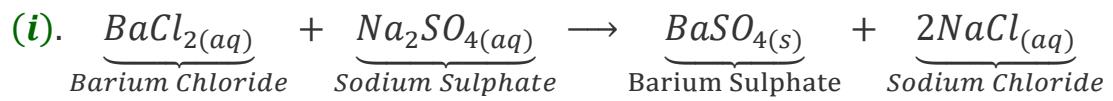


Question 3:

Write a balanced chemical equation with state symbols for the following reactions.

(i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.

(ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.

Answer 3:

Question 1:

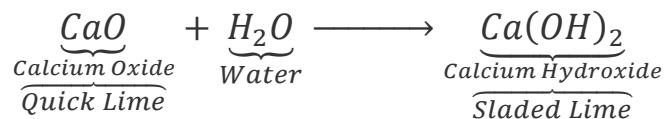
A solution of a substance ‘X’ is used for white washing.

- (i) Name the substance ‘X’ and write its formula.
- (ii) Write the reaction of the substance ‘X’ named in (i) above with water.

Answer 1:

(i). The substance ‘X’ is calcium oxide. Its chemical formula is CaO.

(ii). Calcium oxide reacts vigorously with water to form calcium hydroxide (slaked lime)



Question 2:

Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

Answer 2:

During the *Electrolysis of water*, hydrogen and oxygen is get separated by the electricity. Water (H_2O) contains two parts hydrogen and one part oxygen. Since hydrogen goes to one test tube and oxygen goes to another, the amount of gas collected in one of the test tubes is double of the amount collected in the other.

Question 1:

Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Answer 1:

When an iron nail is dipped in a copper sulphate solution, iron (which is more reactive than copper) displaces copper from copper sulphate solution forming iron sulphate, which is green in colour.



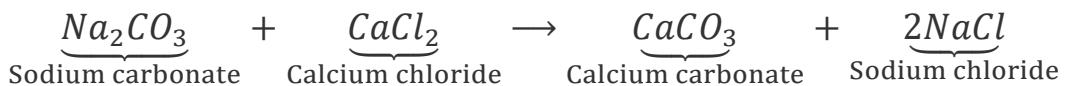
Therefore, the blue colour of copper sulphate solution fades and green colour appears.

Question 2:

Give an example of a double displacement reaction other than the one given in Activity 1.10.

Answer 2:

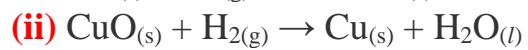
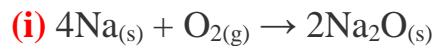
Sodium carbonate reacts with calcium chloride to form calcium carbonate and sodium chloride.



In this reaction, sodium carbonate and calcium chloride exchange ions to form two new compounds. Hence, it is a double displacement reaction.

Question 3:

Identify the substances that are oxidised and the substances that are reduced in the following reactions.



Answer 3:

(i). Sodium (Na) is oxidised as it gains oxygen and oxygen gets reduced.

(ii). Copper oxide (CuO) is reduced to copper (Cu) while hydrogen (H₂) gets oxidised to water (H₂O).

(Chapter 2)(Acids, Bases and Salts)

Class 10

Exercises solution

Question 1:

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

- (a) 1 (b) 4 (c) 5 (d) 10

Answer 1:

(d) Bases turn red litmus blue and acids turn blue litmus red. Basic solution has a pH value more than 7. Since the solution turns red litmus blue, its pH is likely to be 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

Answer 2:

(b) The solution contains HCl.

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

Answer 3:

(d) 16 mL of HCl solution will be required.

Question 4:

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

- (a) Antibiotic
(b) Analgesic
(c) Antacid
(d) Antiseptic

Answer 4:

(c) Antacid is used for treating indigestion.

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.

Answer 5:

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



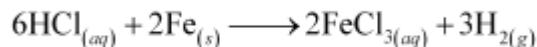
- (b) Hydrochloric acid + Magnesium → Magnesium chloride + Hydrogen



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



- (d) Hydrochloric acid + Iron → Ferric chloride + Hydrogen

**Question 6:**

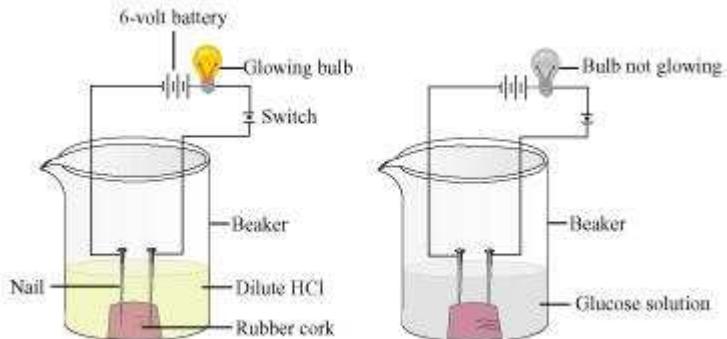
Compounds such as alcohols and glucose also contain hydrogen but are not categorized as acids. Describe an activity to prove it.

Answer 6:

Two nails are fitted on a cork and are kept it in a 100 mL beaker. The nails are then connected to the two terminals of a 6-volt battery through a bulb and a switch. Some dilute HCl is poured in the beaker and the current is switched on. The same experiment is then performed with glucose solution and alcohol solution.

Observations:

It will be observed that the bulb glows in the HCl solution and does not glow in the glucose solution.



Result:

HCl dissociates into H^+ and Cl^- ions. These ions conduct electricity in the solution resulting in the glowing of the bulb. On the other hand, the glucose solution does not dissociate into ions. Therefore, it does not conduct electricity.

Conclusion:

From this activity, it can be concluded that all acids contain hydrogen but not all compounds containing hydrogen are acids.

That is why, though alcohols and glucose contain hydrogen, they are not categorised as acids.

Question 7:

Why does distilled water not conduct electricity, whereas rain water does?

Answer 7:

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 8:

Acids do not show acidic behaviour in the absence of water because the dissociation of hydrogen ions from an acid occurs in the presence of water only. 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 9:

- (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 10:

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 11:

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 12:

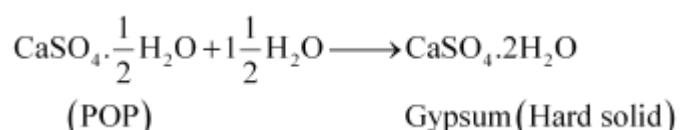
- (a) The milkman shifts the pH of the fresh milk from 6 to slightly alkaline because in alkaline condition, milk does not set as curd easily.
 - (b) Since this milk is slightly basic than usual milk, acids produced to set the curd are neutralized by the base. Therefore, it takes a longer time for the curd to set.

Question 13:

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

Answer 13:

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.



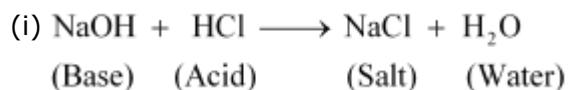
Question 14:

What is a neutralization reaction? Give two examples.

Answer 14-

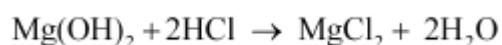
A reaction in which an acid and base react with each other to give a salt and water is termed as neutralization reaction. In this reaction, energy is evolved in the form of heat.

For example:



(ii) During indigestion (caused due to the production of excess of hydrochloric acid in the stomach), we administer an antacid (generally milk of magnesia, $Mg(OH)_2$, 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 15:

Two important used of washing soda and baking soda are as follows:

(1) **Washing soda:**

- (a) It is used in glass, soap, and paper industries.
- (b) It is used to remove permanent hardness of water.

(2) **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 CO₂ that makes bread or cake fluffy.
- (b) It is used in soda-acid fire extinguishers.

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 1:

If the colour of red litmus paper gets changed to blue, then it is a base and if there is no colour change, then it is either acidic or neutral. Thus, basic solution can be easily identified.

Let us mark the three test tubes as **A**, **B**, and **C**. A drop of the solution in **A** is put on the red litmus paper. Same is repeated with solution **B** and **C**. If either of them changes colour to blue, then it is basic. Therefore, out of three, one is eliminated. Out of the remaining two, any one can be acidic or neutral. Now a drop of basic solution is mixed with a drop of each of the remaining two solutions separately and then the nature of the drops of the mixtures is checked. If the colour of red litmus turns blue, then the second solution is neutral and if there is no change in colour, then the second solution is acidic.

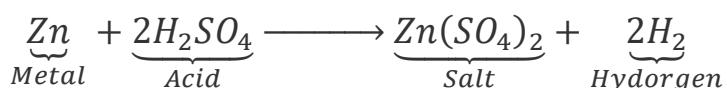
This is because acidic and basic solutions neutralize each other. Hence, we can distinguish between the three types of solutions.

Question 1:

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

Answer 1:

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.

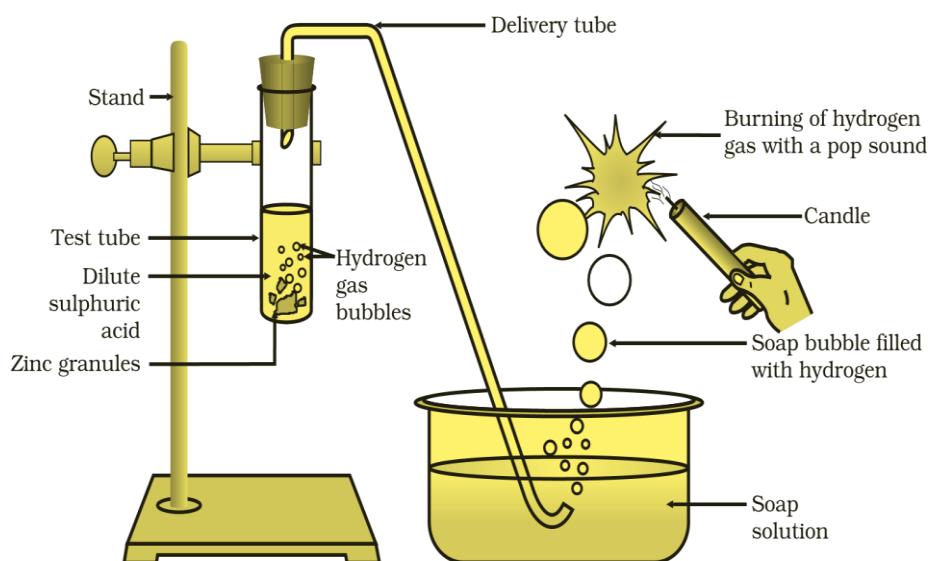


Question 2:

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 2:

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 . Shake it and pass the gas produced into a soap solution. The bubbles of the soap solution are formed. These soap bubbles contain hydrogen gas.

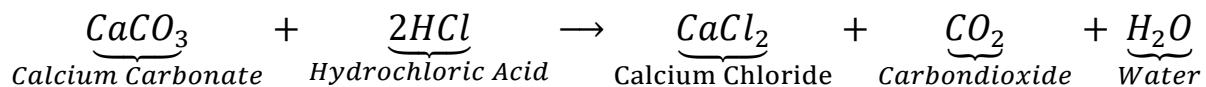


We can test the evolved hydrogen gas by its burning with a pop sound when a candle is brought near the soap bubbles.

Question 3:

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 3:



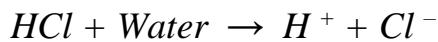
Question 1:

Why do HCl, HNO₃, etc., show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

Answer 1:

The dissociation of HCl or HNO₃ to form hydrogen ions always occurs in the presence of water. Hydrogen ions (H⁺) combine with H₂O to form hydronium ions (H₃O⁺).

The reaction is as follows:



Although aqueous solutions of glucose and alcohol contain hydrogen, these cannot dissociate in water to form hydrogen ions. Hence, they do not show acidic character.

Question 2:

Why does an aqueous solution of an acid conduct electricity?

Answer 2:

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

Question 3:

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

Answer 3:

Colour of the litmus paper is changed by the hydrogen ions. Dry HCl gas does not contain H⁺ ions. It is only in the aqueous solution that an acid dissociates to give ions. Since in this case, neither HCl is in the aqueous form nor the litmus paper is wet, therefore, the colour of the litmus paper does not change.

Question 4:

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

Answer 4:

The process of dissolving an acid or a base in water is a highly exothermic one. Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating

Question 5:

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

Answer 5:

When an acid is diluted, the concentration of hydronium ions (H_3O^+) per unit volume decreases. This means that the strength of the acid decreases.

Question 6:

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

Answer 6:

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

Question 1:

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 1:

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 2:

What effect does the concentration of $\text{H}^+(\text{aq})$ ions have on the nature of the solution?

Answer 2:

Concentration of $\text{H}^+(\text{aq})$ can have a varied effect on the nature of the solution. 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 3:

Do basic solutions also have $\text{H}^+(\text{aq})$ ions? If yes, then why are these basic?

Answer 3:

Yes, basic solution also has $\text{H}^+(\text{aq})$ ions. However, their concentration is less as compared to the concentration of OH^- ions that makes the solution basic.

Question 4:

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 4:

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 1:

What is the common name of the compound CaOCl_2 ?

Answer 1:

The common name of the compound CaOCl_2 is bleaching powder.

Question 2:

Name the substance which on treatment with chlorine yields bleaching powder.

Answer 2:

Calcium hydroxide $[\text{Ca}(\text{OH})_2]$, on treatment with chlorine Cl_2 , yields bleaching powder.

Question 3:

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

Answer 3:

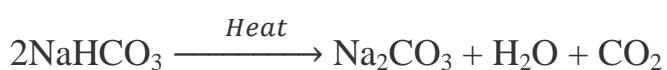
Washing soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) is used for softening hard water.

Question 4:

What will happen if a solution of sodium hydrocarbonate is heated? Give the equation of the reaction involved.

Answer 4:

When a solution of sodium hydrocarbonate is heated, sodium carbonate and water are formed with the evolution of carbon dioxide gas.

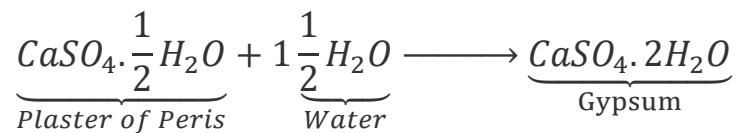


Question 5:

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

Answer 5:

Plaster of Paris is a white powder and on mixing with water, it changes to gypsum giving a hard solid mass.



Science

(Chapter – 3) (Metals and Non – Metals)
(Class X)

Exercises

Question 1:

Which of the following pairs will give displacement reactions?

- (a) NaCl solution and copper metal
- (b) MgCl₂ solution and aluminium metal
- (c) FeSO₄ solution and silver metal
- (d) AgNO₃ solution and copper metal.

Answer 1:

- (d) AgNO₃ 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.

Answer 2:

- (c) Applying a coating of zinc

(We can also apply grease and paint to prevent iron from rusting. However, in case of iron frying pan, grease and paint cannot be applied because when the pan will be heated and washed again and again, the coating of grease and paint would get destroyed.)

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

Answer 3:

(a) The element is likely to be calcium.

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.

Answer 4:

(c) Food cans are coated with tin and not with zinc because zinc is more 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 5:

(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) The above tests are useful in distinguishing between metals and non-metals as these are based on the physical properties. No chemical reactions are involved in these tests.

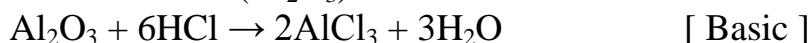
Question 6:

What are amphoteric oxides? Give two examples of amphoteric oxides.

Answer 6:

Those oxides that behave as both acidic and basic oxides are called amphoteric oxides.

Examples: aluminium oxide (Al_2O_3)



Zinc oxide (ZnO) is also an amphoteric oxide.

Question 7:

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

Answer 7:

Metals that are more reactive than hydrogen displace it from dilute acids.

For example: sodium and potassium.

Metals that are less reactive than hydrogen do not displace it.

For example: copper and silver.

Question 8:

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

Answer 8:

In the electrolytic refining of a metal M:

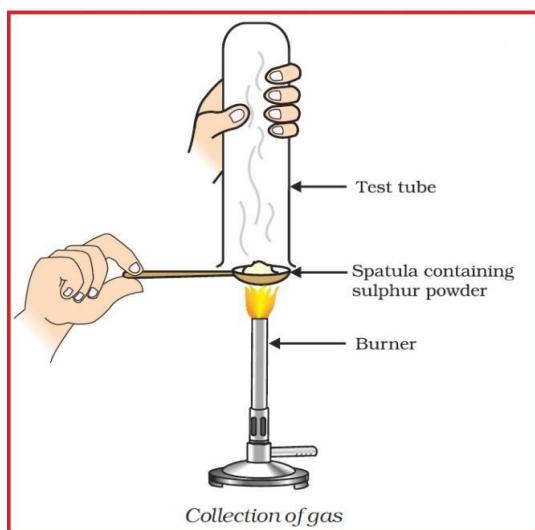
Anode → Impure metal M

Cathode → Thin strip of pure metal M

Electrolyte → Solution of salt of the metal M

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?

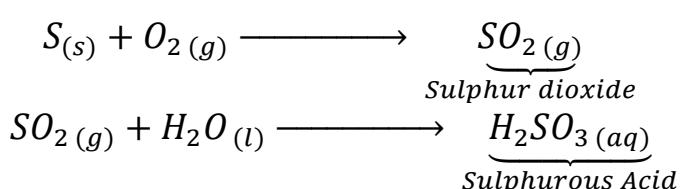
(b) Write a balanced chemical equation for the reaction taking place.

)

Answer 9:

- (a) (i) There will be no action on dry litmus paper.
(ii) Since the gas is sulphur dioxide (SO_2), it turns moist blue litmus paper to red because sulphur dioxide reacts with moisture to form sulphurous acid.

(b)



Question 10:

State two ways to prevent the rusting of iron.

Answer 10:

Two ways to prevent the rusting of iron are:

Oiling, greasing, or painting: By applying oil, grease, or paint, the surface becomes water proof and the moisture and oxygen present in the air cannot come into direct contact with iron. Hence, rusting is prevented.

Galvanisation: An iron article is coated with a layer of zinc metal, which prevents the iron to come in contact with oxygen and moisture. Hence, rusting is prevented.

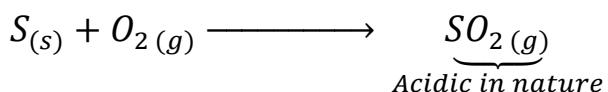
Question 11:

What type of oxides is formed when non-metals combine with oxygen?

Answer 11:

Non-metals combine with oxygen to form acidic oxides.

For example:



Question 12:

Give reasons

- (a) Platinum, gold and silver are used to make jewellery.
(b) Sodium, potassium and lithium are stored under oil.
(c) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.
(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction.

Answer 12:

- (a) Platinum, gold, and silver are used to make jewellery because they are very lustrous. Also, they are very less reactive and do not corrode easily.
- (b) Sodium, potassium, and lithium are very reactive metals and react very vigorously with air as well as water. Therefore, they are kept immersed in kerosene oil in order to prevent their contact with air and moisture.
- (c) Though aluminium is a highly reactive metal, it is resistant to corrosion. 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 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 13:

Copper reacts with moist carbon dioxide in air to form copper carbonate and as a result, copper vessel loses its shiny brown surface forming a green layer of copper carbonate. The citric acid present in the lemon or tamarind neutralises the basic copper carbonate and dissolves the layer. That is why, tarnished copper vessels are cleaned with lemon or tamarind juice to give the surface of the copper vessel its characteristic lustre.

Question 14:

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

Answer 14:

Metal	Non-metal
Metals are electropositive.	Non-metals are electronegative.
<p>They react with oxygen to form basic oxides.</p> $4Na + O_2 \longrightarrow 2Na_2O$ <p>These have ionic bonds.</p>	<p>They react with oxygen to form acidic or neutral oxides.</p> $C + O_2 \longrightarrow CO_2$ <p>These have covalent bonds.</p>
<p>They react with water to form oxides and hydroxides. Some metals react with cold water, some with hot water, and some with steam.</p> $2Na + 2H_2O \longrightarrow 2NaOH + H_2 \uparrow$	They do not react with water.
<p>They react with dilute acids to form a salt and evolve hydrogen gas. However, Cu, Ag, Au, Pt, Hg do not react.</p> $2Na + 2HCl \longrightarrow 2NaCl + H_2 \uparrow$	<p>They do not react with dilute acids. These are not capable of replacing hydrogen.</p>
<p>They react with the salt solution of metals. Depending on their reactivity, displacement reaction can occur.</p> $2CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$	These react with the salt solution of non-metals.
<p>They act as reducing agents (as they can easily lose electrons).</p> $Na \longrightarrow Na^+ + e^-$	<p>These act as oxidising agents (as they can gain electrons).</p> $Cl_2 + 2e^- \longrightarrow Cl^-$

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 15:

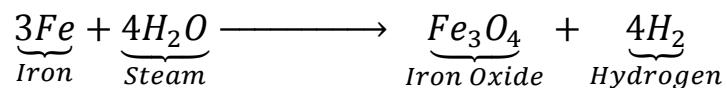
He must have dipped the gold metal in the solution of aqua regia – a 3:1 mixture of conc. HCl and conc. HNO₃. Aqua regia is a fuming, highly corrosive liquid. It dissolves gold in it. After dipping the gold ornaments in aqua regia, the outer layer of gold gets dissolved and the inner shiny layer appears. That is why the weight of gold ornament reduced.

Question 16:

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

Answer 16:

Copper does not react with cold water, hot water, or steam. However, iron reacts with steam. If the hot water tanks are made of steel (an alloy of iron), then iron would react vigorously with the steam formed from hot water.



That is why copper is used to make hot water tanks, and not steel.

Question 1:

Give an example of a metal which

- (i) is a liquid at room temperature.
- (ii) can be easily cut with a knife.
- (iii) is the best conductor of heat.
- (iv) is a poor conductor of heat.

Answer 1:

(i) Metal that exists in liquid state at room temperature → Mercury

(ii) Metal that can be easily cut with a knife → Sodium, Potassium

(iii) Metal that is the best conductor of heat → Silver, Gold

(iv) Metals that are poor conductors of heat → Mercury and lead

Question 2:

Explain the meanings of malleable and ductile.

Answer 2:

Malleable:

Substances that can be converted into thin sheets by beating are called malleable.

Most of the metals are malleable. Gold and Silver are most malleable metals.

Ductile:

Substances that can be drawn into thin wires are called ductile. Most of the metals are ductile. Gold is the most ductile metal.

Question 1:

Why is sodium kept immersed in kerosene oil?

Answer 1:

Metals such as potassium and sodium react so vigorously that they catch fire if kept in the open. Hence, to protect them and to prevent accidental fires, they are kept immersed in kerosene oil.

Question 2:

Write equations for the reactions of

- (i) iron with steam
- (ii) calcium and potassium with water

Answer 2:

(i) Iron react with steam to form the metal oxide and hydrogen.



(ii) The reaction of calcium with water is exothermic but the heat evolved is not sufficient for the hydrogen to catch fire.



Calcium starts floating because the bubbles of hydrogen gas formed stick to the surface of the metal.

Potassium react violently with cold water and its reaction is so violent and exothermic that the evolved hydrogen immediately catches fire.



Question 3:

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		
B	Displacement		No reaction	
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?
- (ii) What would you observe if B is added to a solution of Copper (II) sulphate?
- (iii) Arrange the metals A, B, C and D in the order of decreasing reactivity.

Answer 3:

(i) As per reactivity series, Iron is most reactive metal among Iron, Silver and Copper. Since B can displace Iron from its sulphate, so B is the most reactive metal.

(ii) As B is more reactive than Iron (As discussed in answer (i)), so it will displace Copper from its Copper Sulphate solution.

(iii) B is most reactive as discussed in part (i) and D is the least reactive metal as unable to displace any of the solutions. Copper is more reactive than Silver and metal A can displace Copper, so A is more reactive than C.

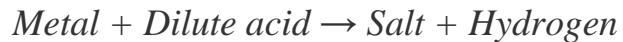
Hence, the order of decreasing reactivity is B > A > C > D.

Question 4:

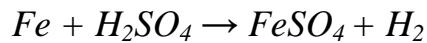
Which gas is produced when dilute hydrochloric acid is added to a reactive metal?
Write the chemical reaction when iron reacts with dilute H₂SO₄.

Answer 4:

When reactive metals react with dilute hydrochloric acids, gives a salt and hydrogen gas



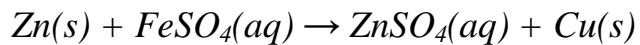
Reaction between Iron and H₂SO₄:

**Question 5:**

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

Answer 5:

Zinc is more reactive than Iron. When Zn is added to Iron (II) Sulphate, Zinc displaces Iron from its solutions and Zinc sulphate is formed.

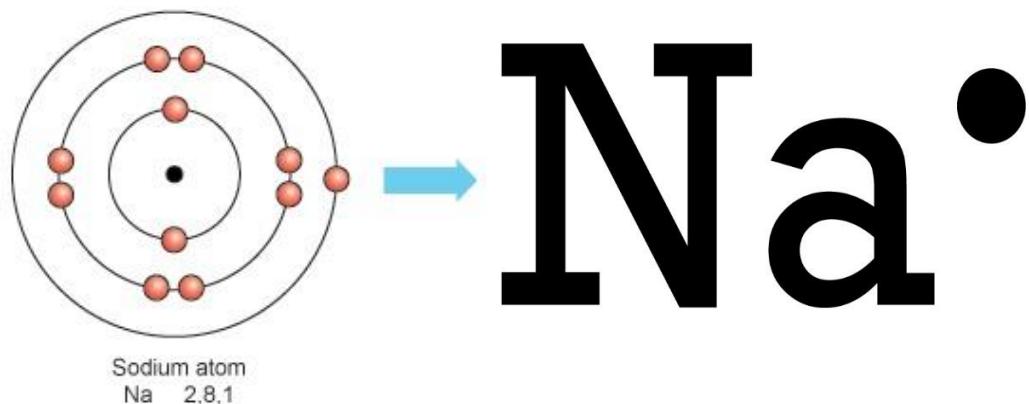


Question 1:

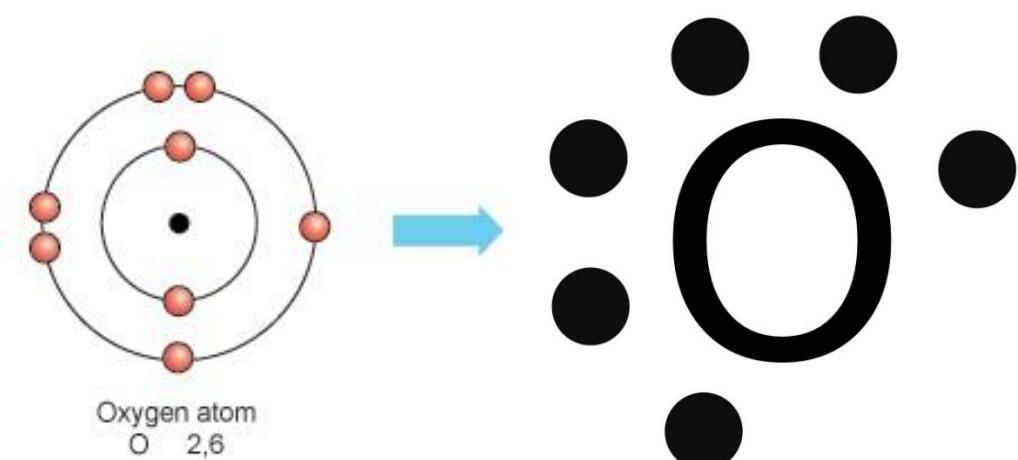
- (i) Write the electron-dot structures for sodium, oxygen and magnesium.
- (ii) Show the formation of Na_2O and MgO by the transfer of electrons.
- (iii) What are the ions present in these compounds?

Answer 1:

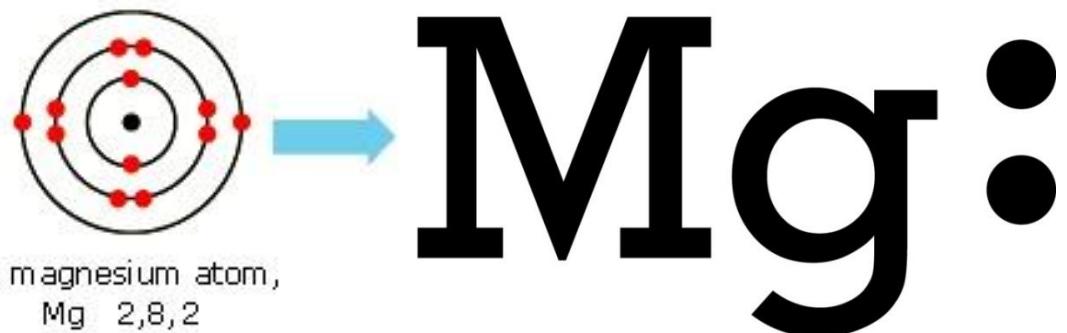
- (i) Electron – dot structure for Sodium:



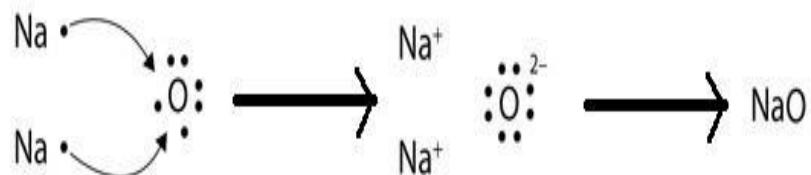
Electron – dot structure for Oxygen:



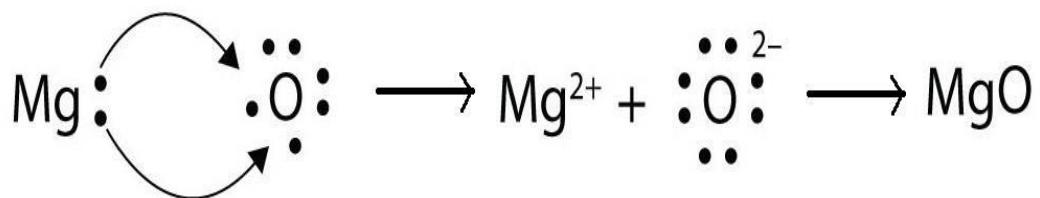
Electron – dot structure for Magnesium:



(ii). Formation of Na₂O by transfer of electron:



Formation of Na₂O by transfer of electron:



(iii). Ions present in these compounds are Mg²⁺, O²⁻ and Na⁺.

Question 2:

Why do ionic compounds have high melting points?

Answer 2:

Ionic compounds have high melting and boiling points. Because ionic compounds are formed by the attraction force of two opposite ions and a considerable amount of energy is required to break this strong inter-ionic attraction.

Question 1:

Define the following terms.

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

Answer 1:

(i) Mineral:

The elements or compounds, which occur naturally in the earth's crust, are known as minerals.

(ii). Ore:

If minerals contain a very high percentage of a particular metal and the metal can be profitably extracted from it. These minerals are called ores.

(iii). Gangue:

Ores mined from the earth are usually contaminated with large amounts of impurities such as soil, sand, etc., called gangue.

Question 2:

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

Answer 2:

The metals which are the least reactive, they are often found in a free state.

For example:

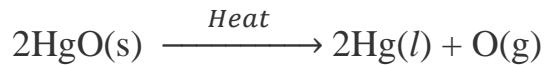
Gold, silver, platinum and copper are found in the free state.

Question 3:

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

Answer 3:

- Metals low in the activity series are very unreactive. The oxides of these metals can be reduced to metals by heating alone.



- The metals in the middle of the activity series such as iron, zinc, lead, copper, etc., are moderately reactive. These metal oxides are reduced to the corresponding metals by using suitable reducing agents



- The metals high up in the reactivity series are very reactive. They are separated from their oxides by electrolysis process.

Question 1:

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

Metal	Zinc	Magnesium	Copper
Zinc oxide			
Magnesium oxide			
Copper oxide			

Answer 1:

Magnesium is the most reactive among these three metals and Zinc is more reactive than Copper. So, Magnesium will displace Zinc oxide and Copper oxide whereas Zinc will displace Copper oxide only.

Metal	Zinc	Magnesium	Copper
Zinc oxide	No Reaction	Displacement Reaction	No Reaction
Magnesium oxide	No Reaction	No Reaction	No Reaction
Copper oxide	Displacement Reaction	Displacement Reaction	No Reaction

Question 2:

Which metals do not corrode easily?

Answer 2:

The metals which are the least reactive, do not corrode easily.

For example:

Gold, silver, platinum and copper.

Question 3:

What are alloys?

Answer 3:

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

For example:

- *Stainless steel* is an alloy of Nickel and Chromium.
- *Amalgam* is an alloy of Mercury.
- *Brass* is an alloy of Copper and Zinc.
- *Bronze* is an alloy of Copper and Tin.
- *Solder* is an alloy of Lead and Tin.

Science

(Chapter – 4) (Carbon and its Compounds)

(Class – X)

Exercises

Question 1:

Ethane, with the molecular formula C₂H₆ has

- (a) 6 covalent bonds.
- (b) 7 covalent bonds.
- (c) 8 covalent bonds.
- (d) 9 covalent bonds.

Answer 1:

(b) Ethane has 7 covalent bonds.

Question 2:

Butanone is a four-carbon compound with the functional group

- (a) carboxylic acid.
- (b) aldehyde.
- (c) ketone.
- (d) alcohol.

Answer 2:

(c) The functional group of butanone is ketone.

Question 3:

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

- (a) the food is not cooked completely.
- (b) the fuel is not burning completely.
- (c) the fuel is wet.
- (d) the fuel is burning completely.

Answer 3:

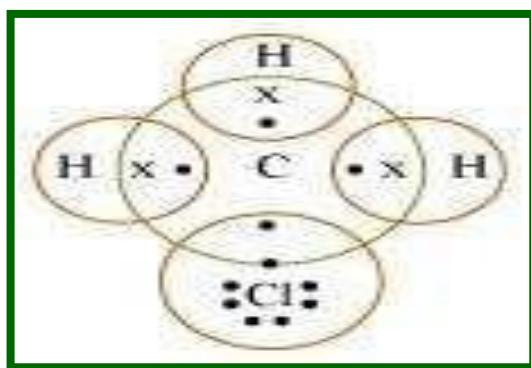
(b) While cooking, if the bottom of the vessel is getting blackened on the outside, then it means that the fuel is not burning completely.

Question 4:

Explain the nature of the covalent bond using the bond formation in CH₃Cl.

Answer 4:

Carbon can neither lose four of its electrons nor gain four electrons as both the processes require extra amount of energy and would make the system unstable. Therefore, it completes its octet by sharing its four electrons with other carbon atoms or with atoms of other elements. The bonds that are formed by sharing electrons are known as covalent bonds. In covalent bonding, both the atoms share the valence electrons, i.e., the shared electrons belong to the valence shells of both the atoms.



Here, carbon requires 4 electrons to complete its octet, while each hydrogen atom requires one electron to complete its duplet. Also, chlorine requires an electron to complete the octet. Therefore, all of these share the electrons and as a result, carbon forms 3 bonds with hydrogen and one with chlorine.

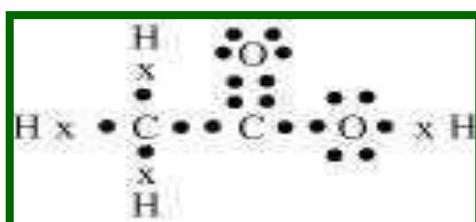
Question 5:

Draw the electron dot structures for

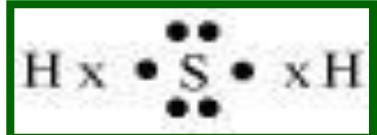
- (a) ethanoic acid.
- (b) H₂S.
- (c) propanone.
- (d) F₂.

Answer 5:

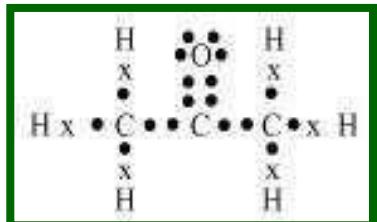
(a) Ethanoic acid



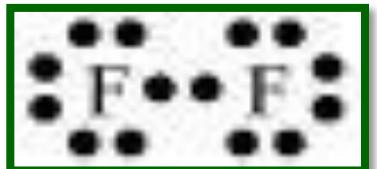
(b) H_2S



(c) Propanone



(d) F_2



Question 6:

What is a homologous series? Explain with an example.

Answer 6:

A homologous series is a series of carbon compounds that have different numbers of carbon atoms but contain the same functional group.

For example, methane, ethane, propane, butane, etc. are all part of the alkane homologous series. The general formula of this series is $\text{C}_n\text{H}_{2n+2}$.

Methane CH_4

Ethane CH_3CH_3

Propane $\text{CH}_3\text{CH}_2\text{CH}_3$

Butane $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

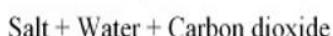
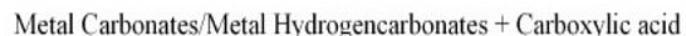
It can be noticed that there is a difference of $-\text{CH}_2$ unit between each successive compound.

Question 7:

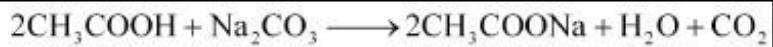
How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?

Answer 7:

- ✓ Ethanol is a liquid at room temperature with a pleasant odour while ethanoic acid has vinegar-like smell. The melting point of ethanoic acid is 17°C. This is below room temperature and hence, it freezes during winters.
- ✓ Ethanoic acid reacts with metal carbonates and metal hydrogencarbonates to form salt, water, and carbon dioxide gas while ethanol does not react with them.



For example,


$$\downarrow$$

No reaction

For example,

**Question 8:**

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

Answer 8:

In the electrolytic refining of a metal M:

- | | | |
|-------------|---|---------------------------------|
| Anode | → | Impure metal M |
| Cathode | → | Thin strip of pure metal M |
| Electrolyte | → | Solution of salt of the metal M |

Question 9:

Why are carbon and its compounds used as fuels for most applications?

Answer 9:

Most of the carbon compounds give a lot of heat and light when burnt in air. Saturated hydrocarbons burn with a clean flame and no smoke is produced. The carbon compounds, used as a fuel, have high calorific values. Therefore, carbon and its compounds are used as fuels for most applications.

Question 10:

Explain the formation of scum when hard water is treated with soap.

Answer 10:

Soap does not work properly when the water is hard. A soap is a sodium or potassium salt of long chain fatty acids. Hard water contains salts of calcium and magnesium. When soap is added to hard water, calcium and magnesium ions present in water displace sodium or potassium ions from the soap molecules forming an insoluble substance called scum. A lot of soap is wasted in the process.

Question 11:

What change will you observe if you test soap with litmus paper (red and blue)?

Answer 11:

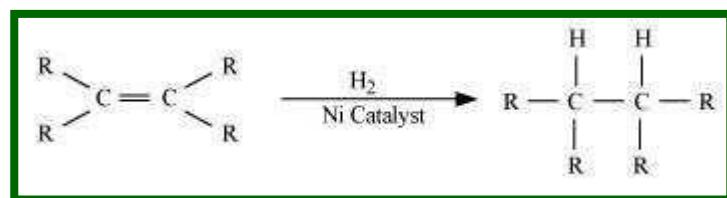
Since soap is basic in nature, it will turn red litmus blue. However, the colour of blue litmus will remain blue.

Question 12:

What is hydrogenation? What is its industrial application?

Answer 12:

Hydrogenation is the process of addition of hydrogen. Unsaturated hydrocarbons are added with hydrogen in the presence of palladium and nickel catalysts to give saturated hydrocarbons.



This reaction is applied in the hydrogenation of vegetables oils, which contain long chains of unsaturated carbons.

Question 13:

Which of the following hydrocarbons undergo addition reactions:
 C_2H_6 , C_3H_8 , C_3H_6 , C_2H_2 and CH_4 .

Answer 13:

Unsaturated hydrocarbons undergo addition reactions. Being unsaturated hydrocarbons, C_3H_6 and C_2H_2 undergo addition reactions.

Question 14:

Give a test that can be used to differentiate chemically between butter and cooking oil.

Answer 14:

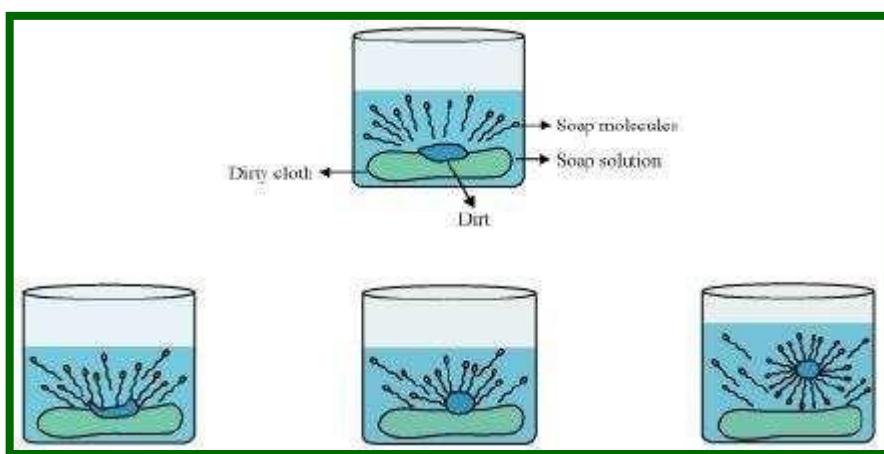
Butter contains saturated fats. Therefore, it cannot be hydrogenated. On the other hand, oil has unsaturated fats. That is why it can be hydrogenated to saturated fats (solids).

Question 15:

Explain the mechanism of the cleaning action of soaps.

Answer 15:**Cleansing action of soaps:**

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

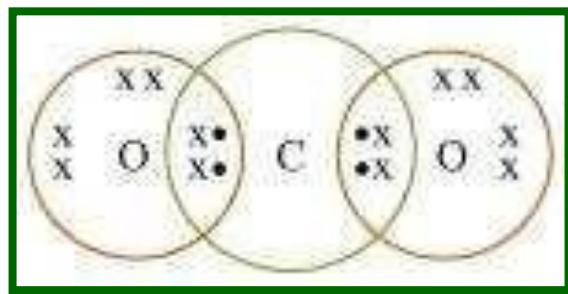


Question 1:

What would be the electron dot structure of carbon dioxide which has the formula CO_2 ?

Answer 1:

Electron dot structure of CO_2 is

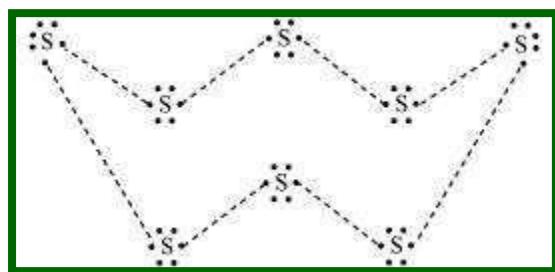


Question 2:

What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? (Hint – the eight atoms of sulphur are joined together in the form of a ring.)

Answer 2:

Electron dot structure of a sulphur molecule



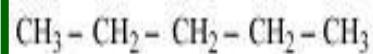
Question 1:

How many structural isomers can you draw for pentane?

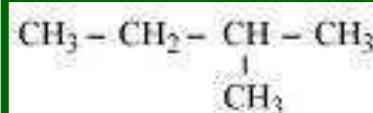
Answer 1:

Three structural isomers are possible for pentane.

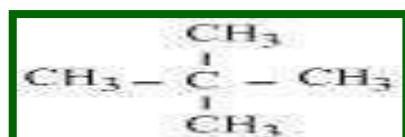
(i)



(ii)



(iii)



Question 2:

What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

Answer 2:

The two features of carbon that give rise to a large number of compounds are as follows:

(i) Catenation: It is the ability to form bonds with other atoms of carbon.

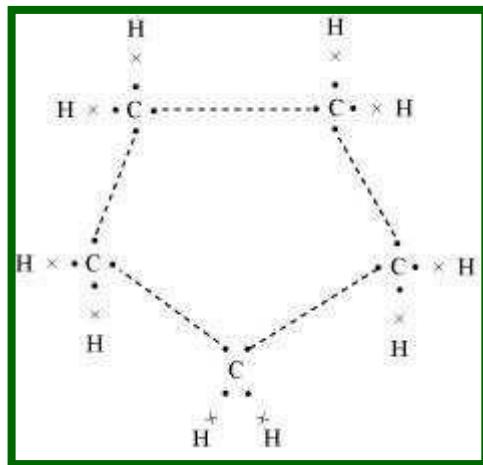
(ii) Tetravalency: With the valency of four, carbon is capable of bonding with four other atoms.

Question 3:

What will be the formula and electron dot structure of cyclopentane?

Answer 3:

The formula for cyclopentane is C_5H_{10} . Its electron dot structure is given below.



Question 4:

Draw the structures for the following compounds.

(i) Ethanoic acid

(ii) Bromopentane*

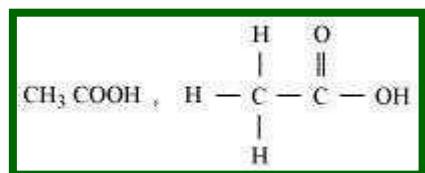
(iii) Butanone

(iv) Hexanal

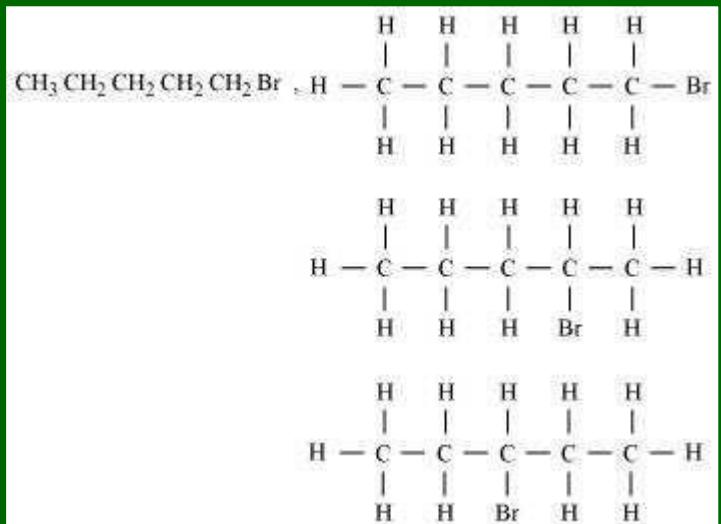
*Are structural isomers possible for bromopentane?

Answer 4:

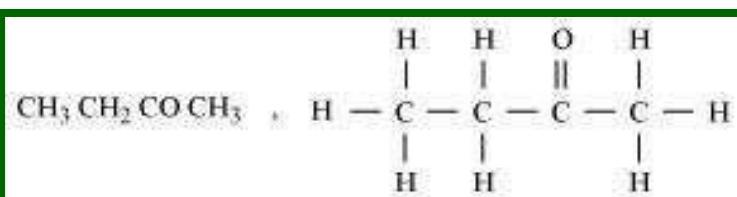
(i)



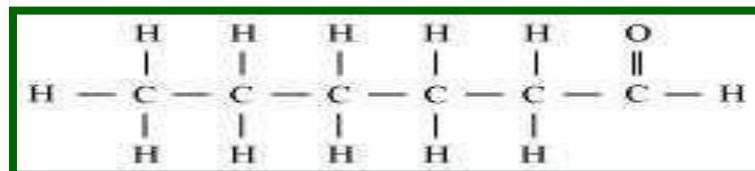
(ii) There are many structural isomers possible for bromopentane. Among them, the structures of three isomers are given.



(iii)

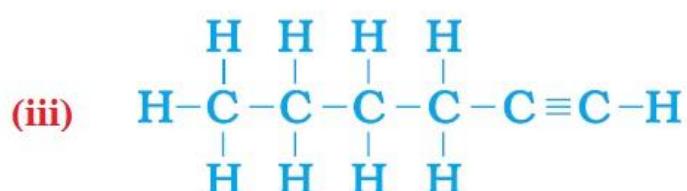
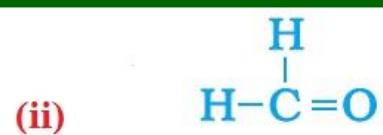


(iv)



Question 5:

How would you name the following compounds?



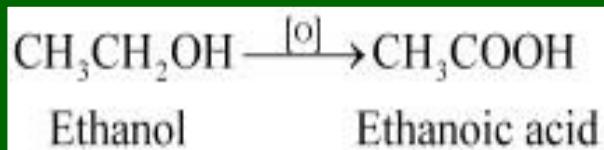
Answer 5:

- (i). Bromoethane
- (ii). Methanal
- (iii). Hexyne

Question 1:

Why is the conversion of ethanol to ethanoic acid an oxidation reaction?

Answer 1:

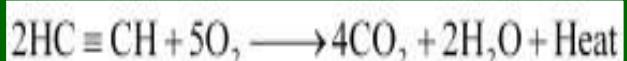


Since the conversion of ethanol to ethanoic acid involves the addition of oxygen to ethanol, it is an oxidation reaction.

Question 2:

A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

Answer 2:



When ethyne is burnt in air, it gives a sooty flame. This is due to incomplete combustion caused by limited supply of air. However, if ethyne is burnt with oxygen, it gives a clean flame with temperature 3000°C because of complete combustion. This oxy-acetylene flame is used for welding. It is not possible to attain such a high temperature without mixing oxygen. This is the reason why a mixture of ethyne and air is not used.

Question 1:

How would you distinguish experimentally between an alcohol and a carboxylic acid?

Answer 1:

We can distinguish between an alcohol and a carboxylic acid on the basis of their reaction with carbonates and hydrogen carbonates. Acid reacts with carbonate and hydrogen carbonate to evolve CO₂ gas that turns lime water milky.

Metal Carbonate/ Metal Hydrogencarbonate + Carboxylic acid



Salt + Water + Carbon dioxide

Alcohols, on the other hand, do not react with carbonates and hydrogen carbonates.

Question 2:

What are oxidising agents?

Answer 2:

Some substances such as alkaline potassium permanganate and acidified potassium dichromate are capable of adding oxygen to others. These are known as oxidising agents.

Question 1:

Would you be able to check if water is hard by using a detergent?

Answer 1:

Detergents are ammonium or sulphonate salts of long chain carboxylic acids. Unlike soap, they do not react with calcium and magnesium ions present in hard water to form scum. They give a good amount of lather irrespective of whether the water is hard or soft. This means that detergents can be used in both soft and hard water. Therefore, it cannot be used to check whether the water is hard or not.

Question 2:

People use a variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes?

Answer 2:

A soap molecule has two parts namely hydrophobic and hydrophilic. With the help of these, it attaches to the grease or dirt particle and forms a cluster called micelle. These micelles remain suspended as a colloid. To remove these micelles (entrapping the dirt), it is necessary to agitate clothes.

Science

(Chapter – 5) (Periodic Classification of Elements)

(Class - X)

Exercises

Question 1:

Which of the following statements is not a correct statement about the trends when going from left to right across the periods of Periodic Table.

- (a) The elements become less metallic in nature.
 - (b) The number of valence electrons increases.
 - (c) The atoms lose their electrons more easily.
 - (d) The oxides become more acidic.

Answer 1:

- (c)** The atoms lose their electrons more easily.

(On moving from left to right across the periods of the periodic table, the non-metallic character increases. Hence, the tendency to lose electrons decreases.)

Question 2:

Element X forms a chloride with the formula XCl_2 , which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as

Answer 2:

- (a)** X would most likely be in the same group of the Periodic Table as magnesium (Mg).

Question 3:

Which element has

- (a)** two shells, both of which are completely filled with electrons?
 - (b)** the electronic configuration 2, 8, 2?
 - (c)** a total of three shells, with four electrons in its valence shell?
 - (d)** a total of two shells, with three electrons in its valence shell?
 - (e)** twice as many electrons in its second shell as in its first shell?

Answer 3:

- (a)** Neon has two shells, both of which are completely filled with electrons (2 electrons in K shell and 8 electrons in L shell).

(b) Magnesium has the electronic configuration 2, 8, 2.



- (c) Silicon has a total of three shells, with four electrons in its valence shell (2 electrons in K shell, 8 electrons in L shell and 4 electrons in M shell).
- (d) Boron has a total of two shells, with three electrons in its valence shell (2 electrons in K shell and 3 electrons in L shell).
- (e) Carbon has twice as many electrons in its second shell as in its first shell (2 electrons in K shell and 4 electrons in L shell).

Question 4:

- (a) What property do all elements in the same column of the Periodic Table as boron have in common?
- (b) What property do all elements in the same column of the Periodic Table as fluorine have in common?

Answer 4:

- (a) All the elements in the same column as boron have the same number of valence electrons (3). Hence, they all have valency equal to 3.
- (b) All the elements in the same column as fluorine have the same number of valence electrons (7). Hence, they all have valency equal to 1.

Question 5:

An atom has electronic configuration 2, 8, 7.

- (a) What is the atomic number of this element?
- (b) To which of the following elements would it be chemically similar? (Atomic numbers are given in parentheses.)
- | | | | |
|------|------|-------|--------|
| N(7) | F(9) | P(15) | Ar(18) |
|------|------|-------|--------|

Answer 5:

- (a) The atomic number of this element is 17.
- (b) It would be chemically similar to F(9) with configuration as 2, 7.



Question 6:

The position of three elements A, B and C in the Periodic Table are shown below –

Group 16	Group 17
–	–
–	A
–	–
B	C

- (a) State whether A is a metal or non-metal.
- (b) State whether C is more reactive or less reactive than A.
- (c) Will C be larger or smaller in size than B?
- (d) Which type of ion, cation or anion, will be formed by element A?

Answer 6:

- (a) A is a non-metal.
- (b) C is less reactive than A, as reactivity decreases down the group in halogens.
- (c) C will be smaller in size than B as moving across a period, the nuclear charge increases and therefore, electrons come closer to the nucleus.
- (d) A will form an anion as it accepts an electron to complete its octet.

Question 7:

Nitrogen (atomic number 7) and phosphorus (atomic number 15) belong to group 15 of the Periodic Table. Write the electronic configuration of these two elements. Which of these will be more electronegative? Why?

Answer 7:

Element	K	L	M
Nitrogen	2	5	
Phosphorus	2	8	5

Nitrogen is more electronegative than phosphorus. On moving down a group, the number of shell increases. Therefore, the valence electrons move away from the nucleus and the effective nuclear charge decreases. This causes the decrease in the tendency to attract electron and hence electronegativity decreases.

Question 8:

How does the electronic configuration of an atom relate to its position in the Modern Periodic Table?

Answer 8:

In the modern periodic table, atoms with similar electronic configurations are placed in the same column. In a group, the number of valence electrons remains the same. Elements across a period show an increase in the number of valence electrons.

Question 9:

In the Modern Periodic Table, calcium (atomic number 20) is surrounded by elements with atomic numbers 12, 19, 21, and 38. Which of these have physical and chemical properties resembling calcium?

Answer 9:

The element with atomic number 12 has same chemical properties as that of calcium. This is because both of them have same number of valence electrons (2).

Question 10:

Compare and contrast the arrangement of elements in Mendeleev's periodic Table and the Modern Periodic Table.

Answer 10:

	Mendeleev's periodic table		Modern periodic table
1.	Elements are arranged in the increasing order of their atomic masses.	1.	Elements are arranged in the increasing order of their atomic numbers.
2.	There are a total of 7 groups (columns) and 6 periods (rows).	2.	There are a total of 18 groups (columns) and 7 periods (rows).
3.	Elements having similar properties were placed directly under one another.	3.	Elements having the same valence shell are present in the same period while elements having the same number of valence electrons are present in the same group.
4.	The position of hydrogen could not be explained.	4.	Hydrogen is placed above alkali metals.
5.	No distinguishing positions for metals and non-metals.	5.	Metals are present at the left hand side of the periodic table whereas non-metals are present at the right hand side.

Question 1:

Did Dobereiner's triads also exist in the columns of Newlands' Octaves? Compare and find out.

Answer 1:

Only one triad of Dobereiner's triads exists in the columns of Newlands' octaves. The triad formed by the elements Li, Na, and K of Dobereiner's triads also occurred in the columns of Newlands' octaves.

Dobereiner's triads

Li	Ca	Cl
Na	Sr	Br
K	Ba	I

Newlands' octaves

H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	—	—

Question 2:

What were the limitations of Dobereiner's classification?

Answer 2:

Limitation of Dobereiner's classification:

All known elements could not be classified into groups of triads on the basis of their properties.

Question 3:

What were the limitations of Newlands' Law of Octaves?

Answer 3:

Limitations of Newlands' law of octaves:

- a) It was not applicable throughout the arrangements. It was applicable up to calcium only. The properties of the elements listed after calcium showed no resemblance to the properties of the elements above them.
- b) Those elements that were discovered after Newlands' octaves did not follow the law of octaves.
- c) The position of cobalt and nickel in the group of the elements (F, Cl) of different properties could not be explained.
- d) Placing of iron far away from cobalt and nickel, which have similar properties as iron, could also not be explained.

Question 1:

Use Mendeleev's Periodic Table to predict the formulae for the oxides of the following elements: K, C, Al, Si, Ba.

Answer 1:

K is in group 1. Therefore, the oxide will be K_2O .

C is in group 4. Therefore, the oxide will be CO_2 .

Al is in group 3. Therefore, the oxide will be Al_2O_3 .

Si is in group 4. Therefore, the oxide will be SiO_2 .

Ba is in group 2. Therefore, the oxide will be BaO .

Question 2:

Besides gallium, which other elements have since been discovered that were left by Mendeleev in his Periodic Table? (any two)

Answer 2:

Scandium and germanium

Question 3:

What were the criteria used by Mendeleev in creating his Periodic Table?

Answer 3:

Mendeleev's periodic table was based on the observation that the properties of elements are a periodic function of their atomic masses. This means that if elements are arranged in the increasing order of their atomic masses, then their properties get repeated after regular intervals.

Question 4:

Why do you think the noble gases are placed in a separate group?

Answer 4:

Noble gases are inert elements. Their properties are different from the all other elements. Therefore, the noble gases are placed in a separate group.

Question 1:

How could the Modern Periodic Table remove various anomalies of Mendeleev's Periodic Table?

Answer 1:

Mendeleev was unable to give fixed position to hydrogen and isotopes in the periodic table. In Mendeleev's periodic table, the increasing manner of atomic mass of the elements is not always regular from one to its next. It was believed that a more fundamental property than atomic mass could explain periodic properties in a better manner.

It was Henry Moseley who demonstrated that atomic number of an element could explain periodic properties in a better way than atomic mass of an element and arranged the elements in increasing order of their atomic numbers. Then it was found that the various anomalies of Mendeleev's periodic table were removed by the modern periodic table.

Question 2:

Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis for your choice?

Answer 2:

Calcium (Ca) and strontium (Sr) are expected to show chemical reactions similar to magnesium (Mg). This is because the number of valence electrons (2) is same in all these three elements. And since chemical properties are due to valence electrons, they show same chemical reactions.

Question 3:

Name

- (a) three elements that have a single electron in their outermost shells.
- (b) two elements that have two electrons in their outermost shells.
- (c) three elements with filled outermost shells.

Answer 3:

- (a) Lithium (Li), sodium (Na), and potassium (K) have a single electron in their outermost shells.
- (b) Magnesium (Mg) and calcium (Ca) have two electrons in their outermost shells.
- (c) Neon (Ne), argon (Ar), and xenon (Xe) have filled outermost shells.

Question 4:

- (a) Lithium, sodium, potassium are all metals that react with water to liberate hydrogen gas. Is there any similarity in the atoms of these elements?
(b) Helium is an unreactive gas and neon is a gas of extremely low reactivity. What, if anything, do their atoms have in common?

Answer 4:

- (a) Yes. The atoms of all the three elements lithium, sodium, and potassium have one electron in their outermost shells.
(b) Both helium (He) and neon (Ne) have filled outermost shells. Helium has a duplet in its K shell, while neon has an octet in its L shell.

Question 5:

In the Modern Periodic Table, which are the metals among the first ten elements?

Answer 5:

Among the first ten elements, lithium (Li) and beryllium (Be) are metals.

Question 6:

By considering their position in the Periodic Table, which one of the following elements would you expect to have maximum metallic characteristic?

Ga, Ge, As, Se, Be

Answer 6:

Since **Be** lies to the **extreme left** hand side of the periodic table, **Be is the most metallic** among the given elements.

Science

(Chapter 6)(Life Processes)

Class - 10

Exercises

Question 1:

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

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

Answer 1:

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

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.

Answer 2:

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

Question 3:

The autotrophic mode of nutrition requires

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

Answer 3:

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

Question 4:

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

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

Answer 4:

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

Question 5:

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

Answer 5:

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 6:

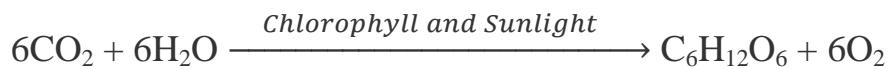
Saliva is secreted by the salivary glands, located under the tongue. It makes the food soft for easy swallowing. It contains a digestive enzyme called salivary amylase, which breaks down starch into sugar.

Question 7:

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

Answer 7:

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 O₂ are the by-products of photosynthesis.

**Question 8:**

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

Answer 8:

Difference between Aerobic respiration and Anaerobic respiration:

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 ₂ O.	4.	It produces alcohols and CO ₂ .
5.	It yields large amount of energy.	5.	Energy released is very low.

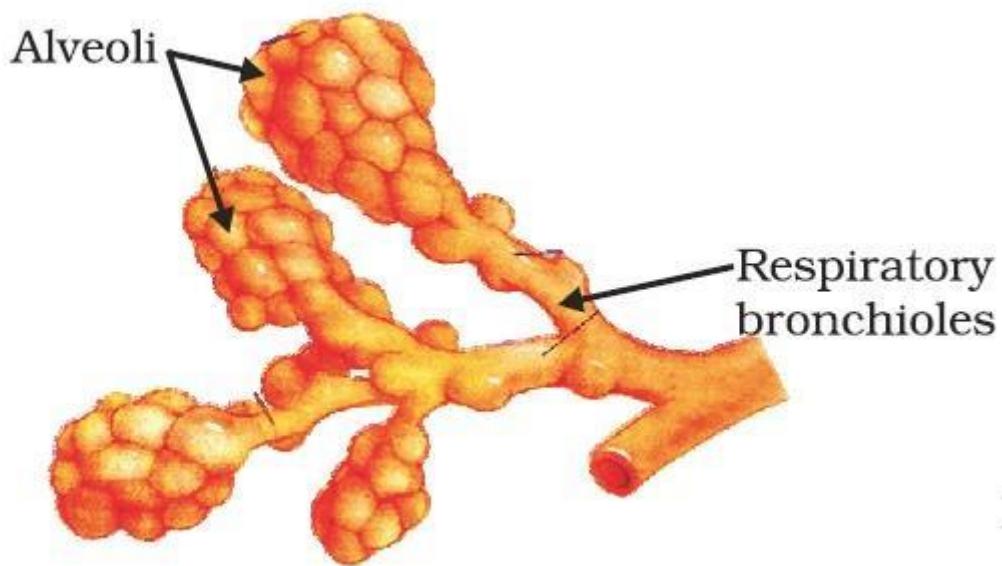
Anaerobic respiration occurs in the roots of some waterlogged plants, some parasitic worms, animal muscles and some micro-organisms such as yeasts.

Question 9:

How are the alveoli designed to maximise the exchange of gases?

Answer 9:

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, making it a total of approximately 700 million in both the lungs. The alveolar surface when spread out covers about 80 m^2 area. This large surface area makes the gaseous exchange more efficient.

**Question 10:**

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

Answer 10:

Haemoglobin is the respiratory pigment that transports oxygen to the body cells for cellular respiration. Therefore, deficiency of haemoglobin in blood can affect the oxygen supplying capacity of blood. This can lead to deficiency of oxygen in the body cells. It can also lead to a disease called anaemia.

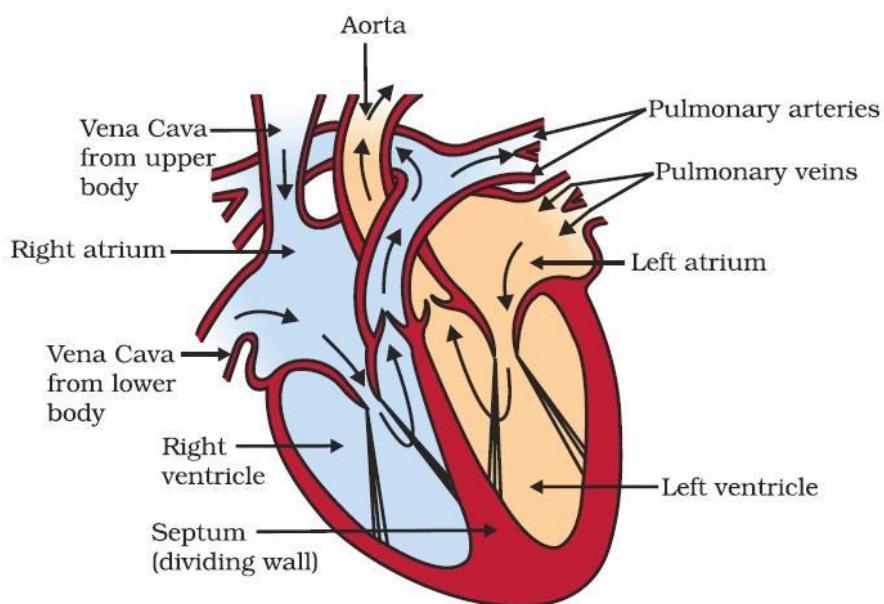
Question 11:

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

Answer 11:

Because both oxygen and carbon dioxide have to be transported by the blood, the heart has different chambers to prevent the oxygen-rich blood from mixing with the blood containing carbon dioxide. The human heart is divided into four chambers – the right atrium, the right ventricle, the left atrium and the left ventricle.

Oxygen-rich blood from the lungs comes to the thin-walled upper chamber of the heart on the left, the left atrium. The left atrium relaxes when it is collecting this blood. 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 on the right, 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.

During this process blood goes twice through the heart. That's why it is known as double circulation.

Double Circulation is necessary:

The separation of oxygenated and de-oxygenated blood allows a more efficient supply of oxygen to the body cells. This efficient system of oxygen supply is very useful in warm-blooded animals such as human beings. As we know, warm-blooded animals have to maintain a constant body temperature by cooling themselves when they are in a hotter environment and by warming their bodies when they are in a cooler environment. Hence, they require more O₂ for more respiration so that they can produce more energy to maintain their body temperature.

Thus, the circulatory system of humans is more efficient because of the double circulatory heart.

Question 12:

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

Answer 12:

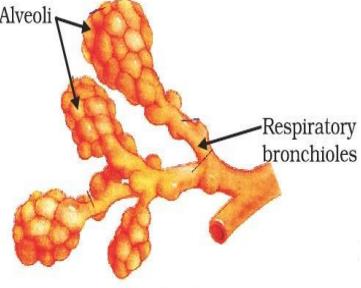
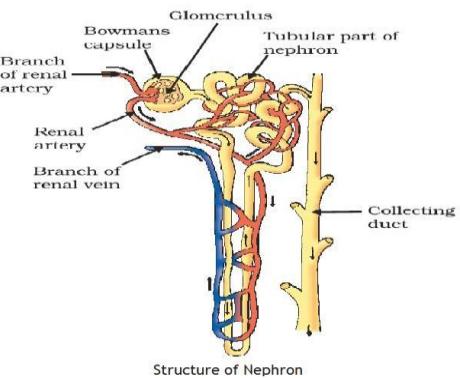
Difference between Xylem and Phloem:

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 13:

Alveoli	Nephron
1. Alveoli are tiny balloon-like structures present inside the lungs.	1. Nephrons are tubular structures present inside the kidneys.
2. The walls of the alveoli are one cell thick and it contains an extensive network of blood capillaries. 	2. Nephrons are made of glomerulus, bowman's capsule, and a long renal tube. It also contains a cluster of thin walled capillaries. 
3. The exchange of O ₂ and CO ₂ takes place between the blood of the capillaries that surround the alveoli and the gases present in the alveoli. Alveoli are the site of gaseous exchange.	3. The blood enters the kidneys through the renal artery which branches into many capillaries in the glomerulus. The water and solute are transferred to the nephron at Bowman's capsule. Then the filtrate moves through the proximal tubule, distal tubule and collecting duct. The collecting duct collects the urine from many nephrons and passes it to the ureter. During the flow of filtrate, some substances such as glucose, amino acids, and water are selectively reabsorbed. Nephrons are the basic filtration unit.

Question 1:

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

Answer 1:

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 2:

Any visible movement such as walking, breathing, or growing is generally used to decide whether something is alive or not. However, a living organism can also have movements, which are not visible to the naked eye. Therefore, the presence of molecular movement inside the organisms used to decide whether something is alive or not.

Question 3:

What are outside raw materials used for by an organism?

Answer 3:

An organism uses outside raw materials mostly in the form of food (Since life on earth depends on carbon based molecules, most of these food sources are also carbon-based) and oxygen. The raw materials required by an organism can be quite varied depending on the complexity of the organism and its environment.

Question 4:

What processes would you consider essential for maintaining life?

Answer 4:

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

Question 1:

What are the differences between autotrophic nutrition and heterotrophic nutrition?

Answer 1:

<i>Autotrophic nutrition</i>		<i>Heterotrophic nutrition</i>	
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 2:

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

Answer 2:

The following raw materials are required for photosynthesis:

- The raw material CO₂ enters from the atmosphere through stomata.
- Water is absorbed from the soil by the plant roots.
- Sunlight, an important component to manufacture food, is absorbed by the chlorophyll and other green parts of the plants.

Question 3:

What is the role of the acid in our stomach?

Answer 3:

Role of the acid (HCl) in our stomach:

- Kills germs present in the food.
- Makes the food acidic, so that pepsin can digest protein.

Question 4:

What is the function of digestive enzymes?

Answer 4:

Digestive enzymes such as amylase, lipase, pepsin, trypsin, etc. help in the breaking down of complex food particles into simple ones. These simple particles can be easily absorbed by the blood and thus transported to all the cells of the body.

Question 5:

How is the small intestine designed to absorb digested food?

Answer 5:

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 1:

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

Answer 1:

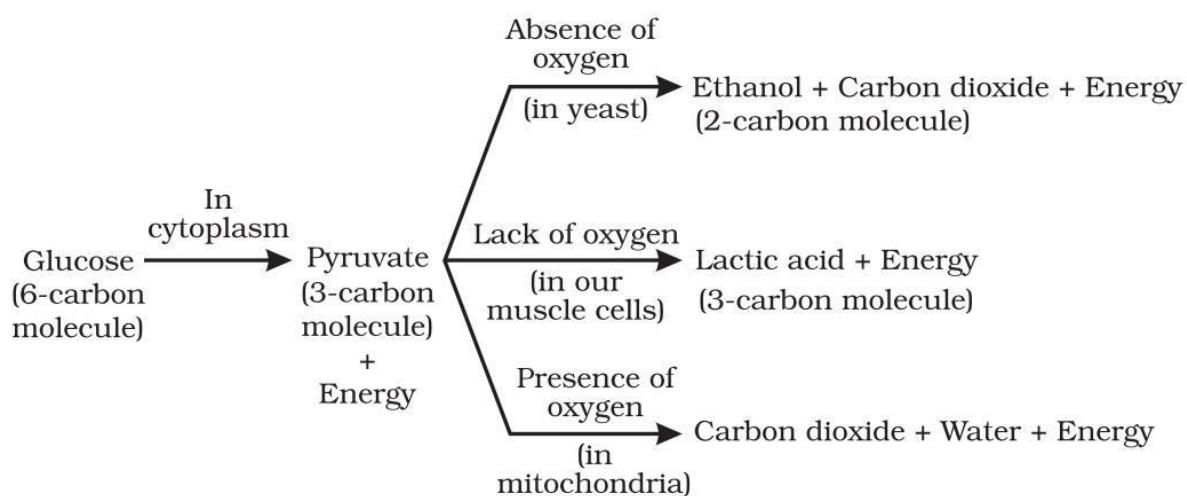
Since the amount of dissolved oxygen is fairly low compared to the amount of oxygen in the air, the rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms. Therefore, unlike aquatic animals, terrestrial animals do not have to show various adaptations for better gaseous exchange.

Question 2:

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

Answer 2:

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 3:

How is oxygen and carbon dioxide transported in human beings?

Answer 3:

Haemoglobin transports oxygen molecule to all the body cells for cellular respiration. The haemoglobin pigment present in the blood gets attached to O₂ molecules that are obtained from breathing. It thus forms oxyhaemoglobin and the blood becomes oxygenated. This oxygenated blood is then distributed to all the body cells by the heart. After giving away O₂ to the body cells, blood takes CO₂ which is the end product of cellular respiration. Now the blood becomes de-oxygenated.

Since haemoglobin pigment has less affinity for CO₂, CO₂ is mainly transported in the dissolved form. This de-oxygenated blood gives CO₂ to lung alveoli and takes O₂ in return.

Question 4:

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

Answer 4:

The exchange of gases takes place between the blood capillaries that surround the alveoli and the gases present in the alveoli. Thus, alveoli are the site for exchange of gases. The lungs get filled up with air during the process of inhalation as ribs are lifted up and diaphragm is flattened. The air that is rushed inside the lungs fills the numerous alveoli present in the lungs. 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 1:

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

Answer 1:

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

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

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

Answer 2:

Warm-blooded animals such as birds and mammals maintain a constant body temperature by cooling themselves when they are in a hotter environment and by warming their bodies when they are in a cooler environment. Hence, these animals require more oxygen (O_2) for more cellular respiration so that they can produce more energy to maintain their body temperature.

Thus, it is necessary for them to separate oxygenated and de-oxygenated blood, so that their circulatory system is more efficient and can maintain their constant body temperature.

Question 3:

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

Answer 3:

In highly organised plants, there are two different types of conducting tissues – *xylem* and *phloem*.

- **Xylem** conducts water and minerals obtained from the soil (via roots) to the rest of the plant.
- **Phloem** transports amino acids and food materials from the leaves to different parts of the plant body.

Question 4:

How are water and minerals transported in plants?

Answer 4:

The components of xylem tissue (tracheids and vessels) of roots, stems and leaves are interconnected to form a continuous system of water – conducting channels that reaches all parts of the plant. 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 5:

How is food transported in plants?

Answer 5:

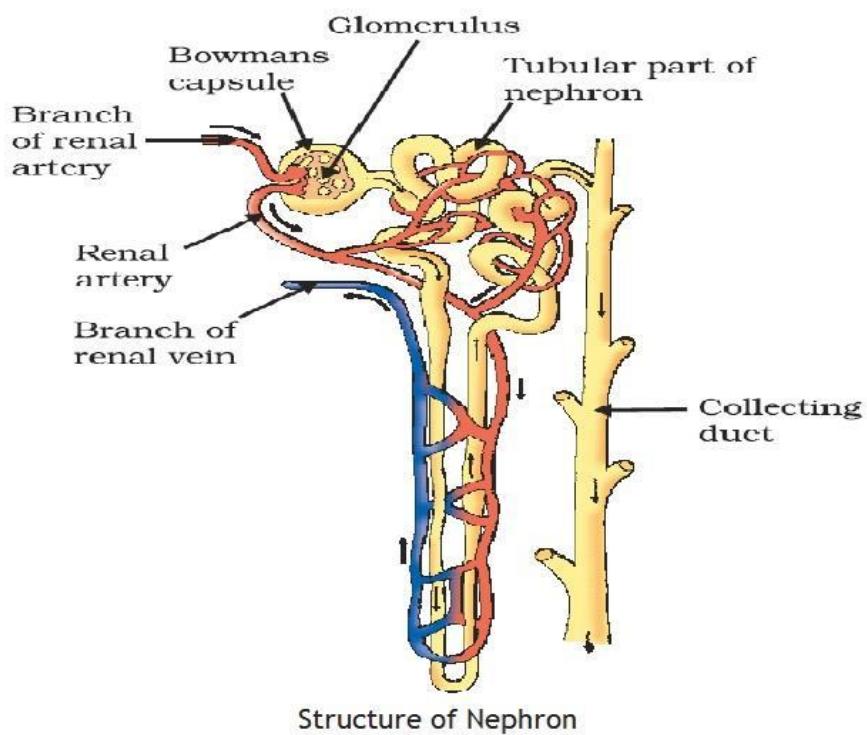
Phloem transports food materials from the leaves to different parts of the plant body. The transportation of food in phloem is achieved by utilizing energy from ATP. As a result of this, the osmotic pressure in the tissue increases causing water to move into it. This pressure moves the material in the phloem to the tissues which have less pressure. This is helpful in moving materials according to the needs of the plant. For example, the food material, such as sucrose, is transported into the phloem tissue using ATP energy.

Question 1:

Describe the structure and functioning of nephrons.

Answer 1:

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:

- The blood enters the kidney through the renal artery, which branches into many capillaries associated with glomerulus.
- The water and solute are transferred to the nephron at Bowman's capsule.

- In the proximal tubule, some substances such as amino acids, glucose, and salts are selectively reabsorbed and unwanted molecules are added in the urine.
- The filtrate then moves down into the loop of Henle, where more water is absorbed.
- From here, the filtrate moves upwards into the distal tubule and finally to the collecting duct. Collecting duct collects urine from many nephrons.
- The urine formed in each kidney enters a long tube called ureter. From ureter, it gets transported to the urinary bladder and then into the urethra.

Question 2:

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

Answer 2:

Plants use completely different strategies for excretion than those of animals. They can get rid of excess water by transpiration. For other wastes, plants use the fact that many of their tissues consist of dead cells, and that they can even lose some parts such as leaves. Many plant waste products are stored in cellular vacuoles. Waste products may be stored in leaves that fall off. Other waste products are stored as resins and gums, especially in old xylem. Plants also excrete some waste substances into the soil around them.

Question 3:

How is the amount of urine produced regulated?

Answer 3:

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.

Science

(Chapter 7)(Control and Coordination)

Class - 10

Exercises

Question 1:

Which of the following is a plant hormone?

- (a) Insulin
- (b) Thyroxin
- (c) Oestrogen
- (d) Cytokinin.

Answer 1:

(d) Cytokinin is a plant hormone.

Question 2:

The gap between two neurons is called a

- (a) dendrite.
- (b) synapse.
- (c) axon.
- (d) impulse.

Answer 2:

(b) The gap between two neurons is called a synapse.

Question 3:

The brain is responsible for

- (a) thinking.
- (b) regulating the heart beat.
- (c) balancing the body.
- (d) all of the above.

Answer 3:

(d) The brain is responsible for thinking, regulating the heart beat and balancing the body.

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 4:

Receptors are sensory structures (organs/tissues or cells) present all over the body. The receptors are either grouped in case of eye or ear, or scattered in case of skin.

Functions of receptors:

- They sense the external stimuli such as heat or pain.
- They also trigger an impulse in the sensory neuron which sends message to the spinal cord.

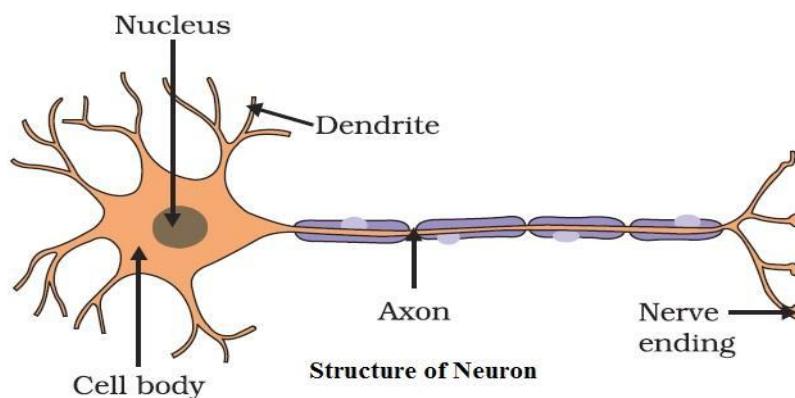
When the receptors are damaged, the external stimuli transferring signals to the brain are not felt. For example, in the case of damaged receptors, if we accidentally touch any hot object, then our hands might get burnt as damaged receptors cannot perceive the external stimuli of heat and pain.

Question 5:

Draw the structure of a neuron and explain its function.

Answer 5:

Neurons are the functional units of the nervous system. The three main parts of a neuron are axon, dendrite and cell body.



Functions of the three parts of a neuron:

- **Axon:** It conducts messages away from the cell body.
- **Dendrite:** It receives information from axon of another cell and conducts the messages towards the cell body.
- **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 6:

The movement of plant in response to light is called phototropism. Stem shows positive phototropism as follows:

When growing plants detect light, a hormone called auxin, synthesised at the shoot tip, helps the cells to grow longer. When light is coming from one side of the plant, auxin diffuses towards the shady side of the shoot. This concentration of auxin stimulates the cells to grow longer on the side of the shoot which is away from light. Thus, the plant appears to bend towards light.

Question 7:

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

Answer 7:

The reflex arc connections between the input and output nerves meet in a bundle in the spinal cord. In fact, nerves from all over the body meet in a bundle in the spinal cord on their way to the brain. In case of any injury to the spinal cord, 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 8:

Animals have a nervous system for controlling and coordinating the activities of the body. But plants have neither a nervous system nor muscles.

Plants respond to stimuli by showing movements. The growth, development, and responses to the environment in plants is controlled and coordinated by a special class of chemical substances known as hormones. These hormones are produced in one part of the plant body and are translocated to other needy parts. For example, a hormone produced in roots is translocated to other parts when required. The five major types of phytohormone are auxins, gibberellins, cytokinins, abscisic acid, and ethylene. These phytohormones are either growth promoters (such as auxins, gibberellins, cytokinins, and ethylene) or growth inhibitors such as abscisic acid.

Question 9:

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

Answer 9:

The maintenance of the body functions in response to changes in the body by working together of various integrated body systems is known as *coordination*. All the movements that occur in response to stimuli are carefully coordinated and controlled. In animals, the control and coordination movements are provided by nervous and muscular systems. The nervous system sends messages to and away from the brain. The spinal cord plays an important role in the relay of messages. In the absence of this system of control and coordination, our body will not be able to function properly.

For example, when we accidentally touch a hot utensil, we immediately withdraw our hand. In the absence of nerve transmission, we will not withdraw our hand and may get burnt.

Question 10:

How are involuntary actions and reflex actions different from each other?

Answer 10:

Involuntary actions cannot be consciously controlled. For example, we cannot consciously control the movement of food in the alimentary canal or pumping of blood through heart. These actions are however directly under the control of the brain. On the other hand, the *reflex actions* such as closing of eyes immediately when bright light is focused show sudden response and do not involve any thinking. This means that unlike involuntary actions, the reflex actions are not under the control of brain.

Question 11:

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

Answer 11:

<i>Nervous system mechanism</i>		<i>Hormonal system mechanism</i>	
1.	The information is conveyed in the form of electric impulse.	1.	The information is conveyed in the form of chemical messengers.
2.	The axons and dendrites transmit the information through a coordinated effort.	2.	The information is transmitted or transported through blood.
3.	The flow of information is rapid and the response is quick.	3.	The information travels slowly and the response is slow.
4.	Its effects are short lived.	4.	It has prolonged effects.

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 12:

<i>Movement in sensitive plants</i>		<i>Movement in our legs</i>	
1.	The movement that takes place in a sensitive plant such as <i>Mimosa pudica</i> occurs in response to touch (stimulus).	1.	Movement in our legs is an example of voluntary actions.
2.	For this movement, the information is transmitted from cell to cell by electrochemical signals as plants do not have any specialised tissue for conduction of impulses.	2.	The signal or messages for these actions are passed to the brain and hence are consciously controlled.
3.	For this movement to occur, the plant cells change shape by changing the amount of water in them.	3.	In animal muscle cells, some proteins are found which allow the movement to occur.

Question 1:

What is the difference between a reflex action and walking?

Answer 1:

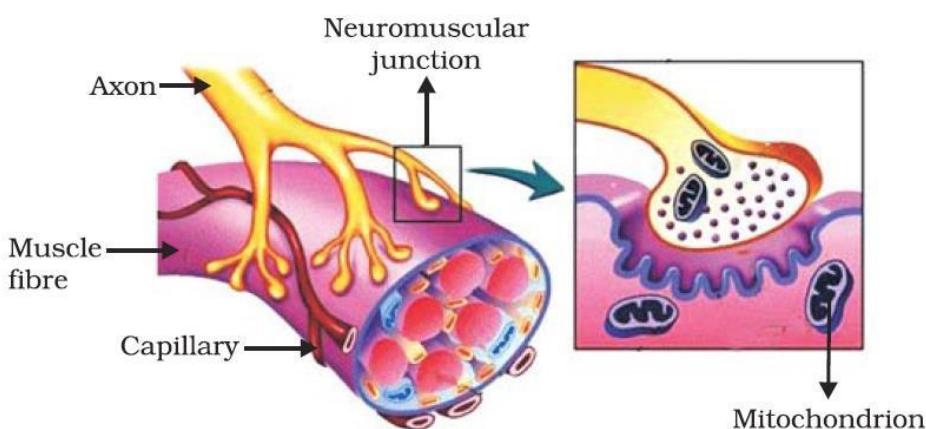
- A *reflex action* is a rapid, automatic response to a stimulus. It does not involve any thinking. For example, we close our eyes immediately when the bright light is focused.
- *Walking*, on the other hand, is a voluntary action. It is under our conscious control.

Question 2:

What happens at the synapse between two neurons?

Answer 2:

A very small gap that occurs between the last portion of axon of one neuron and the dendrite of the other neuron is known as a synapse. It acts as a one way valve to transmit impulses in one direction only.



This one-directional transfer of impulses occurs as the chemicals are produced in only one side of the neuron i.e., the axon's side. From axon, the impulses travel across the synapse to the dendrite of the other neuron.

Question 3:

Which part of the brain maintains posture and equilibrium of the body?

Answer 3:

Cerebellum, a part of hindbrain is responsible for maintaining posture and equilibrium of the body.

Question 4:

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

Answer 4:

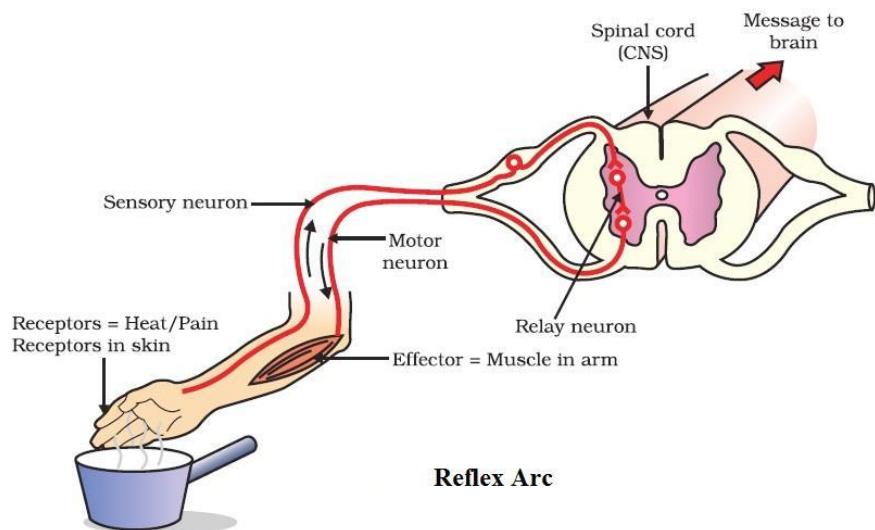
The thinking part of our brain is the forebrain. It has separate areas that are specialized for hearing, smelling, sight, taste, touch, etc. The forebrain also has regions that collect information or impulses from the various receptors. When the smell of an incense stick reaches us, our forebrain detects it. Then, the forebrain interprets it by putting it together with the information received from other receptors and also with the information already stored in the brain.

Question 5:

What is the role of the brain in reflex action?

Answer 5:

Reflex actions are sudden responses, which do not involve any thinking. For example, when we touch a hot object, we withdraw our hand immediately without thinking as thinking may take time which would be enough to get us burnt. The sensory nerves that detect the heat are connected to the nerves that move the muscles of the hand. Such a connection of detecting the signal from the nerves (input) and responding to it quickly (output) is called a reflex arc. The reflex arcs –connections present between the input and output nerves – meet in a bundle in the spinal cord.



Reflex arcs are formed in the spinal cord and the information (input) reaches the brain. The brain is only aware of the signal and the response that has taken place. However, the brain has no role to play in the creation of the response.

Question 1:

What are plant hormones?

Answer 1:

Plant hormones or phytohormones are naturally-occurring organic substances. These are synthesized in one part of the plant body (in minute quantities) and are translocated to other parts when required. The five major types of phytohormones are auxins, gibberellins, cytokinins, abscisic acid and ethylene.

- *Gibberellins* help in the growth of the stem.
- *Auxins* help in the growth of the stem.
- *Cytokinins* promote cell division.
- *Abscisic acid* is one example of a hormone which inhibits growth.

Question 2:

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

Answer 2:

- The movement of leaves of the sensitive plant, *Mimosa pudica* or “touch me not”, occurs in response to touch or contact stimuli. This is done by plant cells by changing the amount of water in leaves. This movement is independent of growth.
- The movement of shoot towards light is known as phototropism. This type of movement is directional and is growth dependent.

Question 3:

Give an example of a plant hormone that promotes growth.

Answer 3:

Examples of plants growth hormones:

- *Gibberellins* help in the growth of the stem.
- *Auxins* help in the growth of the stem.
- *Cytokinins* promote cell division.

Question 4:

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

Answer 4:

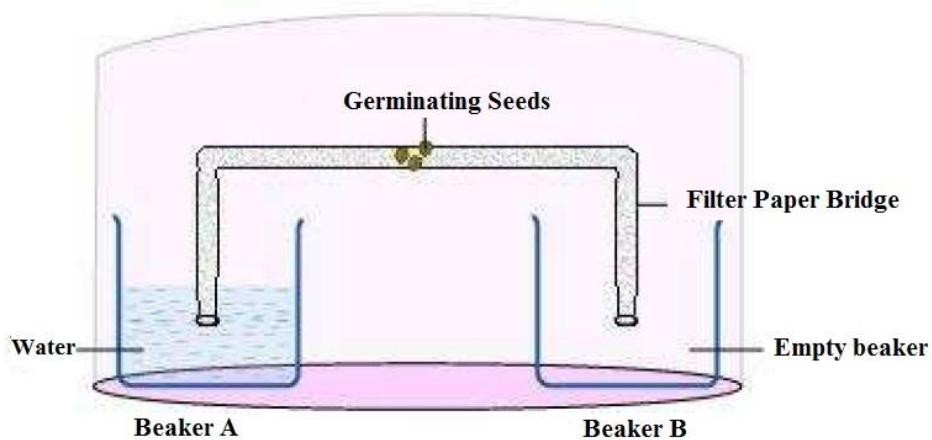
These tendrils are sensitive to touch. When they come in contact with any support, auxin (a growth hormone) diffuses from the part of the tendril in contact with the object to other side, which is not in the contact. Therefore the part of the tendril in the contact with the object does not grow as rapidly as the part of the tendril away from the object. This causes the tendril to circle around the object and thus cling to it.

Question 5:

Design an experiment to demonstrate hydrotropism.

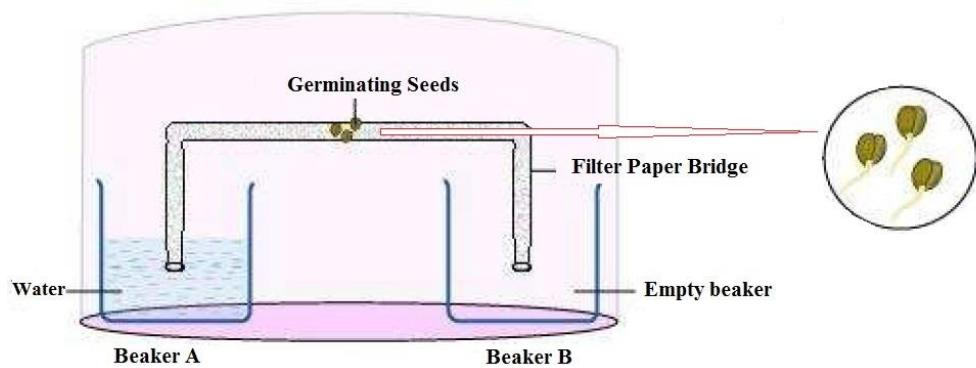
Answer 5:

Take two small beakers and label them as A and B. Fill beaker A with water. Now make a cylindrical-shaped roll from a filter paper and keep it as a bridge between beaker A and beaker B, as shown in the figure. Attach few germinating seeds in the middle of the filter paper bridge. Now, cover the entire set-up with a transparent plastic container so that the moisture is retained.



Observation:

The roots of the germinating seeds will grow towards beaker A.



This experiment demonstrates the phenomenon of hydrotropism

Question 1:

How does chemical coordination take place in animals?

Answer 1:

Chemical coordination takes place in animals with the help of hormones. Hormone is the chemical messenger that regulates the physiological processes in living organisms. It is secreted by glands. The regulation of physiological processes and control and coordination by hormones comes under the endocrine system. The nervous system along with the endocrine system in our body controls and coordinates the physiological processes.

Question 2:

Why is the use of iodised salt advisable?

Answer 2:

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. Therefore, iodised salt is advised for normal functioning of the thyroid gland.

Question 3:

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

Answer 3:

Adrenalin is a hormone secreted by the adrenal glands in case of any danger or emergency or any kinds of stress. It is secreted directly into the blood and is transported to different parts of the body.

When secreted in large amounts, it speeds up the heartbeat and hence supplies more oxygen to the muscles. The breathing rate also increases due to contractions of diaphragm and rib muscles. It also increases the blood pressure. All these responses enable the body to deal with any stress or emergency.

Question 4:

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

Answer 4:

Diabetes is a disease in which the level of sugar in the blood is too high. Insulin, a hormone secreted by the pancreas, helps in regulating the blood sugar levels. This is the reason why diabetic patients are treated by giving injections of insulin.

Science

(Chapter – 8) (How Do Organisms Reproduce?)

(Class – X)

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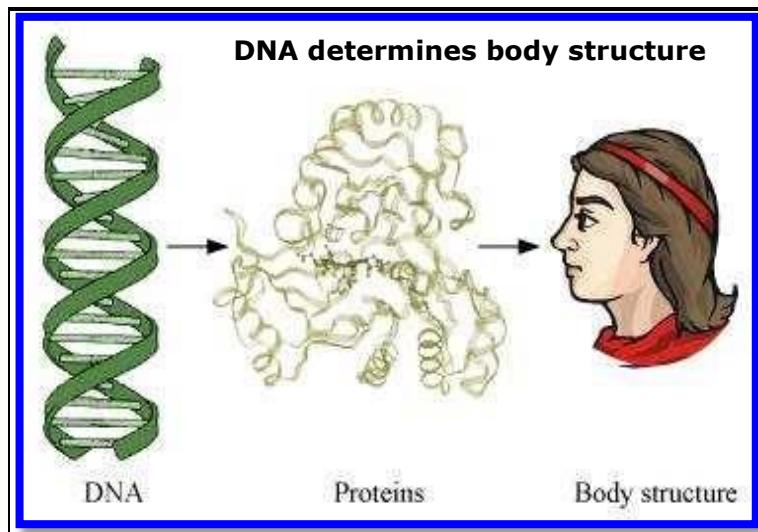
Question 1:

What is the importance of DNA copying in reproduction?

Answer 1:

DNA (Deoxyribonucleic acid) is the genetic material found in the chromosomes, which are present in the nucleus of a cell. The DNA is the information site for making proteins and each specific type of protein leads to a specific type of body design.

Thus, it is the DNA molecule that determines the body design of an individual. Therefore, it can be concluded that it is the DNA that gets transferred from parents to offsprings and makes them look similar.



Question 2:

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

Answer 2:

Variations are beneficial to the species than individual because sometimes for a species, the environmental conditions change so drastically that their survival becomes difficult. For example, if the temperature of water increases suddenly, then most of the bacteria living in that water would die. Only few variants that are resistant to heat would be able to survive. However, if these variants were not there, then the entire species of bacteria would have been destroyed.

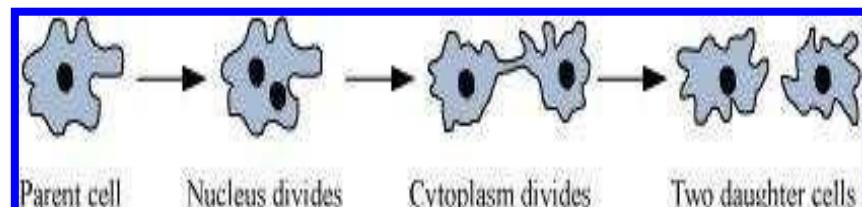
Thus, these variants help in the survival of the species. However, all variations are not necessarily beneficial for the individual organisms.

Question 1:

How does binary fission differ from multiple fission?

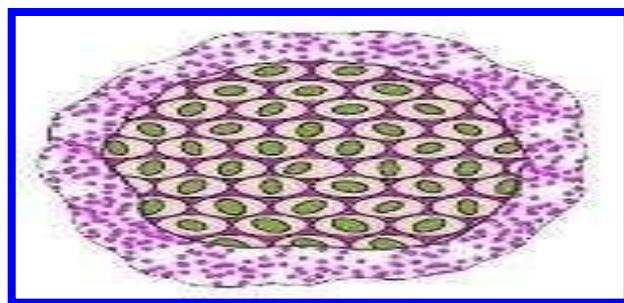
Answer 1:

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



Binary fission in *Amoeba*

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



Multiple fission in *Plasmodium*

Question 2:

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

Answer 2:

There are many advantages, if an organism reproduces through spores.

Advantages of spore formation:

- Large numbers of spores are produced in one sporangium.
- 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 3:

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

Answer 3:

Simple organisms such as *Hydra* and *Planaria* are capable of producing new individuals through the process of regeneration. The process of regeneration involves the formation of new organisms from its body parts. Simple organisms can utilize this method of reproduction as their entire body is made of similar kind of cells in which any part of their body can be formed by growth and development.

However, complex organisms have organ-system level of organization. All the organ systems of their body work together as an interconnected unit. They can regenerate their lost body parts such as skin, muscles, blood, etc. However, they cannot give rise to new individuals through regeneration.

Question 4:

Which of the following is a plant hormone?

- (a) Insulin
- (b) Thyroxin
- (c) Oestrogen
- (d) Cytokinin

Answer 4:

(d) Cytokinin is a plant hormone.

Question 5:

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

Answer 5:

DNA (Deoxyribonucleic acid) copying is an essential part of reproduction as it passes genetic information from parents to offspring. It determines the body design of an individual. The reproducing cells produce a copy of their DNA through some chemical reactions and result in two copies of DNA. The copying of DNA always takes place along with the creation of additional cellular structure. This process is then followed by division of a cell to form two cells.

Question 1:

How is the process of pollination different from fertilization?

Answer 1:

Pollination is the process of transfer of pollens from anther to stigma. It occurs with the help of certain pollinators such as air, water, birds, or some insects.

Fertilization, on the other hand, is the fusion of the male and female gametes. It occurs inside the ovule and leads to the formation of zygote.

Question 2:

What is the role of the seminal vesicles and the prostate gland?

Answer 2:

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 nutrient in the form of fructose, calcium, and some enzymes.

Question 3:

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

Answer 3:

Secondary sexual characteristics in girls:

- Increase in breast size and darkening of skin of the nipples present at the tips of the breasts.
- Appearance of hair in the genital area.
- Appearance of hair in other areas of skin like underarms, face, hands, and legs.
- Increase in the size of uterus and ovary.
- Beginning of menstrual cycle.
- More secretion of oil from the skin, which results in the appearance of pimples.

Question 4:

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

Answer 4:

The embryo develops inside the mother's body for about nine months. 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. They provide a large surface area for exchange of oxygen and nutrients. 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 5:

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

Answer 5:

No. Using a copper-T will not provide a protection from sexually transmitted diseases, as it does not prevent the entry of semen. It only prevents the implantation of the embryo in the uterus.

Exercises

Question 1:

Asexual reproduction takes place through budding in

- (a) *amoeba*.
- (b) yeast.
- (c) *plasmodium*.
- (d) *leishmania*.

Answer 1:

(b) Asexual reproduction takes place through budding in yeast.

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

Answer 2:

(c) Vas deferens is not a part of the female reproductive system in human beings.

Question 3:

The anther contains

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

Answer 3:

(d) The anther contains pollen grains.

Question 4:

What are the advantages of sexual reproduction over asexual reproduction?

Answer 4:**Advantages of sexual reproduction:**

- In sexual reproduction, more variations are produced. Thus, it ensures survival of species in a population.
- The new formed individual has characteristics of both the parents.
- Variations are more viable in sexual mode than in asexual one. This is because in asexual reproduction, DNA has to function inside the inherited cellular apparatus.

Question 5:

What are the functions performed by the testis in human beings?

Answer 5:

The testes are the male reproductive organs that are located outside the abdominal cavity within a pouch called scrotum.

Functions of testes:

- Produce sperms
- Produce a hormone called testosterone, which brings about secondary sexual characters in boys.

Question 6:

Why does menstruation occur?

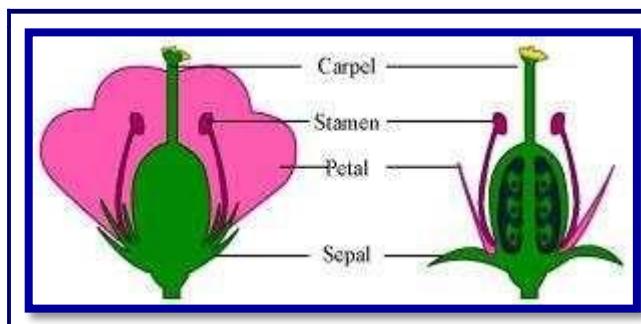
Answer 6:

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 fertilised, 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 7:



Question 8:

What are the different methods of contraception?

Answer 8:

The contraceptive methods can be broadly divided into the following types:

- **Natural method:** It involves avoiding the chances of meeting of sperms and ovum. In this method, the sexual act is avoided from day 10th to 17th of the menstrual cycle because during this period, ovulation is expected and therefore, the chances of fertilization are very high.
- **Barrier method:** In this method, the fertilization of ovum and sperm is prevented with the help of barriers. Barriers are available for both males and females. Condoms are barriers made of thin rubber that are used to cover penis in males and vagina in females.
- **Oral contraceptives:** In this method, tablets or drugs are taken orally. These contain small doses of hormones that prevent the release of eggs and thus fertilization cannot occur.
- **Implants and surgical methods:** Contraceptive devices such as the loop or Copper-T are placed in uterus to prevent pregnancy. Some surgical methods can also be used to block the gamete transfer. It includes the blocking of vas deferens to prevent the transfer of sperms known as vasectomy. Similarly, fallopian tubes of the female can be blocked so that the egg will not reach the uterus known as tubectomy.

Question 9:

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

Answer 9:

In unicellular organisms, reproduction occurs by the division of the entire cell. The modes of reproduction in unicellular organisms can be fission, budding, etc. whereas in multicellular organisms, specialised reproductive organs are present. Therefore, they can reproduce by complex reproductive methods such as vegetative propagation, spore formation, etc. In more complex multicellular organisms such as human beings and plants, the mode of reproduction is sexual reproduction.

Question 10:

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

Answer 10:

Living organisms reproduce for the continuation of a particular species. It helps in providing stability to the population of species by producing a new individual that resembles the parents. This is the reason why cats give birth to only cats or dogs give birth to only dogs. Therefore, reproduction provides stability to populations of dogs or cats or any other species.

Question 11:

What could be the reasons for adopting contraceptive methods?

Answer 11:

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 prevent the transfer of sexually transmitted diseases.