



केन्द्रीय विद्यालय संगठन
KENDRIYA VIDYALAYA SANGATHAN



क्षेत्रीय कार्यालय रायपुर
REGIONAL OFFICE RAIPUR

अध्ययन सामग्री/STUDY MATERIAL (2022-23)

कक्षा X/CLASS X
विज्ञान / SCIENCE



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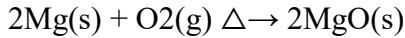
DELETED TOPICS

NAME OF CHAPTER	Page No.	DELETED TOPIC
Chemical SubstancesNature and Behaviour	4-38	-
World of Living	39-63	-
Natural Phenomena	64-71	-
Effects of Current	72-87	-
Periodic Classification (Full Chapter Deleted)		Need for classification, early attempts at classification of elements (Dobereiner's Triads, Newland's Law of Octaves, Mendeleev's Periodic Table), Modern periodic table, gradation in properties, valency, atomic number, metallic and non-metallic properties.
Heredity and Evolution		Basic concepts of evolution: evolution; evolution and classification and evolution should not be equated with progress
The Human Eye and the Colourful World		Application of scattering in explaining colour change of the sun at sunrise and sunset
Magnetic Effects of Current		Electric Motor, Electromagnetic induction. Induced potential difference, Induced current. Fleming's Right Hand Rule, Electric Generator,
Sources of Energy		Different forms of energy, conventional and non-conventional sources of energy: Fossil fuels, solar energy; biogas; wind, water and tidal energy; Nuclear energy. Renewable versus non-renewable sources of Energy.
Management of Natural Resources		(This chapter will not be assessed in the year-end examination. It needs to be prepared only for Internal Assessment.)

Chemical Substances-Nature and Behaviour

Chemical Reaction: In a chemical reaction, a new substance is formed which is completely different in properties from the original substance, so in a chemical reaction, a chemical change takes place.

Example: The burning of magnesium in the air to form magnesium oxide is an example of a chemical reaction.



Before burning in air, the magnesium ribbon is cleaned by rubbing with sandpaper.

This is done to remove the protective layer of basic magnesium carbonate from the surface of the magnesium ribbon.

Characteristics of Chemical Reactions:

Evolution of gas

Change in Colour

Change in state of substance

Change in temperature

Formation of precipitate

Balanced Chemical Equation: A balanced chemical equation has the number of atoms of each element equal on both sides.



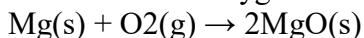
Types of Chemical Reactions:

Chemical reactions can be classified in following types:

Combination Reaction: Reactions in which two or more reactants combine to form one product are called Combination Reactions.

Example:

When magnesium is burnt in the air (oxygen), magnesium oxide is formed. In this reaction, magnesium is combined with oxygen.



Magnesium + Oxygen → Magnesium Oxide

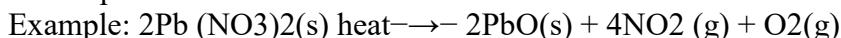
Decomposition Reaction: Reactions in which one compound decomposes in two or more compounds or elements are known as Decomposition Reaction. A decomposition reaction is just the opposite of combination reaction.

Example:

When calcium carbonate is heated, it decomposes into calcium oxide and carbon dioxide. $\text{CaCO}_3\text{(s)} \xrightarrow{\text{heat}} \text{CaO(s)} + \text{CO}_2\text{(g)}$

Calcium carbonate → Calcium oxide + Carbon dioxide

Thermal Decomposition: The decomposition of a substance on heating is known as Thermal Decomposition.



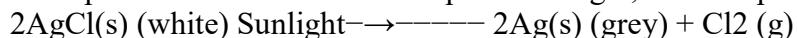
Electrolytic Decomposition: Reactions in which compounds decompose into simpler compounds because of passing of electricity, are known as Electrolytic Decomposition. This is also known as Electrolysis.

Example: When electricity is passed in water, it decomposes into hydrogen and oxygen



Photolysis or Photo Decomposition Reaction: Reactions in which a compound decomposes because of sunlight are known as Photolysis or Photo Decomposition Reaction.

Example: When silver chloride is put in sunlight, it decomposes into silver metal and chlorine gas.



Displacement Reaction: The chemical reaction in which a more reactive element displaces a less reactive element from a compound is known as Displacement Reactions. Displacement reactions are also known as Substitution Reaction or Single Displacement/ replacement reactions.

Example:

When zinc reacts with hydrochloric acid, it gives hydrogen gas and zinc chloride. $\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$

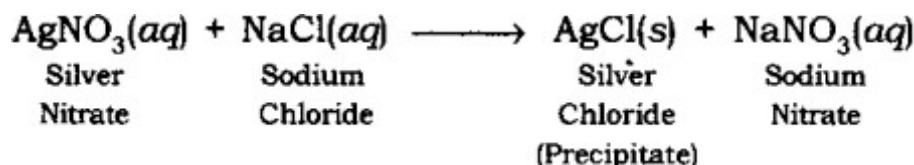
Double Displacement Reaction: Reactions in which ions are exchanged between two reactants forming new compounds are called Double Displacement Reactions.

Example:

When the solution of barium chloride reacts with the solution of sodium sulphate, white precipitate of barium sulphate is formed along with sodium chloride.



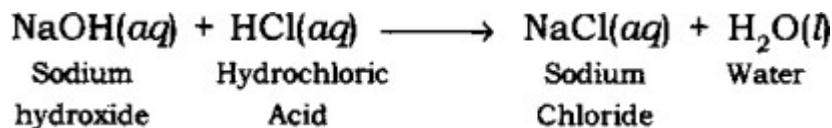
Precipitation Reaction: The reaction in which precipitate is formed by the mixing of the aqueous solution of two salts is called Precipitation Reaction.



Example:

Neutralization Reaction: The reaction in which an acid reacts with a base to form salt and water by an exchange of ions is called Neutralization Reaction.

Example:



Oxidation and Reduction Reactions:

Oxidation: Addition of oxygen or non-metallic element or removal of hydrogen or metallic element from a compound is known as Oxidation.

Elements or compounds in which oxygen or non-metallic element is added or hydrogen or metallic element is removed are called to be oxidized.

Reduction: Addition of hydrogen or metallic element or removal of oxygen or non-metallic element from a compound is called Reduction.

The compound or element which goes under reduction is called to be reduced. Oxidation and Reduction take place together.

Oxidizing agent:

The substance which gives oxygen for oxidation is called an Oxidizing agent.

The substance which removes hydrogen is also called an Oxidizing agent.

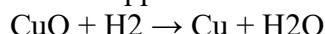
Reducing agent:

The substance which gives hydrogen for reduction is called a Reducing agent.

The substance which removes oxygen is also called a Reducing agent.

REDOX REACTIONS: The reaction in which oxidation and reduction both take place simultaneously is called Redox reaction.

When copper oxide is heated with hydrogen, then copper metal and hydrogen are formed.



(i) In this reaction, CuO is changing into Cu. Oxygen is being removed from copper oxide. Removal of oxygen from a substance is called Reduction, so copper oxide is being reduced to copper.

In this reaction, H₂ is changing to H₂O. Oxygen is being added to hydrogen. Addition of oxygen to a substance is called Oxidation, so hydrogen is being oxidized to water.

The substance which gets oxidized is the reducing agent.

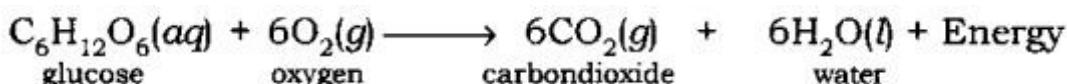
The substance which gets reduced is the oxidizing agent

(vi) **Exothermic and Endothermic Reactions:**

Exothermic Reaction: Reaction which produces energy is called Exothermic Reaction. Most of the decomposition reactions are exothermic.

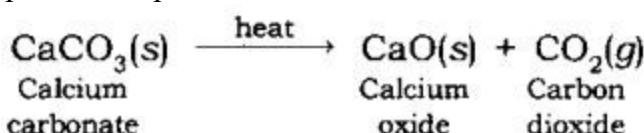
Example:

Respiration is a decomposition reaction in which energy is released.



Endothermic Reaction: A chemical reaction in which heat energy is absorbed is called Endothermic Reaction.

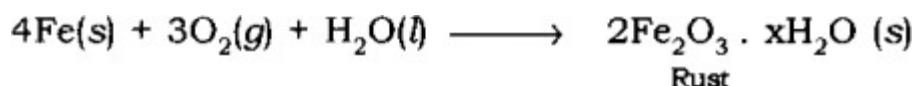
Example: Decomposition of calcium carbonate.



Effects of Oxidation Reactions in Everyday life: Corrosion and Rancidity.

Corrosion: The process of slow conversion of metals into their undesirable compounds due to their reaction with oxygen, water, acids, gases etc. present in the atmosphere is called Corrosion.

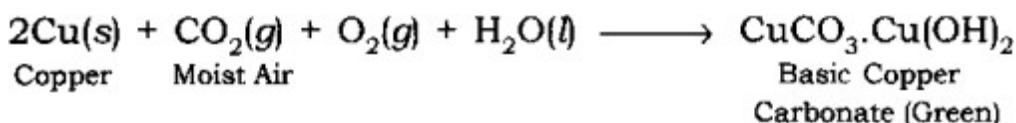
Rusting: Iron when reacts with oxygen and moisture forms red substance which is called Rusting.



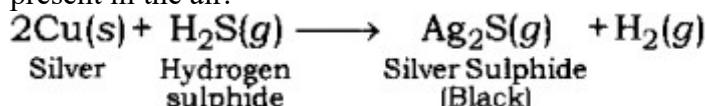
Example: Rusting of iron.

(Hydrated ferric oxide)

Corrosion of Copper: Copper objects lose their lustre and shine after some time because the surface of these objects acquires a green coating of basic copper carbonate, CuCO₃.Cu(OH)₂ when exposed to air.



Corrosion of Silver Metal: The surface of silver metal gets tarnished (becomes dull) on exposure to air, due to the formation of a coating of black silver sulphide (Ag₂S) on its surface by the action of H₂S gas present in the air.



Rancidity: The taste and odour of food materials containing fat and oil changes when they are left exposed to air for a long time. This is called Rancidity. It is caused due to the oxidation of fat and oil present in food materials.

Methods to prevent rancidity:

By adding anti-oxidant.

Vacuum packing.
Replacing air by nitrogen.
Refrigeration of foodstuff.

Practice questions

- Q. Why is it important to balance a skeletal chemical equation?
(a) To verify law of conservation of energy. (b) To verify the law of constant proportion.
(c) To verify the law of conservation of mass. (d) To verify the law of conservation of momentum.
Ans:- (c) To verify the law of conservation of mass.

Q. Give an example of a combination reaction in which heat is produced.

Ans:- $C + O_2 \rightarrow CO_2 + \text{Heat}$

Q. What happens when dilute sulphuric acid is added to iron filling?

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

Ans:- (a) Hydrogen gas and Iron sulphate are produced.

Q. Write the balanced chemical equations for the following chemical reaction:-

- (i) Hydrogen sulphide gas burns in air to give water and sulphur dioxide
(ii) During respiration glucose combines with oxygen and produces carbon dioxide with release of energy.

Ans:- i) $2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

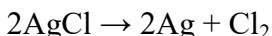
ii) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

Q. Which among the following are physical or chemical changes?

- (a) Evaporation of petrol
(b) Burning of Liquefied Petroleum Gas (LPG)
(c) Heating of an iron rod to red hot.
(d) Sublimation of solid ammonium chloride
Ans:- a) Physical change b) Chemical change c) Chemical change

Q. Why do we store silver chloride in dark coloured bottles?

Ans:- This is because it is decomposed to silver by light .



Q. What happens when a piece of :-

- (a) Zinc metal is added to copper sulphate solution?
(b) aluminium metal is added to dilute hydrochloric acid?
(c) Silver metal is added to copper sulphate solution?

Also, write the balanced chemical equation if the reaction occurs.

Ans:- a) $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

b) $2Al(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq) + 3 H_2$

c) $Ag + CuSO_4(aq) \rightarrow \text{No Reaction}$ (**Ans: silver is less reactive than copper**)

Q. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

- (a) Thermit reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.
(b) Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.

ANS:- a) Thermit reaction, iron (III) oxide reacts with aluminium and gives molten iron and

aluminium oxide.



This is a Single displacement reaction.

b) Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.



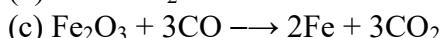
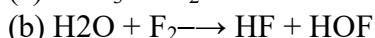
This is a Single displacement reaction.



In above equation out of the two elements X and Y which is more reactive and why?

Ans:- **As X can easily lose electrons as compared to Y and result in the formation of from , thus X is more reactive than Y. As Y is not able to displace X from its salt solution, it is less reactive than X. Thus the answer is X is more reactive than Y.**

Q.Identify the reducing agent in the following reactions :-



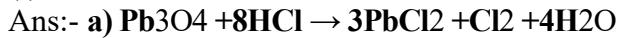
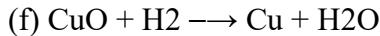
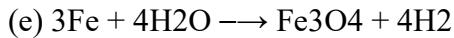
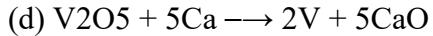
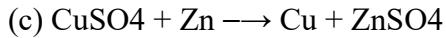
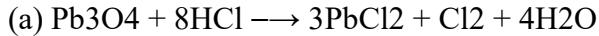
Ans:-a) NH₃ gets oxidized to NO (Removal of hydrogen, addition of oxygen) O₂ gets reduced to H₂O (Addition of hydrogen). Thus, NH₃ acts as reducing agent.

b) F₂ gets reduced to HF (Addition of hydrogen) H₂O gets oxidized to HO_F (Removal of hydrogen) Hence, H₂O acts as reducing agent.

c). Fe₂O₃ gets reduced to Fe (Removal of oxygen) CO gets oxidized to CO₂ (Addition of oxygen) Hence, CO acts as reducing agent.

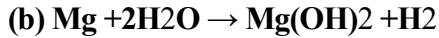
d) H₂ gets oxidized to H₂O (Addition of oxygen) O₂ gets reduced to H₂O (Addition of hydrogen) Hence, H₂ acts as reducing agent.

Q.Identify the oxidising agent (oxidant) in the following reactions :-

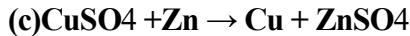


Oxidising agent - Pb₃O₄

Pb₃O₄ gets reduced to PbCl₂ and oxidises HCl to Cl₂



H₂O is an oxidising agent as it oxidises Mg to Mg(OH)₂ (Mg²⁺)



CuSO₄ is an oxidising agent as it oxidises Zn to ZnSO₄



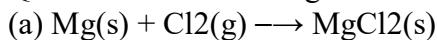
V₂O₅ is a oxidising agent as it oxidises Ca to CaO

e) Fe has been oxidised to Fe₃O₄ whereas H₂O has been reduced to H₂ . Hence, H₂O is the oxidizing agent.

(f) CuO has been reduced to Cu whereas to Cu whereas H₂ whereas H₂ has been oxidised to H₂O.

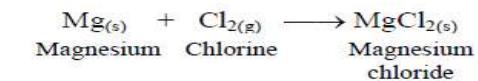
Hence, CuO is the oxidizing agent.

Q.Balance the following chemical equations and identify the type of chemical reaction.

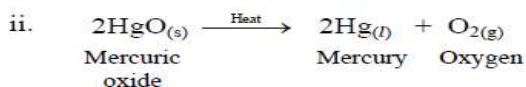


- (b) HgO(s) Heat $\rightarrow \text{Hg(l)} + \text{O}_2(\text{g})$
 (c) $\text{Na(s)} + \text{S(s)} \longrightarrow \text{Na}_2\text{S(s)}$
 (d) $\text{TiCl}_4(\text{l}) + \text{Mg(s)} \longrightarrow \text{Ti(s)} + \text{MgCl}_2(\text{s})$
 (e) $\text{CaO(s)} + \text{SiO}_2(\text{s}) \longrightarrow \text{CaSiO}_3(\text{s})$
 (f) $\text{H}_2\text{O}_2(\text{l}) \xrightarrow{\text{U V}} \text{H}_2\text{O(l)} + \text{O}_2(\text{g})$

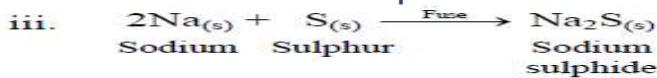
ANS-



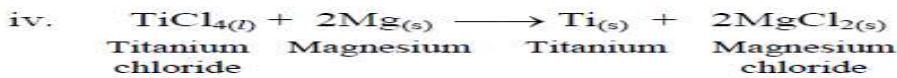
This is a combination reaction.



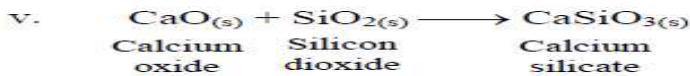
This is a thermal decomposition reaction as well as reduction reaction.



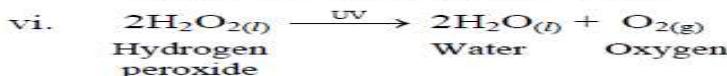
This is a combination reaction.



This is a displacement reaction.



This is a combination reaction.



This is a photochemical decomposition

Q.A solution of a substance X is used for whitewashing.

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

Ans:- i) The substance X is Calcium oxide , CaO

ii) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{heat}$

Q.A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light. If the burning ribbon is now placed in an atmosphere of nitrogen, it continues to burn and forms a compound Y.

(a) Write the chemical formulae of X and Y.

(b) Write a balanced chemical equation, when X is dissolved in water.

Ans:- a) formula of compound X is MgO . Y is magnesium nitride Mg_3N_2

b) If magnesium oxide is dissolved in water it forms magnesium hydroxide. $\text{MgO} + \text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2 + \text{heat}$

Q. On heating blue colour powder of copper(II) in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed

Write a balanced chemical equation of the reaction.

Identify the brown gas X evolved.

Identify the type of reaction.

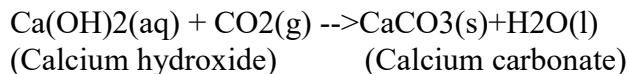
Ans: Ans- On heating blue coloured powder of copper (II) nitrate in a boiling tube, black copper oxide, O_2 and a brown gas X is formed. Hence, it is a Decomposition Reaction. Gas X= NO_2 (Nitrogen dioxide) is

released.

Q22. Read the following paragraph and answer the given questions:-

A solution of slaked lime produced by the reaction is used for whitewashing walls. * Calcium hydroxide reacts slowly with the carbon dioxide in air to form a thin layer of calcium carbonate on the walls - Calcium carbonate is formed after two to three days of whitewashing and gives a shiny finish to the walls, It is interesting to note that the chemical formula for marble is also CaCO₃.

ANS-



(i) What happens when water is added to quick lime?

- (A) It dissolve in water with absorption of heat.
- (B) Calcium and oxygen are produced.
- (C) Heat is produced forming lime water.
- (D) Oxidation of quick lime occurs

Ans:- (C) Heat is produced forming lime water

(ii) Which of the following are exothermic processes

- (A) Reaction of water is quick lime
 - (B) Dilution of an acid
 - (C) Evaporation of water
 - (D) Sublimation of camphor (crystals)
- (a) A and B (b) B and C (c) A and D (d) C and D

Ans :- a) A and B

iii) Which type of reaction takes place in the formation of quick lime?

- (A) Combination reaction
- (B) Decomposition reaction
- (C) Displacement reaction
- (D) Precipitation reaction

Ans:- (A) Combination reaction

iv) What are the different product formed when we heat calcium carbonate?

- (A) Calcium oxide and carbon dioxide
- (B) Calcium oxide and carbon monoxide
- (C) Calcium and carbon dioxide
- (D) Calcium and oxygen

Ans:- A) Calcium oxide and carbon dioxide

v) A substance X is used for testing CO₂. Identify the substance X

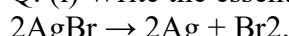
- (A) Quick lime
- (B) Slaked lime
- (C) Calcium carbonate
- (D) None of the above

Ans:- B) Slaked lime

Q. What will happen if the white powder obtained on burning magnesium is dissolved in water, do you think it will change the colour of red litmus paper?

ANS- MgO + H₂O → Mg(OH)₂, yes red litmus turns blue.

Q. (i) Write the essential condition for the following reaction:



Write one application of this reaction.

(ii) In which of the following, the identity of initial substance remains unchanged?

- (a) Curdling of milk
 - (b) Formation of crystals by process of crystallisation
 - (c) Fermentation of grapes
 - (d) Digestion of food
- (iii) What happens when water is added to quicklime? Write the chemical equation

Ans:- (i) $2\text{AgBr} \rightarrow \text{Sunlight } 2\text{Ag} + \text{Br}_2$

This reaction used in photography

- (ii) (b) Formation of crystals by process of crystallization
- (iii) Slaked lime is formed with hissing sound and lot of heat is evolved

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

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q. Assertion (A) : Decomposition of vegetable matter into compost is an example of exothermic reactions.

1

Reason (R) : Exothermic reaction are those reactions in which heat is evolved.

Ans-a)

Q. Assertion (A): Iron articles are painted so as to prevent them from rusting.

Reason (R): When the surface of iron is coated with paint, its surface does not come in contact with oxygen and moisture therefore rusting does not take place.

Ans- .(a)

Q. Assertion (A): Rusting of iron metal is the most common form of corrosion.

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

Ans- c)

Q.Three beakers labelled as A, B and C each containing 25 ml of water were taken. A small amount of NaOH, anhydrous CuSO₄ and NaCl were added to the beakers A, B and C respectively. It was observed that there was an increase in the temperature of the solution contained in beakers A and B, whereas in case of beaker C, the temperature of the solution falls. Which one of the following statement(s) is (are) correct?

- (i) In beakers A and B, exothermic process has occurred.
- (ii) In beakers A and B, endothermic process has occurred.
- (iii) In beaker C exothermic process has occurred.
- (iv) In beaker C endothermic process has occurred.

(a) (i) only (b) (ii) only (c) (i) and (iv) (d) (iv), (ii) and (iii)

Ans-(c)

Q.We all know that we need energy to stay alive. We get this energy from the food we eat. During digestion, food is broken down into simpler substances. For example, rice, potatoes, and bread contain carbohydrates. These carbohydrates are broken down to form glucose. This glucose combines with oxygen in the cells of our body and provides energy .The special name of this reaction is respiration.

1. Digestion is a:

- (a) Reversible change (b) Physical change(c) endothermic reaction (d) exothermic reaction

Ans.(d)

2. $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy (ATP)}$ this reaction corresponds to:

- (a)displacement reaction (b)addition reaction(c) combination reaction(d)Respiration reaction

Ans-(d)

3. Carbohydrates are:

- (a) Hydrocarbons (b) amino acids (c) mineral acids (d) organic acids

Ans- a

4. Energy released during respiration is transferred as:

- (a) CO₂ (b) H₂O (c) Glucose (d) ATP

Ans -d

5. Which food stuff is rich source of carbohydrates?

- (a) rice (b) lemon juice (c) Milk (d) Mustard seeds

Ans: (a) rice

ACIDS, BASES & SALTS

Ionisable and non-ionisable compounds

An ionisable compound when dissolved in water or in its molten state, dissociates into ions almost entirely.

Example: NaCl, HCl, KOH, etc.

A non-ionisable compound does not dissociate into ions when dissolved in water or in its molten state. Example: glucose, acetone, etc

Acids and Bases

An acid is any hydrogen-containing substance that is capable of donating a proton (hydrogen ion) to another substance. A base is a molecule or ion able to accept a hydrogen ion from an acid. Acidic substances are usually identified by their sour taste.

Arrhenius theory of acids and bases

Arrhenius acid – when dissolved in water, dissociates to give H⁺ (aq) or H₃O⁺ ion.

Arrhenius base – when dissolved in water, dissociates to give OH⁻ ion.

Examples

Acids: Hydrochloric acid (HCl), Sulphuric acid (H₂SO₄), Nitric acid (HNO₃)

Bases: Sodium hydroxide (NaOH), Potassium hydroxide (KOH), Calcium hydroxide (Ca(OH)₂)

Physical test

a. Taste

An acid tastes sour whereas a base tastes bitter.

The method of taste is not advised as an acid or a base could be contaminated or corrosive.

Example: The taste of curd, lemon juice, orange juice, and vinegar are all sour. Because they contain acids,

Baking soda has a bitter taste.

b. Effect on indicators by acids and bases

An indicator is a chemical substance which shows a change in its physical properties, mainly colour or odour when brought in contact with an acid or a base.

Below mentioned are commonly used indicators and the different colours they exhibit:

Indicator	Original colour	Acid	Base
Red Litmus	Red	No Change	Blue
Blue Litmus	Blue	Red	No Change
Turmeric	Yellow	No Change	Reddish Brown
Red Cabbage	Purple	Reddish	Greenish Yellow
Phenolphthalein	Colourless	Colourless	Pink
Methyl Orange	Orange	Red	Yellow
Onion	NA	No Change	Smell Vanish

Vanilla	NA	No Change	Smell Vanish
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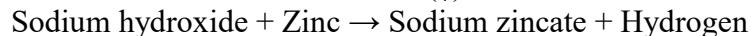
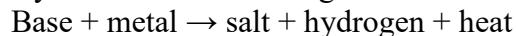
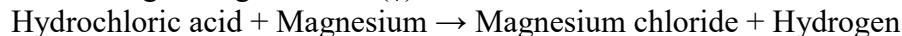
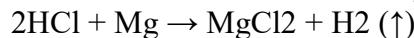
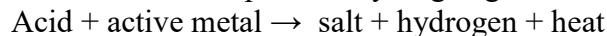
Acid-Base Reactions

A neutralisation reaction occurs when an acid reacts with a base. A salt and water are the end products of this reaction. An acid–base neutralisation reaction is formulated as a double-replacement reaction in this standard approach.

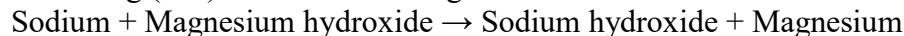
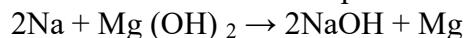
Reactions of acids and bases

a) Reaction of acids and bases with metals

Acids, in general, react with metals to produce salt and hydrogen gas. Bases, in general, do not react with metals and do not produce hydrogen gas.

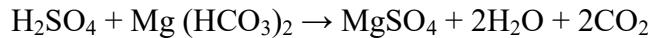
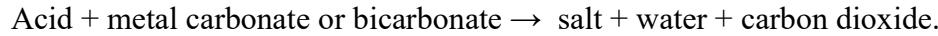


A more reactive metal displaces the less reactive metal from its base.



b) Reaction of acids with metal carbonates and bicarbonates

Acids produce carbon dioxide, as well as metal salts and water, when they react with metal carbonates or metal bicarbonates. Sodium chloride, carbon dioxide, and water are formed when sodium carbonate interacts with hydrochloric acid. Allowing carbon dioxide gas to travel through lime water turns it milky.

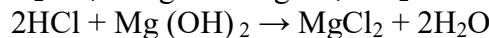
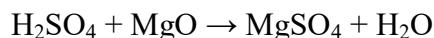


Effervescence indicates liberation of CO_2 gas.

c) Reaction of Acid with Base

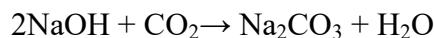
1. Reaction of metal oxides and hydroxides with acids

Metal oxides or metal hydroxides are basic in nature.



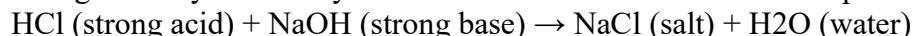
2. Reaction of non-metal oxides with bases

Non-metal oxides are acidic in nature



3. Reaction of acids and base

A very common acid is hydrochloric acid. The reaction between strong acid says hydrochloric acid and strong base say sodium hydroxide forms salt and water. The complete chemical equation is shown below.



Acids and bases in water

When added to water, acids and bases dissociate into their respective ions and help in conducting electricity.

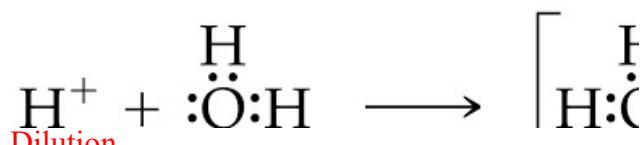
Difference between a base and an alkali

Base: Bases undergo neutralisation reaction with acids. They are comprised of metal oxides, metal hydroxides, metal carbonates and metal bicarbonates. Most of them are insoluble in water.

Alkali: An alkali is an aqueous solution of a base, (mainly metallic hydroxides). It dissolves in water and dissociates to give OH^- ion. All alkalis are bases, but not all bases are alkalis.

Hydronium ion

Hydronium ion is formed when a hydrogen ion accepts a lone pair of electrons from the oxygen atom of a water molecule, forming a coordinate covalent bond.



Dilution

Dilution is the process of reducing the concentration of a solution by adding more solvent (usually water) to it.

It is a highly exothermic process.

To dilute acid, the acid must be added to water and not the other way round.

Strength of acids and bases

Strong acid or base: When all molecules of a given amount of an acid or a base dissociate completely in water to furnish their respective ions, $\text{H}^+(\text{aq})$ for acid and $\text{OH}^-(\text{aq})$ for base).

Weak acid or base: When only a few of the molecules of a given amount of an acid or a base dissociate in water to furnish their respective ions, $\text{H}^+(\text{aq})$ for acid and $\text{OH}^-(\text{aq})$ for base).

Universal indicator

A universal indicator has a pH range from 0 to 14 that indicates the acidity or alkalinity of a solution.

A neutral solution has $\text{pH}=7$

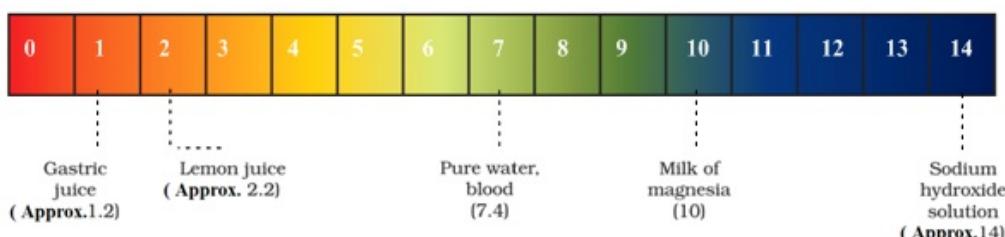
pH :

The pH of pure water is 7.

The pH scale ranges from 0 to 14.

If $\text{pH} < 7 \rightarrow$ acidic solution

If $\text{pH} > 7 \rightarrow$ basic solution



Salts

A salt is a combination of an anion of an acid and a cation of a base.

Examples – KCl , NaNO_3 , CaSO_4 , etc.

Salts are usually prepared by the neutralisation reaction of an acid and a base.

Common salt

Sodium Chloride (NaCl) is referred to as common salt because it's used all over the world for cooking.

Family of salts

Salts having the same cation or anion belong to the same family. For example, NaCl , KCl , LiCl .

pH of salts

A salt of a strong acid and a strong base will be neutral in nature. $\text{pH} = 7$ (approx.).

A salt of a weak acid and a strong base will be basic in nature. $\text{pH} > 7$.

A salt of a strong acid and a weak base will be acidic in nature. $\text{pH} < 7$.

The pH of a salt of a weak acid and a weak base is determined by conducting a pH test.

Chemicals from common salt

Sodium chloride is a common salt. NaCl is its molecular formula. The fundamental element in our meals is sodium chloride. It is used in our food as a flavour enhancer as well as a preservative
From common salt, we may make the following four compounds.

- 1.Sodium hydroxide or lye or caustic soda.2.Baking soda or sodium hydrogen carbonate or sodium bicarbonate 3.Washing soda or sodium carbonate decahydrate 4.Bleaching powder or calcium hypochlorite

Preparation of Sodium hydroxide

The strong base sodium hydroxide is a common and useful one. Preparing a solution of sodium hydroxide (NaOH) in water requires extra caution because the exothermic reaction releases a lot of heat. It's possible that the solution will spatter or boil. Here's how to manufacture a sodium hydroxide solution safely, as well as recipes for a variety of NaOH strengths.

Chemical formula – NaOH (Also known as – caustic soda)

Preparation (Chlor-alkali process):

Electrolysis of brine (solution of common salt, NaCl) is carried out.

At anode: Cl₂ is released At cathode: H₂ is released

Sodium hydroxide remains in the solution.

Bleaching powder

Bleaching powder is soluble in water and is used as a bleaching agent in t an oxidizing agent and a disinfectant in many industries. It should also be synthesized by the reacting chlorine gas on dry slaked lime i.e. Ca(OH)₂.

Chemical formula – Ca(OCl)Cl or CaOCl₂

Preparation – Ca(OH)₂(aq)+Cl₂(g)→CaOCl₂(aq)+H₂O(l)

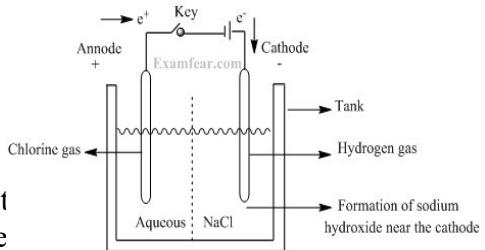
On interaction with water – bleaching powder releases chlorine which is responsible for bleaching action.

Uses of Bleaching Powder

It is used for bleaching dirty clothes in the laundry, as a bleaching agent for cotton and linen in the textile industry.

It is a strong oxidizing agent, hence used as an oxidizer in many industries.

It is used as a disinfectant which is used for disinfecting water to make potable water.



Practice questions

Q. What is brine?

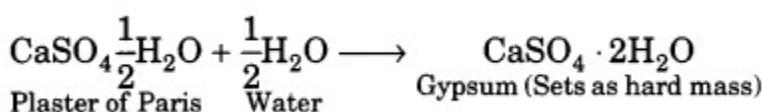
Ans-Brine, salt water, particularly a highly concentrated water solution of common salt (sodium chloride).

Q. Give two important uses of washing soda.

Ans:Two important uses of washing soda are; It is used in the manufacture of soap and glass. It is used to remove the permanent hardness of water.

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

Ans:



Q. What do you understand by neutralization reaction. Give one example.

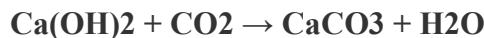
Ans: Neutralization reaction: Neutralization is a type of chemical reaction in which an acid reacts with a base to form salt and water. Example: 1. Reaction between hydrochloric acid(HCl) and sodium hydroxide(NaOH) Hydrochloric acid reacts with sodium hydroxide to produce their salt sodium chloride(NaCl) and water.

Q. Why does an aqueous solution of an acid conduct electricity?

Ans:In an aqueous solution, acids dissociate to produce ions. These ions are responsible for the conduction of electricity.

Q.What is observed when carbon di oxide gas is passed through lime water

Ans:When carbon dioxide gas is passed through lime water, it turns milky or turbid due to the formation of calcium carbonate which is insoluble in water. Following is the chemical equation for the reaction



However, when excess of carbon dioxide is passed through the solution, the turbidity disappears and a clear solution is obtained due to the formation of calcium bicarbonate, which is soluble in water.

Following is the chemical equation for the reaction



Q. What are strong and weak acids? Separate strong and weak acids from the following list-

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

Ans:Strong acid is an acid that ionizes completely in aqueous solution. It always loses a proton (H^+) when dissolved in water. Weak acid is an acid that ionizes partially in a solution. It gives off only a few of its (H^+) atoms when dissolved in water.

Strong acid- Hydrochloric acid, sulphuric acid, nitric acid

Weak acid- formic acid, acetic acid, Citric acid

Q.Name the acids present in ant stings and give its chemical formulae. Also give common methods to get relief from the discomfort caused by the ant sting.

Ans:Formic acid (HCOOH) acid present in the ant sting. Rubbing baking soda and applying Calamine solution are common method to get relief from the discomfort caused by the ant sting.

Q.A dry pellet of a common base B, when kept in open absorbs moisture and turns sticky. The compound is also a by-product of chloralkali process. Identify B. What type of reaction occurs when B is treated with an acidic oxide? Write a balanced chemical equation for one such solution.

Ans-

The brine solution is electrolyzed during the chloralkali process. Brine is a sodium chloride solution in water. Brine solution decomposes into hydrogen gas, chlorine gas, and sodium hydroxide during electrolysis.
$$2\text{NaCl(aq)Sodium chloride} + 2\text{H}_2\text{O(l)Water} \rightarrow 2\text{NaOH(aq)Sodium hydroxide} + \text{H}_2\text{(g)Hydrogen} + \text{Cl}_2\text{(g) Chlorine}$$

The chloralkali process produces sodium hydroxide as a byproduct. It collects moisture and becomes sticky when left out in the open.

When sodium hydroxide is combined with carbon dioxide, sodium carbonate is formed. It is important to keep in mind that carbon dioxide is an acidic gas.



Q. During summer season, a milkman usually adds a small amount of baking soda to fresh milk. Give reason.

Ans:A milkman adds a very small amount of baking soda so as to prevent spoilage of milk. It leads to change in the pH which does not allow bacteria and enzymes to act and milk does not become sour due to fermentation.

Q.A stain of curry on a white cloth becomes raddish – brown when soap is scrubbed on it.

Which indicator can be used here? What type of indicator is it ?

Why did the stain becomes raddish – brown when soap is scrubbed on it ?

What happens when the cloth is washed with plenty of water ?

ANS- (i) turmeric indicator

(ii) Soap is base so turmeric gives raddish brown color in basic medium

(iii) When cloth is washed in plenty water ,the stain turns yellow.

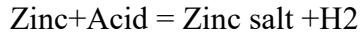
Q.A cloth ‘strip dipped in onion juice is used for testing a liquid ‘X. The liquid ‘X changes its odor. Which type of an indicator is onion juice? The liquid ‘X turns blue litmus red. List the observations the liquid ‘X will show on reacting with the following :

- (a) Zinc granules
- (b) Solid sodium carbonate

Write the chemical equations for the reactions involved.

Ans- Olfactory indicator

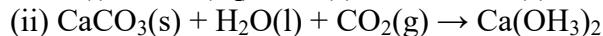
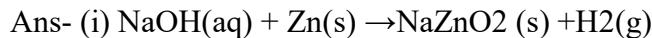
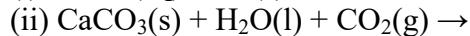
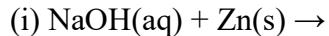
(a) Colorless and odourless gas is evolved with bubbles-



(b) Brisk effervescence /colorless and odourless gas evolved.



Q.Complete and balance the following chemical equations :



Q.To a solution of sodium hydroxide in a test tube, two drops of phenolphthalein are added.

(i) State the colour change observed.

(ii) If dil HCl is added dropwise to the solution, what will be the colour change?

(iii) On adding few drops of NaOH solution to the above mixture the colour of the solution reappears. Why?

Ans-(i) **When few drops of phenolphthalein are added to a dilute solution of sodium hydroxide a pink colour is produced.**

(ii) **It turns colourless**

sodium hydroxide, NaOH is a strong basic in nature. so, when few drops of phenolphthalein is added to sodium hydroxide, solution turns deep pink. (iii) if few drops of NaOH is added to again to the solution, solution becomes basic in nature and hence, pink colour of Phenolphthalein reappears.

Q. Five solutions A,B,C,D and E when tested with universal showed pH as 4,1,11 ,7 and 9 respectively.

Which solutions is-

(a) Neutral ? (b) strongly alkaline ? (c) strongly acidic (d) weakly acidic (e) weakly alkaline

(f) arrange the pH in increasing order of hydrogen ion concentration .

Ans- Solution

$\text{pH} \uparrow [\text{H}^+] \text{conc.} \downarrow$
 $[\text{H}^+] \text{conc.} \uparrow \text{Acid Strength} \uparrow$

B→ Strongly Acidic

A→ Weakly Acidic

D→ Neutral [pH=7]

E→ Weakly Alkaline

C→ Strongly Alkaline

So, $[\text{H}^+] \text{conc. is } \text{B} > \text{A} > \text{D} > \text{E} > \text{C}$

Q. Out of HCl and CH₃COOH , which one is weak acid and why?

HCl, being a strong acid 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 CH₃COOH is a weak acid. It does not dissociate into ions completely in solution.

Q.. The pH and hydrogen ion concentration of some solutions

H ⁺ concentration (moles)	pH	Soluton
10⁻¹	1	
10⁻²	2	Lemon juice
10⁻³	3	Vinegar
10⁻⁴	4	Tomato juice
10⁻⁵	5	Rain water
10⁻⁶	6	Urine
10⁻⁷	7	Pure water
10⁻⁸	8	Sea water
10⁻⁹	9	Baking soda
10⁻¹⁰	10	
10⁻¹¹	11	Milk of magnesia
10⁻¹²	12	House hold bleach
10⁻¹³	13	Oven cleaner
10⁻¹⁴	14	

How is the hydrogen ion concentration and pH related to each other.

On the basis of above table , arrange the following in the decreasing order of H⁺ concentration .

Pure water, tomato juice , milk of magnesia , sea water

A solution of pH 2 is fill in two separate beaker and few drops of methyl orange and phenolphthalein are added into separate solution. How will the color of the indicators change?

Ans- (i) pH is inversely proportional to the hydrogen ion concentration.

(i) The decreasing order of H⁺ concentration is

Tomato juice > Pure water > Sea water > Milk of magnesia

(iii) The solution of pH 2 is acidic in nature. So, the colour change is

Methyl orange: red; phenolphthalein: colourless

Q.pH is quite useful to us in a number of ways in daily life. Some of its applications are:
 Control of pH of the soil : Plants need a specific pH range for proper growth. The soil may be acidic, basic or neutral depending upon the relative concentration of H⁺ and OH⁻. The pH of any soil can be determined by using pH paper. If the soil is too acidic, it can be corrected by adding lime to it. If the soil is too basic, it can be corrected by adding organic manure which contains acidic materials.
 Regaining shine of a tarnished copper vessel by use of acids : A copper vessel gets tarnished due to formation of an oxide layer on its surface. On rubbing lenion on the vessel, the surface is cleaned and the vessel begins to shine again. This is due to the fact that copper oxide is basic in nature, which reacts with the acid (citric acid) present in lemon to form a salt (copper citrate) which is washed away with water. As a result, the layer of copper oxide is removed from the surface of the vessel and the shining surface is exposed.
 Self-defence by animals through chemical warfare : Stings of bees and ants contain methanoic acid. When stung, it causes lot of pain and irritation. This can be cured by rubbing the affected area with mild base like baking soda.

- (i) When black copper oxide placed in a beaker is treated with dilute HCl, its colour changes to
(a) white (b) dark red
(c) bluish green (d) no change.

Ans-C

ii) P is an aqueous solution of acid and Q is an aqueous solution of base. When these two are diluted separately, then

- (a) pH of P increases while that of Q decreases till neutralisation.
(b) pH of P decreases while that of Q increases till neutralisation.
(C) pH of both P and Q decrease.
(d) pH of both P and Q increase.

Ans-A

(iii) Which of the following acids is present in bee sting?

- (a) Formic acid
(b) Acetic acid
(c) Citric acid
(d) Hydrochloric acid

Ans-C

(iv) Sting of ant can be cured by rubbing the affected area with soap because

- (a) it contains oxalic acid which neutralises the effect of formic acid.
(b) it contains aluminium hydroxide which neutralises the effect of formic acid
(c) it contains sodium hydroxide which neutralises the effect of formic acid
(d) none of these

Ans- C

Q. Read the following passage and answer the questions given :-

An indicator is special chemical that changes its colour to indicate the presence of a chemical substance. It is used to confirm the presence of an acid, a base or a neutral solution. Indicators show different colours in acidic and basic medium. These are dyes or mixture of dyes which are used to indicate the presence of acid and bases. Some examples are litmus solutions, methyl orange, phenolphthalein and universal indicator. There are some substances whose odour changes in acidic or basic medium. These are called olfactory indicators. Onion and vanilla extract are examples of such indicators.

(i) What are indicators? What is the use of any indicator?

(ii) What are olfactory indicators? Give two examples.

Ans- (i) An indicator is special chemical that changes its colour to indicate the presence of a chemical substance.

(ii) There are some substances whose odour changes in acidic or basic medium. These are called olfactory indicators. Onion and vanilla extract are examples of such indicators.

Q. Read the following passage and answer the questions given :-

The primary reason behind the toxic foam is high phosphate content in the waste water because of detergents used in dying industries, dhobi ghat and house holds. Yamuna's pollution level is so bad that parts of it having labelled dead as there is no oxygen in it or aquatic life to survive.

(i) Predict the pH value of the water of river Yamuna if the reason for froth is high content of detergents dissolved in it.

10-11

5-7

2-5

7

The table provides the pH value of four solutions P, Q, R and S



Solutions	pH value
P	2
Q	9
R	5
S	11

Which of the following correctly represents the solutions in increasing order of their hydronium ion concentration ?

P>Q>R>S

P>S>Q>R

S<Q<R<P

S<P<Q<R

High content of phosphate ion in river Yamuna may lead to

Decreased level of dissolved oxygen and increased growth of algae

Decreased level of dissolved oxygen and no effect on growth of algae

Increased level of dissolved oxygen and increased growth of algae

Decreased level of dissolved oxygen and decreased growth of algae

(i) Detergents being basic increase the pH of water above 7.

(ii) (b) Detergents are basic in nature. So, it has high concentration of hydroxide ion (OH^-) and low concentration of hydronium ion (H_3O^+)

(iii)(c); Higher the pH, lower is the hydronium ion concentration.

(iv) (a); Phosphate ion increases the growth of algae which ultimately decrease the level of dissolved oxygen.

Q. Read the following passage and answer the questions given :-

Salts having the same positive or negative radicals are said to belong to a family. For example, NaCl and Na₂SO₄ belong to the family of sodium salts. Similarly, NaCl and KCl belong to the family of chloride salts. Salts of a strong acid and a strong base are neutral with pH value of 7. On the other hand, salts of a strong acid and weak base are acidic with pH value less than 7 and those of a strong base and weak acid are basic in nature, with pH value more than 7.

(i) Identify the basic salt from the following salts.

(a) Na₂CO₃ (b) NH₄Cl (c) NaNO₃ (d) KCl

(ii) Salts of strong base and weak acids are having pH value –

(a) less than 7 (b) more than 7 (c) equal to 7 (d) none of these

(iii) NaCl and Na₂SO₄ belong to _____ salt family.

(a) Chloride (b) Sodium (c) Sulphate (d) Hydrogen

METALS AND NON METALS

Physical Properties of Metals

- Hard and have a high tensile strength – Carbon is the only non metal with very high tensile strength.
 - Solid at room temperature – One non-metal, bromine, is a liquid at room temperature. The other non-metals are solids at room temperature, including carbon and sulfur.
 - Sonorous – Metals produce a typical ringing sound when hit by something.
 - Good conductors of heat and electricity – Graphite is good conductor of heat and electricity.
- Malleable, i.e., can be beaten into thin sheets
- Ductile, i.e., can be drawn into thin wires
- High melting and boiling points (except Caesium (Cs) and Gallium (Ga)) – Graphite, a form of carbon (a non-metal), has a high boiling point and exists in the solid state at room temperature.
 - Dense, (except alkali metals). Osmium – highest density and lithium – least density
 - Lustrous – Metals have the quality of reflecting light from their surface and can be polished e.g., gold, silver and copper. Iodine and carbon are non-metals which are lustrous. Note that carbon is lustrous only in certain forms like diamond , and graphite.
 - Silver-grey in colour, (except gold and copper) – Metals usually have a silver or grey colour.

Physical Properties of Non-metals

Occur as solids, liquids and gases at room temperature

Brittle

Non-malleable

Non-ductile

Non-sonorous

Bad conductors of heat and electricity

Chemical Properties of Metals

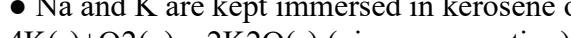
- Alkali metals (Li, Na, K, etc) react vigorously with water and oxygen or air.
- Mg reacts with hot water.
- Al, Fe and Zn react with steam.
- Cu, Ag, Pt, Au do not react with water or dilute acids.

Reaction of Metals with Oxygen (Burnt in Air)

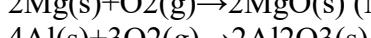
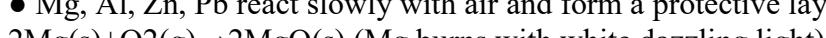
Metal oxide is formed when metals are burned in air and react with oxygen in the air. Metal oxides are a type of basic material found in nature.

Metal + Oxygen → Metal oxide (basic)

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



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



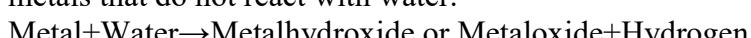
- Silver, platinum and gold don't burn or react with air.

Reactivity Series

The reactivity series of metals, also known as the activity series, refers to the arrangement of metals in the descending order of their reactivities.

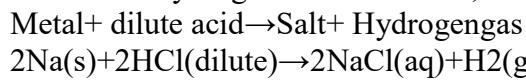
Reaction of Metals with Water or Steam

Aluminium, iron, and zinc are metals that do not react with either cold or hot water. However, when they come into contact with steam, they produce metal oxide and hydrogen. Lead, copper, silver, and gold are metals that do not react with water.



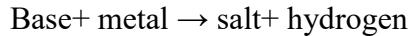
Reaction of Metals with Acid

When a metal is immersed in acid, it becomes smaller and smaller as the chemical process consumes it. Gas bubbles can also be detected at the same moment. Hydrogen gas bubbles are formed as a result of the reaction. Because hydrogen is combustible, this can be demonstrated with a burning splint.



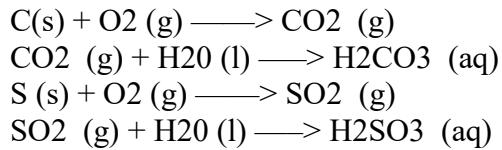
Reaction of Metals with Bases

The base has a bitter taste and a slippery texture. A base dissolved in water is called an alkali. When chemically reacting with acids, such compounds produce salts. Bases are known to turn blue on red litmus paper.



Reaction Of Non-Metals with Oxygen

Non-Metals react with oxygen to form acidic oxides or neutral oxides. Carbon form an acidic oxide carbon dioxide. Sulphur form an acidic oxide sulphur dioxide. Hydrogen form a neutral oxide water. The acidic oxides of non-metals turn blue litmus solution to red.



Reaction of non-metal with water

They do not react with water to evolve hydrogen gas.

Reaction of non-metals with acids

They do not react with dilute acids. They do not displace hydrogen from acids.

Reaction of Non-metals with salt solution

A more reactive non-metal displaces a less reactive non-metal from its salt solution.

Reaction of Non-metal with chlorine

Non-Metals react with chlorine to form covalent chlorides which are non-electrolytes.

Reaction of Non-metals with hydrogen

Non-Metals react with hydrogen to form covalent hydrides.

Extraction of metals

Thermite reaction: $\text{Al(s)} + \text{Fe}_2\text{O}_3\text{(s)} \rightarrow \text{Al}_2\text{O}_3 + \text{Fe(molten)}$

The thermite reaction is used in welding of railway tracks, cracked machine parts, etc.

Occurrence of Metals

Most of the elements, especially metals occur in nature in the combined state with other elements. All these compounds of metals are known as minerals. But out of them, only a few are viable sources of that metal.

Such sources are called ores.

Au, Pt – exist in the native or free state.

Metals of high reactivity – Na, K, Mg, Al.

Metals of medium reactivity – Fe, Zn, Pb, Sn.

Metals of low reactivity – Cu, Ag, Hg

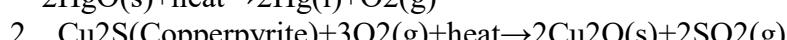
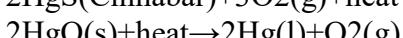
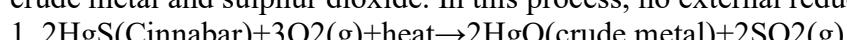
Enrichment of Ores

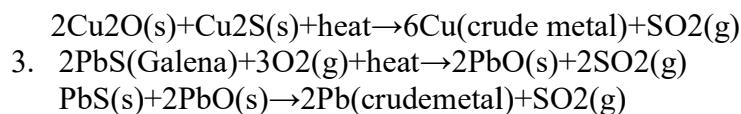
It means the removal of impurities or gangue from ore, through various physical and chemical processes.

The technique used for a particular ore depends on the difference in the properties of the ore and the gangue.

Extracting Metals Low in Reactivity Series

By self-reduction- when the sulphide ores of less electropositive metals like Hg, Pb, Cu etc., are heated in air, a part of the ore gets converted to oxide which then reacts with the remaining sulphide ore to give the crude metal and sulphur dioxide. In this process, no external reducing agent is used.





Extracting Metals in the Middle of Reactivity Series

Calcination is a process in which ore is heated in the absence of air or air might be supplied in limited quantity. Roasting involves heating of ore lower than its melting point in the presence of air or oxygen. Calcination involves thermal decomposition of carbonate ores.

Smelting – it involves heating the roasted or calcined ore (metal oxide) to a high temperature with a suitable reducing agent. The crude metal is obtained in its molten state.

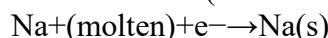


Extraction of Metals Towards the Top of the Reactivity Series

Electrolytic reduction:

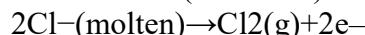
Down's process: Molten NaCl is electrolysed in a special apparatus.

At the cathode (reduction):



Metal is deposited.

At the anode (oxidation):



Chlorine gas is liberated.

The metals at the top of the reactivity series are highly reactive. They cannot be obtained from their compounds by heating with carbon, because these metals have more affinity for oxygen than carbon. Hence, for the extraction of such metals electrolytic reduction method is used.

Refining of Metals

Refining of metals – removing impurities or gangue from crude metal. It is the last step in metallurgy and is based on the difference between the properties of metal and the gangue.

Electrolytic Refining

Metals like copper, zinc, nickel, silver, tin, gold etc., are refined electrolytically.

Anode: impure or crude metal

Cathode: a thin strip of pure metal

Electrolyte: aqueous solution of metal salt

From anode (oxidation): metal ions are released into the solution

At cathode (reduction): the equivalent amount of metal from solution is deposited

Impurities deposit at the bottom of the anode.

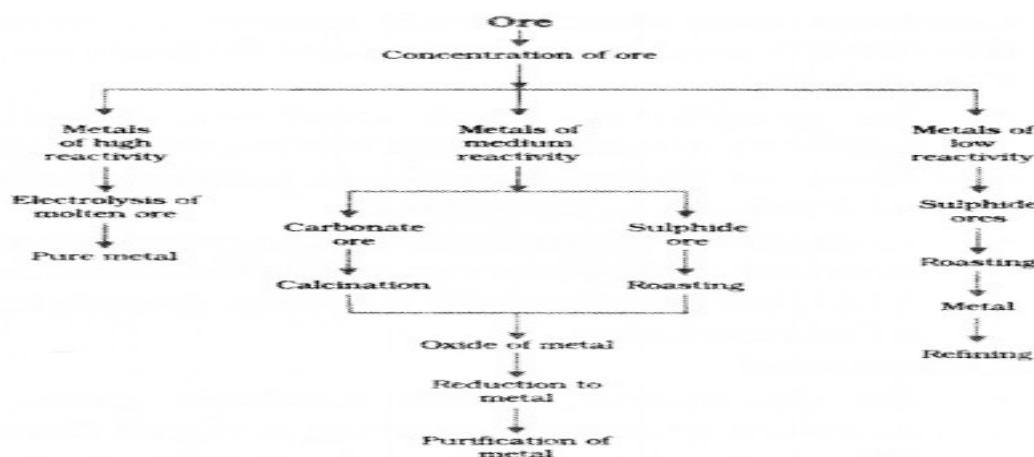


Figure: Steps involved in the extraction of metals from ores

How Do Metals and Nonmetals React

Metals lose valence electron(s) and form cations.

Non-metals gain those electrons in their valence shell and form anions.

The cation and the anion are attracted to each other by strong electrostatic force, thus forming an ionic bond.

For example: In calcium chloride, the ionic bond is formed by opposite charged calcium and chloride ions.

Calcium atom loses 2 electrons and attains the electronic configuration of the nearest noble gas (Ar). By doing so, it gains a net charge of +2. The two Chlorine atoms take one electron each, thus gaining a charge of -1 (each) and attain the electronic configuration of the nearest noble gas (Ar).

Ionic Compounds

Ionic compounds are neutral compounds that are made up of positively charged cations and negatively charged anions. Binary ionic compounds (ionic compounds containing only two types of elements) are named by first writing the name of the cation, then the name of the anion.

The electrostatic attractions between the opposite charged ions hold the compound together.

Example: MgCl₂, CaO, MgO, NaCl etc.

Properties of Ionic Compound

Ionic compounds

Are usually crystalline solids (made of ions).

Have high melting and boiling points.

Conduct electricity when in aqueous solution and when melted.

Are mostly soluble in water and polar solvents.

Alloys

Alloys are homogeneous mixtures of metal with other metals or nonmetals. Alloy formation enhances the desirable properties of the material, such as hardness, tensile strength and resistance to corrosion.

Examples of a few alloys:

Brass: copper and zinc

Bronze: copper and tin

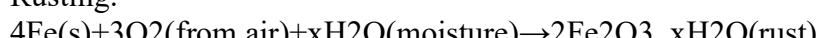
Solder: lead and tin

Amalgam: mercury and other metal

Corrosion

Gradual deterioration of material usually a metal by the action of moisture, air or chemicals in the surrounding environment.

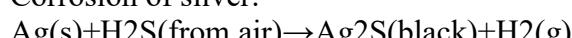
Rusting:



Corrosion of copper:



Corrosion of silver:



Prevention of Corrosion

1. Coating with paints or oil or grease: Application of paint or oil or grease on metal surfaces keep out air and moisture.

2. Alloving: Alloyed metal is more resistant to corrosion. Example: stainless steel.

3. Galvanization: This is a process of coating molten zinc on iron articles. Zinc forms a protective layer and prevents corrosion.

4. Electroplating: It is a method of coating one metal with another by the use of electric current. This method not only lends protection but also enhances the metallic appearance.

Example: silver plating, nickel plating.

5. Sacrificial protection: Magnesium is more reactive than iron. When it is coated on the articles made of iron or steel, it acts as the cathode, undergoes reaction (sacrifice) instead of iron and protects the articles.

Practice questions

Q. Name the non-metal which is lustrous?

Ans Iodine

Q. What is meant by Calcination?

Ans-The carbonate ores are changed into oxides by heating strongly in limited air. This process is known as calcination.

Q. What do you understand by the term Corrosion?

Ans- Corrosion is the deterioration of a material

Q. What is metallurgy?

Ans The extraction of metals from their ores and then refining them for use is known as metallurgy



Name the type of reaction shown in the given chemical equation?

Ans- Reduction

Q. Arrange the following in the increasing order of reactivity.

Mg, K, Al, Cu

Ans- Cu, Al, Mg ,K

Q. Why metals are generally used for making cooking utensils?

Ans- Good conductor of heat

Q. A student used a hammer, beat two objects a) Wooden table b) Steel plate. What do you observe in this case?

Ans- Steel plate – Ringing sound

Q. It is said that Al utensils should not be used for cooking as it is toxic for our health. Still we use them but it does not cause any harm to us. Why?

Ans- Al oxide coat is formed over Al

Q. Mg ribbon is burnt then you get ashes, if we dissolve it in water and dip litmus paper. What will we observe?

Ans- Red litmus converts to Blue

Q.Why carbon is not used for extraction of Al from its ore? Which method is used to obtain Al?

Ans- Because carbon has less affinity for Al.

Electrolytic reduction

Q. Why hydrogen gas is not evolved when a metal reacts with HNO_3 ?

Ans- Because HNO_3 is strong oxidizing agent

Q.What will be the electronic configuration of Na atom if we remove one electron from its outermost shell?

Ans-2,8

Q. In the earth's crust, metals are present in the form of minerals and there are more than one mineral for a particular metal. However, metal may not be extracted from all of them. Why?

Ans- Because it is not profitable to extract

Q. A student has taken NaCl in two forms a) Powdered NaCl b) NaCl solution. In which case will the electricity be conducted and why?

Ans- NaCl solution because of movement of electrons

Q. What would you observe when two metals namely Zn and Cu is added in two test tube containing FeSO₄ solution?

Ans- Zn will displace iron

Q. Draw electron dot structure of the following elements

Cl

S

P

Q. A student put an iron knife kept in blue copper sulphate solution. What will he observe in the above activity. Explain.

Ans- Iron displace Cu from its solution.

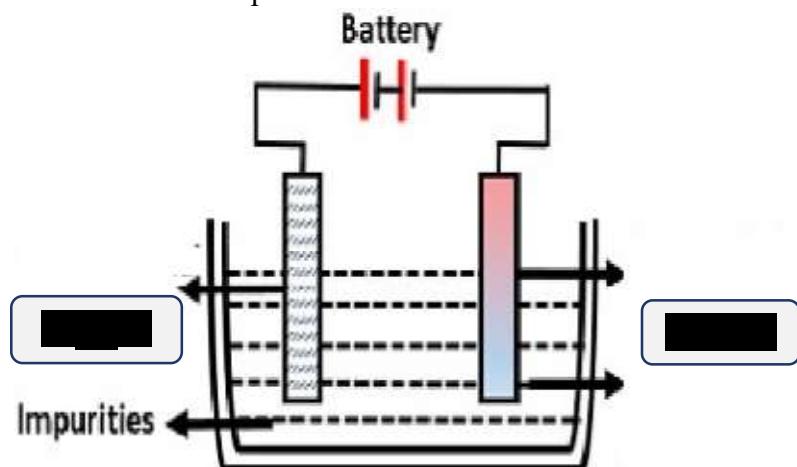
Q. An athlete won a bronze medal in a race competition. After some days, he found that the medal had lost its lustre due to the formation of a greenish layer on it. Name the metals present in the medal. What is the reason for the appearance of a greenish layer on its surface ?

Ans- Cu and Sn, Corrosion

Q. What happens if we bring Na metal in contact of water?

Ans- Catches fire

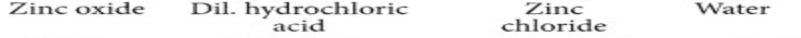
Q. A student set up the following electrolytic refining apparatus in the laboratory. He connected pure Cu strip to cathode and impure Cu strip to anode . After few hours he saw that the set up was not working. What could be the possible causes?



ELECTROLYTIC REFINING

Ans- Because he wrongly placed the anode and cathode rod

Q. Evaluate the nature of Zinc oxide from the following given reactions.



Ans- Amphoteric in nature

Q. Two students set up an electric circuit in the lab. One of them used Cu connecting wires and another students used alloy of Cu and Sn as connecting wires. Whose circuit will work more efficiently and why?

Ans- Alloys is poor conductor of electricity. Cu wire circuit will work more efficiently

Q. A metal 'X' combines with a non-metal 'Y' by the transfer of electrons to form a compound Z.

(I) State the type of bond in compoundZ.

(ii) What can you say about the melting point and boiling point of compound Z?

(iii) Will this compound dissolve in kerosene or petrol?

Ans -i) Ionic bond

ii) High M.P and B.P

No

Q.Which of the following are not ionic compounds?

KCl (ii)HCl (iii)CCl₄ (iv)NaCl

(a) (i) and (ii)

(b) (ii) and (iii)

(c) (iii) and (iv)

(d) (i) and (iii)

Ans- B

Q.(i)Identify the oxides from the following which turn blue litmus into red.

CO₂, Na₂O, CaO, SO₂, NO₂.

(ii)What is the nature of these oxides ?

Ans- CO₂, SO₂, NO₂. – Acidic oxides

Q. Metallic compound A reacts with dilute hydrochloric acid to produce effervescence and a gas B. The gas B extinguishes a burning candle and also turns lime water milky. Identify A and B. Write balanced chemical equations for the reactions involved.

Ans- NaHCO₃ – A

CO₂ – B

Q.Alloying is a very good method of improving the properties of a metal. We can get the desired properties by this method. For example, iron is the most widely used metal. But it is never used in its pure state. This is because pure iron is very soft and stretches easily when hot. But, if it is mixed with a small amount of carbon (about 0.05 %), it becomes hard and strong. When iron is mixed with nickel and chromium, we get stainless steel, which is hard and does not rust. Thus, if iron is mixed with some other substance, its properties change. In fact, the properties of any metal can be changed if it is mixed with some other substance. The substance added may be a metal or a non-metal.

1. Alloy is Type of mixture.

Homogenous

Heterogenous

Colloid

None of the above

Ans-A

2. If one metal is Mercury then the alloy is known as.....

Brass

Bronze

Amalgam

Steel

Ans-C

3. Name the metal which is mixed with the Gold to make it suitable for making jewellary?

Copper
Silver
Both A and B
Iron
Ans-C

4. An alloy is made by dissolving different elements in any ratio. State whether the statement is True/False

.Metals react with water and produce a metal oxide and hydrogen gas. Metal oxides that are soluble in water dissolve in it to further form metal hydroxide. But all metals do not react with water

Metal + Water → Metal oxide + Hydrogen
Metal oxide + Water → Metal hydroxide

Ans False

5.What happens when calcium is reacts with water?

It does not react with water

It reacts violently with water

It reacts less violently with water

Bubbles of hydrogen gas formed stick to the surface of calcium

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

Ans-D

6. Mg reacts with hot water to form MgO and H₂. Which of the following statements are true?

Mg(OH)₂ turns blue litmus red

H₂ released in the reaction burns with a pop sound

Mg(OH)₂ formed during the reaction floats on the surface of water

Mg also reacts with cold water

A and B

B and C

B, C and D

A, B, C

Ans-B

7. Show the formation of NaCl by transfer of electron. And name the cation and anion formed during the reaction?

Ans - Na⁺ Cl⁻

Q..Different metals show different reactivities towards oxygen. 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. At ordinary temperature, the surfaces of metals such as magnesium, aluminium, zinc, lead, etc., are covered with a thin layer of oxide. Iron does not burn on heating but iron filings burn vigorously when sprinkled in the flame of the burner. Copper does not burn, but the hot metal is coated with a black coloured layer. Silver and gold do not react with oxygen even at high temperatures.

What is the role of thin layer of oxide formed over the surface of Mg.

Iron does not burn on heating but iron filings burn vigorously when sprinkled in the flame of the burner.

Why?

What is the chemical name of the black coloured layer formed over Cu when it is heated?

Ans-A) Prevents the metal from further oxidation.

B) iron fillings when sprinkled in flames attain the ignition temperature (as iron fillings are comparatively smaller particles) and gain larger surface area for the reaction. Therefore they burn vigorously.

C) Copper carbonate

Q. A familiar example of an ionic compound is table salt or sodium chloride. Salt has a high melting point of 800°C. While a salt crystal is an electric insulator, saline solutions (salt dissolved in water) readily conduct electricity. Molten salt is also a conductor. If you examine salt crystals with a magnifying glass, you can observe the regular cubic structure resulting from the crystal lattice. Salt crystals are hard, yet brittle -- it's easy to crush a crystal. Although dissolved salt has a recognizable flavor, you don't smell solid salt because it has a low vapor pressure.

A) Why ionic compounds have high Melting point?

B) Why can't Na accept electrons from Cl to form NaCl?

Suppose if Na donates two electrons to Cl. How will it affect Na ion?

Ans – A) Because ionic bond is very strong

B) Na need to complete its outermost orbital. For Na it is not energy feasible.

C) Stability disturb

Q. The metals in the middle of the activity series such as iron, zinc, lead, copper, etc., are moderately reactive. These are usually present as sulphides or carbonates in nature. It is easier to obtain a metal from its oxide, as compared to its sulphides and carbonates. Therefore, prior to reduction, the metal sulphides and carbonates must be converted into metal oxides.

Suggest a

method of reduction for the following metals during their metallurgical processes:

(i) metal 'A' which is one of the last, second or third position in the reactivity.

(ii) metal 'B' which gives vigorous reaction even with water and air.

(iii) metal 'C' which is kept in the middle of activity series.

Ans-a) Oxidation, by heating its metallic oxide

b) Electrolytic refining

c) Roasting and calcination

Q. Rust is an iron oxide, a usually reddish-brown oxide formed by the reaction of iron and oxygen in the catalytic presence of water or air moisture. It is caused by a chemical reaction that affects masses of iron and steel. Once formed, rust begins to eat away at the metal, forming a flaky, orange-red coating that weakens the iron.



Salty Seaside

Rust can be a big problem in areas near the sea, especially where there is saltwater spray. Salt stays on metal after it has evaporated and makes the rusting process happen faster.

Write a chemical equation for rusting?

Write the measures taken for prevention of rusting?

Why rusting takes place very fast near coastal areas?

Silver articles become black after some time when exposed to air. Why?

Can rusting be also called Corrosion?

Ans- a) $4\text{Fe} + 3\text{O}_2 + 2x\text{H}_2\text{O} \rightarrow 2\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$

b) Galvanisation, Painting, Anodising, Greasing and oiling etc

c) Due to high content of minerals and water which is suitable for rusting

d) Due to corrosion e) Yes, rusting is a type of corrosion

Carbon and its Compounds

Bonding in Carbon

In the case of carbon, it has four electrons in its outermost shell and needs to gain or lose four electrons to attain noble gas configuration. If it were to gain or lose electrons –

- (i) It could gain four electrons forming C₄₋ anion. But it would be difficult for the nucleus with six protons to hold on to ten electrons, that is, four extra electrons.
- (ii) It could lose four electrons forming C₄₊ cation. But it would require a large amount of energy to remove four electrons leaving behind a carbon cation with six protons in its nucleus holding on to just two electrons.

Carbon overcomes this problem by sharing its valence electrons with other atoms of carbon or with atoms of other elements.

Covalent Bond

The bond formed by sharing a pair of electrons between two atoms are known as Covalent Bond. Carbon forms covalent bonds.

Lewis dot structures-

Lewis dot structures also called electron dot structures are diagrams that describe the chemical bonding between atoms in a molecule.

They also display the total number of lone pairs present in each of the atoms that constitute the molecule.

Note that only the valence shell electrons need to be depicted

The shared pair of electrons is said to constitute a single covalent bond between the two hydrogen atoms. A single covalent bond is also represented by a line between the two atoms

The two electrons contributed by each oxygen atom give rise to two shared pairs of electrons. This is said to constitute a double bond between the two atoms.

Nitrogen atom in a molecule of nitrogen contributes three electrons giving rise to three shared pairs of electrons. This is said to constitute a triple bond between the two atoms.

Allotropes of Carbon

Different forms of an element that has same chemical properties but different physical properties are known as Allotropes. There are three allotropes of carbon- diamond, graphite and fullerene.

Graphite	Diamond	Fullerene
<ul style="list-style-type: none">*Graphite is made from weak van der waal forces.*Each carbon atom is bonded with other three carbon atoms in order to form hexagonal rings.*It serves as a good conductor of heat and electricity.*It is used as dry lubricant for machine parts as well as it is used in lead pencils.	<ul style="list-style-type: none">*Diamond exists as a three-dimensional network with strong carbon-carbon covalent bonds.*Diamonds are hard in nature with high melting points.*It shines in the presence of light and it is a bad conductor of electricity.*The most common use of diamond is in making jewellery. It is also used in cutting and drilling tools.	<ul style="list-style-type: none">*It is a hollow cage which exists in the form of a sphere.*Its structure is similar to fullerene. But along with hexagonal rings, sometimes pentagonal or heptagonal rings are also present.

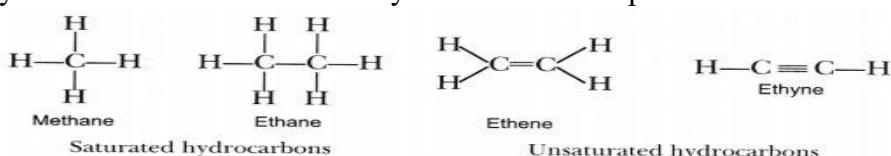
Versatile nature of carbon

Catenation is a property of carbon by which carbon atoms can link one another via covalent bond and can form long chains, closed rings or branched chains etc. Carbon atoms can be linked by single, double or triple bonds.

Carbon has a valency of 4 due to which it is known to have tetravalency. Due to this one carbon atom can bond with other 4 carbon atoms, with other atoms also such as Oxygen, Nitrogen etc.

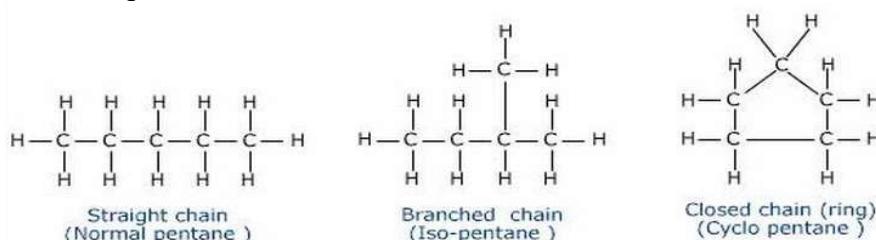
Hydrocarbons

Compounds which are made up of carbon and hydrogen they are known as Hydrocarbons. There are two types of hydrocarbons found - Saturated Hydrocarbons and Unsaturated Hydrocarbons. Saturated Hydrocarbons consist of single bonds between the carbon atoms. For Example, Alkanes. Alkanes are saturated hydrocarbons represented by a formula, C_nH_{2n+2} . Unsaturated Hydrocarbons are the one with double or triple bonds between the carbon atoms. For Example, Alkenes and Alkynes. Alkenes are represented as C_nH_{2n} whereas alkynes are represented as C_nH_{2n-2} . Some saturated hydrocarbons and unsaturated hydrocarbons are represented as-



Chains, Branches and Rings

Such compounds with identical molecular formulas but different structures are called structural isomers.



Will you be my friend? (Bonding with heteroatoms)

In a hydrocarbon chain, one or more hydrogens can be replaced by these elements, such that the valency of carbon remains satisfied. In such compounds, the element replacing hydrogen is referred to as a heteroatom. These heteroatoms and the group containing these confer specific properties to the compound, regardless of the length and nature of the carbon chain and hence are called functional groups.

Table . Some functional groups in carbon compounds.

Heteroatom	Functional group	Formula of functional group	Suffix
Cl/Br Oxygen	Halo-(chloro/bromo) 1. Alcohols 2. Aldehyde 3. Ketone 4. Carboxylic acid 5. Esters	$-Cl$, $-Br$ $-OH$ 	(Named as prefix) $-ol$ $-al$ $-one$ $-oic\ acid$ $-oate$
Nitrogen	1. Amino 2. Nitro	$-NH_2$ $-NO_2$	(Named as prefix) (Named as prefix)

Homologous Series

Such a series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called a homologous series.

The successive members of a homologous series differ by a $-CH_2-$ molecule and 14u by molecular mass. As the molecular mass increases in any homologous series, a gradation in physical properties is seen. This is because the melting and boiling points increase with increasing molecular mass.

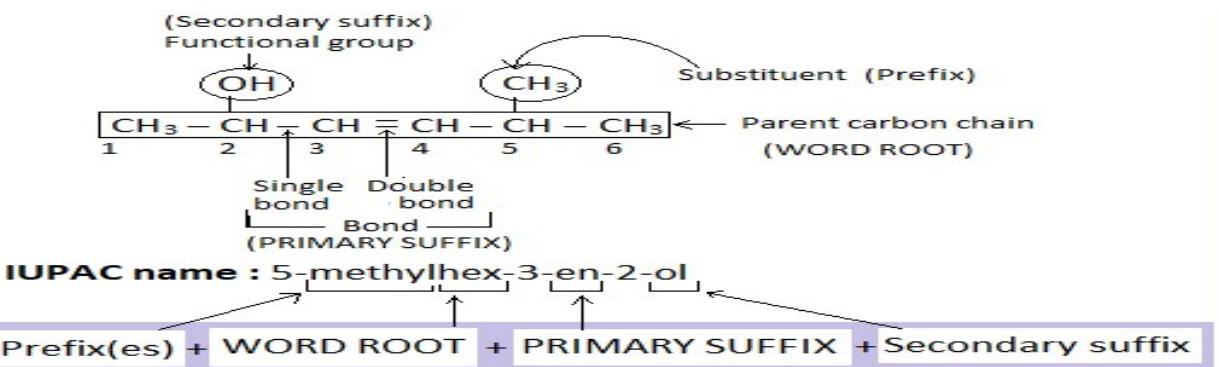
Other physical properties such as solubility in a particular solvent also show a similar gradation.

Nomenclature of Carbon Compounds

The names of compounds in a homologous series are based on the name of the basic carbon chain modified by a “prefix” “phrase before” or “suffix” “phrase after” indicating the nature of the functional group.

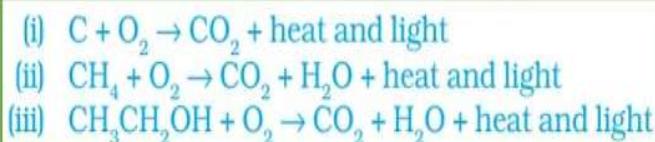
Naming a carbon compound can be done by the following method –

- (i) Identify the number of carbon atoms and longest chain in the compound. A compound having three carbon atoms would have the name propane.
- (ii) In case a functional group is present, it is indicated in the name of the compound with either a prefix or a suffix.
- (iii) If the name of the functional group is to be given as a suffix, and the suffix of the functional group begins with a vowel a, e, i, o, u, then the name of the carbon chain is modified by deleting the final ‘e’ and adding the appropriate suffix. For example, a three-carbon chain with a ketone group would be named in the following manner – Propane – ‘e’ = propan + ‘one’ = propanone.
- (iv) If the carbon chain is unsaturated, then the final ‘ane’ in the name of the carbon chain is substituted by ‘ene’ or ‘yne’ as given in Table 4.4. For example, a three-carbon chain with a double bond would be called propene and if it has a triple bond, it would be called propyne.

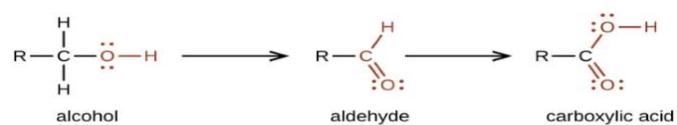


Chemical properties of Carbon Compounds

Combustion- Carbon along with its compound is used as a fuel as it burns in presence of oxygen to release energy. Saturated hydrocarbons produce blue and non-sooty flame whereas unsaturated hydrocarbons produce yellow sooty flame.



Oxidation- Alcohol can be oxidized to aldehydes whereas aldehydes in turn can be oxidized to carboxylic acid. Oxidizing agents such as potassium permanganate can be used for oxidation.



Addition Reaction- Hydrogenation of vegetable oil is an example of an additional reaction. Addition of hydrogen in presence of catalysts such as nickel or palladium. This converts oil into ghee.



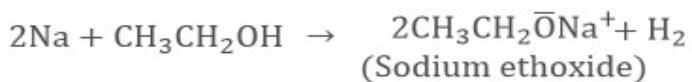
Substitution Reaction- When one atom in hydrocarbon is replaced by chlorine, bromine, etc. this is known as Substitution Reaction.



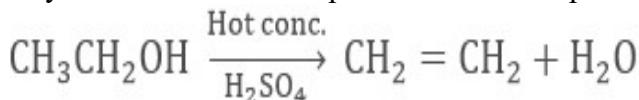
Important Carbon Compounds: Ethanol and Ethanoic Acid

Ethanol -

Ethanol is a volatile liquid with low melting point. It reacts with sodium to form sodium ethoxide.



This reaction is used to test the presence of ethanol by the evolution of hydrogen gas.
Dehydration of ethanol in presence of hot sulphuric acid forms alkene.



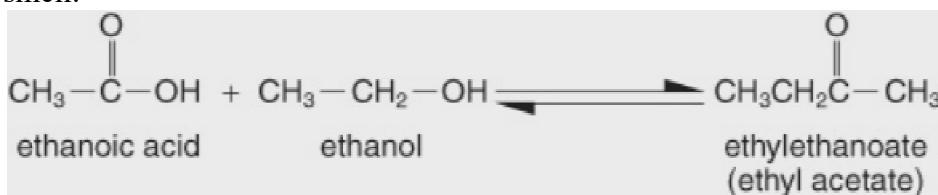
Ethanoic acid-

Ethanoic acid is a colourless liquid.

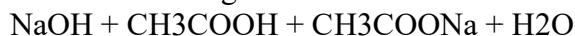
When pure ethanoic acid freeze like ice, it is known as Glacial Acetic Acid.

It is formed at a temperature of about 16.6 degree centigrade

Ethanoic Acid/Acetic acid when reacts with ethanol it forms an ester. Ester can be identified by its sweet smell.



Reaction of ester with strong base is used to form soap. This is known as Saponification. Acetic acid also reacts with strong base to form sodium acetate and water.



Soaps and Detergents

*Sodium or potassium salt of carboxylic acid is known as Soap.

*They work most effectively in soap water.

*Detergents are sulphonate or ammonium salt of a long chain of carboxylic acid.

*They can work effectively on soft as well as hard water.

Cleansing Action of Soaps and Detergents

Cleansing action of soaps and detergents is due to the ability to minimize the surface tension of water, to emulsify oil or grease and to hold them in a suspension of water.

When soap dissolves in water, it forms soap anions and soap cations.

The hydrophobic part of soaps and detergents are soluble in grease and the hydrophilic part is soluble in water.

Soap and Micelle Formation

When dirt and grease are mixed with soap water, soap molecules arrange them in tiny clusters known as Micelle.

The hydrophilic part sticks to the water and forms the outer surface of the micelle and the hydrophobic part binds to oil and grease.

Esterification: Esters are sweet-smelling substances. These are used in making perfumes and as flavouring agents.

Esters react in the presence of an acid or a base to give back the alcohol and carboxylic acid. This reaction is known as saponification because it is used in the preparation of soap.

Practice questions

Q.What would be the product when a compound containing carbon is burnt?

Ans- CO₂

Q.What is the amount of carbon present in the earth's crust?

Ans- 0.02%

Q.What is the distribution of electrons in various shells of carbon?

Ans- 2+4

Q.Write the number of covalent bonds in the molecule of ethane.

Ans- 7

Q Covalent compounds are generally poor conductors of electricity. Why?

Ans- The electrons in covalent compounds are shared between atoms to form covalent compounds. They do not form any charged particles . Therefore, covalent compounds are poor conductor of electricity.

Evaluation based

Q.Write the name and structure of an aldehyde with four carbon atoms in its molecule.

Ans- Butanal (draw structure)

Q.Write the name and molecular formula of the first members of the homologous series of alkynes.

Ans- Ethyne (C_2H_2), Propyne (C_3H_4), Butyne [1-Butyne and 2-Butyne] (C_4H_6).

Q.Priyanka went to Mussoorie with her parents. While washing her hands and face with soap, she noticed that scum was formed on her hands in place of lather. Why does this happen?

Ans- hard water. When soap is mixed with hard water it forms scum instead of lather.

Q.Adi's sister studies in class X and told him that the pencil is made up of carbon. He did not believe and asked his teacher. Which form of carbon is used to make lead of pencil and why?

Ans- lead of pencil is made of graphite. Graphite is an allotrope of carbon.

Q.We know that water is a universal solvent. When we try to dissolve ester in the water, it does not dissolve.

Why does ester not dissolving water?

Ans- Water is a ionic solvent which can dissolve polar substances which easily split into ions. Ether is an organic and non polar substance.

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

Ans- Carbon compounds are used as fuel because they burn with a clean flame and no smoke is produced. Carbon compounds have higher calorific values, maximum ignition temperature and their combustion can be restrained. Hence, carbon and its compounds are a great source of fuel.

Q.What would be the electron dot structure of a molecule of sulphur which is made up of 8 atoms of sulphur?

(Ans – The eight atoms of Sulphur are joined together in the form of a ring).

Q.What happens when 5% of alkaline potassium permanganate solution is added drop by drop to warm propyl alcohol taken from a test tube? Explain with the help of a chemical equation.

(Ans- purple colour of potassium permanganate gradually disappears as it oxidizes the propanol to its respective carboxylic acid i.e propionic acid. Write chemical reaction)

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

(Ans- A molecule of ethanol contains six hydrogen atoms while that of ethanoic acid contains four hydrogen atoms since oxidation involves removal of hydrogen, therefore conversion of ethanol to ethanoic acid is an oxidation reaction.)

Q.Write the structural formula of any four isomers of hexane.

Ans-Write structural formula of C_6H_{12}

Q.Write the functional groups present in the following compounds:

$CH_3 COCH_2 CH_2 CH_2 CH_3$

Ans-keton

$CH_2 CH_2 CH_2 COOH$ -

Ans-Carboxylic acid

$CH_3 CH_2 CH_2 CH_2 CHO$

Ans-Aldehyde

$CH_3 CH_2 OH$

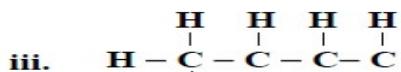
Ans-Alcohol

Q.A gas is evolved when ethanol reacts with sodium. Name the gas evolved and also write the balanced chemical equation of the reaction involved.

(Ans- When ethanol reacts with sodium, then hydrogen gas is evolved. This reaction can be given by following equation: $2\text{Na} + 2\text{CH}_3\text{CH}_2\text{OH} \rightarrow 2\text{CH}_3\text{CH}_2\text{ONa} + \text{H}_2$.)

Q. Write the IUPAC name the following compounds?

i. $\text{CH}_3 - \text{CH}_2 - \text{Br}$ ii. $\text{H} -$



(Ans- i. Bromoethane ii. Methanal iii. 1-hexyne.)

Q. For elements given below with their electronic configuration:

P (2,6); Q (2,8,1); R (2,8,7); and S (2,8,8).

Identify which element(s) will form covalent bonds with carbon.

(Ans- P and R)

"Carbon Reacts with an element in the above table to form several compounds." Give a suitable reason.

(Ans- Carbon has tetravalency and catenation)

Q. What is a micelle? Draw the structure of the missile that would be formed if we dissolve soap in a hydrocarbon.

(Ans- The molecule of soap constitutes sodium or potassium salts of long-chain carboxylic acids. In the case of soaps, the carbon chain dissolves in oil and the ionic end dissolves in water. Thus, the soap molecules form structures called micelles. In micelles, one end is towards the oil droplet and the other end which is the ionic faces outside.) (draw the structure of micelle)

Q. Draw the electron dot structure for

Ethanoic acid

Propanone

(Draw structures)

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

(Ans- Carboxylic acid and Alcohol can be distinguished by using Sodium bicarbonate as, Carboxylic acid produces a brisk effervesce when reacted with it, whereas Alcohols do not produce anything when reacted with Sodium bicarbonate.)

Q. The general formula of the organic compounds 'P', 'Q' and 'R' is C_nH_{2n} . Their boiling points are -162°C , -42.2°C and -0.5°C respectively. Based on this information answer the following:

Which type of compounds 'P', 'Q' and 'R' are and why?

(Ans- P, Q and R are alkenes because their general formula is C_nH_{2n})

Which of these has maximum number of carbon atoms in the molecule and why?

(Ans- Compound R has maximum number of carbon atoms because boiling point increases with molecular mass which depends on number of C atoms)

Write the name and structural formula of the second member of this series.

(Ans- Name: propane

Structural formula: $\text{CH}_3 - \text{CH} = \text{CH}_2$

Q. Write the name and molecular formula of an organic compound having its name suffixed with 'ol' and having two carbon atoms in its molecule. Write a balanced chemical equation to indicate what happens when this compound is heated with excess conc. H_2SO_4 and the name of the main product formed. Also state the role of conc. H_2SO_4 in the reaction.

(Ans- Alcohols have 'ol' suffix. Ethanol ($\text{CH}_3\text{CH}_2\text{OH}$) is alcohol with 2 carbon.

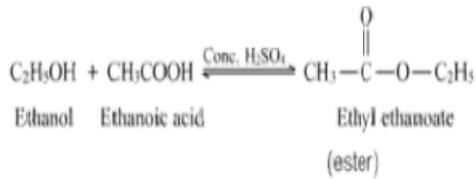
When ethanol is heated with excess concentrated sulphuric acid at 443 K , dehydration takes place and ethene is formed. In this reaction concentrated sulphuric acid acts as a dehydrating agent.



Q. Ethanoic acid reacts with absolute ethanol in the presence of concentrated H_2SO_4 to form a compound:
Write the smell and class of compounds to which this compound belongs.

(Ans- The fruity smell and the compounds are esters.)

Write the chemical equation for the reaction and state the role of concentrated H_2SO_4 in the reaction.



(Ans-

One use of the product of this reaction.

(Ans- The main use of esters is for flavourings and perfumes, however they can also be used in the chemicals industry as solvents.)

Q.What are covalent compounds? How are the different from ionic compounds? List any two properties of covalent compounds.

Ans- Covalent compounds - Covalent compounds are compounds which are formed by sharing of electrons between atoms of compounds.

Ionic compounds - Ionic compounds are those compounds which are formed by the transfer of electrons.
Difference-

Ionic bonds are between metals and non - metals while the covalent bonds are between the non - metals.
Covalent bonds have low melting and ionic compounds have high melting point.

Properties of covalent compounds :-

(1) Low boiling points

(2) Poor conductors of heat and electricity

Q.A carbon compound 'A' having melting point 156K and boiling point 351K, with molecular formula $\text{C}_2\text{H}_6\text{O}$ is soluble in water in all proportions.

(a) Identify 'A' and draw its electron dot structure.

Ans-Ethanol; $\text{C}_2\text{H}_5\text{OH}$

(b) Give the molecular formulae of any two homologues of 'A'.

Ans- CH_3OH and $\text{C}_3\text{H}_7\text{OH}$

Q.You must have seen dark patches of dirt on the collar of your shirts which are very difficult to clean.
Explain how this dirt is formed at the collar and cuffs only of the shirt? How is it cleaned with surf and detergents? Explain the process.

Ans- Dark patches of stain on the collar and cuffs of shirts are formed due to sticking of grease/oils and dirt/dust.

Cleaning action of Detergents -

When detergent is dissolved in water it forms a colloidal solution.

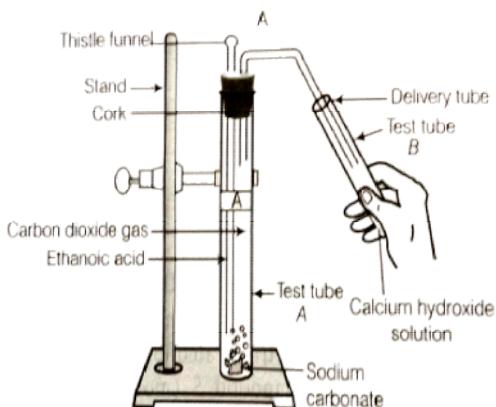
The detergent molecules of this solution unite together in the form of bunches to form micelle.

In the middle, the detergents molecules are arranged in such a manner that the hydrocarbon end is towards the centre and the ionic part is outside.

The grease or oil particles of dirty clothes get attached to the hydrocarbon end of the detergents.

Thus the dirt particles get stuck. On rinsing with water, these particles come outside and the cloth becomes clean.

Q.Look at the figure and answer the following questions:



(A) What change would you observe in the calcium hydroxide solution taken in tube B?

Ans-Lime water will turn milky.

(B) Write the reaction involved in test tubes A and B respectively.

Ans-Test tube A: $2\text{CH}_3\text{COOH(l)} + \text{Na}_2\text{CO}_3(\text{s}) \rightarrow 2\text{CH}_3\text{COONa(aq)} + \text{H}_2\text{O} + \text{CO}_2(\text{g})$

Test tube B: $\text{Ca(OH)}_2(\text{aq}) + \text{CO}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O(l)}$

(C) If ethanol is taken instead of ethanoic acid, would you expect the same change?

Ans-Ethanol will not react with Na_2CO_3 and CO_2 gas will not formed.

(D) How can a solution of lime water be prepared in the laboratory?

Ans-Add Ca(OH)_2 in water ,shake it well .Filter the solution .The filtrate is lime water .

Q.An organic compound with molecular formula $\text{C}_2\text{H}_4\text{O}_2$ produces brisk effervescence on addition of sodium carbonate/bicarbonate.

Identify the organic compound.

Ans-Acetic acid

Name the gas evolved.

Ans-Carbon dioxide

How will you test the gas evolved.

Ans- passing the gas through lime water. If it turns white, then it is carbon dioxide.

Write the chemical equation for the above action.

Ans- $2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow \text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$

$\text{CH}_3\text{COOH} + \text{NaHCO}_3 \rightarrow \text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$

List two important uses of the above compound.

Ans-Used as vinegar , preservatives

Q.Why do substances burn with or without a flame?

Have you ever observed either a coal or a wood fire? If not, the next time you get a chance, take close note of what happens when the wood or coal starts to burn. You have seen above that a candle or the LPG in the gas stove burns with a flame. However, you will observe the coal or charcoal in an 'angithi' sometimes just glows red and gives out heat without a flame. This is because a flame is only produced when gaseous substances burn. When wood or charcoal is ignited, the volatile substances present vapourise and burn with a flame in the beginning. A luminous flame is seen when the atoms of the gaseous substance are heated and start to glow. The colour produced by each element is a characteristic property of that element. Try and heat a copper wire in the flame of a gas stove and observe its colour. You have seen that incomplete combustion gives soot which is carbon. On this basis, what will you attribute the yellow colour of a candle flame to?

When is a flame produced on burning a fuel

When coal burns.

When gaseous substance burns.

When 'angithi' burns.

When solids burn.

Ans- When gaseous substance burns.

What colour of flame is produced when LPG is burnt?

Yellow flame

Red flame

Sooty flame

Blue flame

Ans- Blue flame

What does the yellow colour of flame indicate?

Incomplete combustion

Complete combustion

Rapid combustion

Spontaneous combustion

Ans- B) Complete combustion

Which type of hydrocarbons burn with yellow smoky flame? Why?

Ans- unsaturated hydrocarbons, incomplete combustion of fuel.

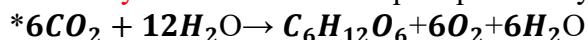
An organic compound burns with a blue flame. Is it saturated or unsaturated? Explain the reason for your answer.

Ans- Saturated. Complete combustion of fuel produces blue flame.

LIFE PROCESSES

Autotrophic nutrition :- Organisms synthesise their food from simple inorganic substances .

* **Photosynthesis**:- it is a complex process by which green plants synthesise their food



* Sites of photosynthesis:- chloroplasts containing chlorophyll

* events in photosynthesis:-

- Absorption of light energy by chlorophyll.
- Conversion of light energy into chemical energy and splitting of water molecule in into hydrogen and oxygen.
- Reduction of carbon di oxide to carbohydrates .

Photosynthesis-A process in which green plants takes carbon dioxide and water and converts them into carbohydrates in the presence of sunlight and chlorophyll. $6CO_2 + 6H_2O$ Sunlight $C_6H_{12}O_6 + 6O_2$ Chlorophyll

Mechanism:

- Absorption of light energy by chlorophyll.
- Conversion of light energy to chemical energy.
- Splitting of water molecules (H_2O) into hydrogen and oxygen.
- Reduction of carbon dioxide to carbohydrate.

2. Heterotrophic nutrition :-

a. Holozoic nutrition :- Complex food molecules are taken in .

Ex. Herbivores, carnivores and omnivores.

b. Saprotrophic nutrition:-

* feed upon dead organic matter, breakdown complex molecules outside the body then absorb.

Ex. Fungi, mushroom, yeast and bacteria .

c. parasitic nutrion :- Parasites obtain their nutrition from their host without killing them.

NUTRITION IN HUMAN BEING

* Alimentary canal:-

Mouth (tongue + teeth) ,oesophagus, stomach, small large intestine , anus .

* Digestive glands ;- 1. salivery glands (saliva – salivery digests starch into sugars.

2. Stomach – gastric glands –

a. HCL – Creates an acidic medium , kills bacteria and other microorganisms.

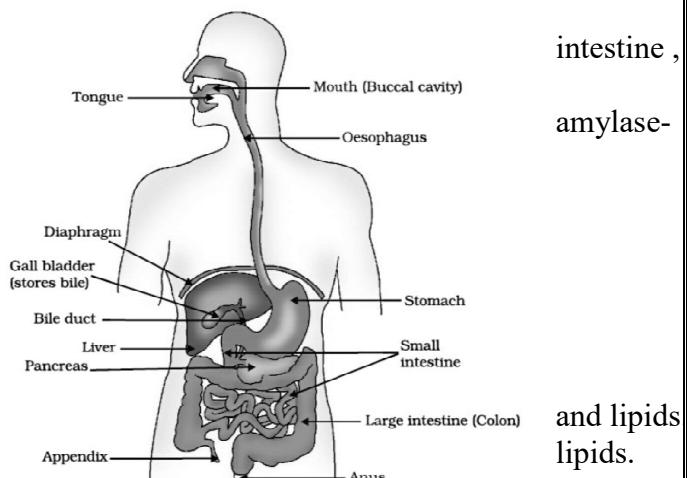
b. pepsin – digests protein .

c. Mucus – Protects the lining of stomach from HCL.

3. Liver – bile juice – emulsification .

4. Pancreas- pancreatic juice – digests carbohydrates, fats

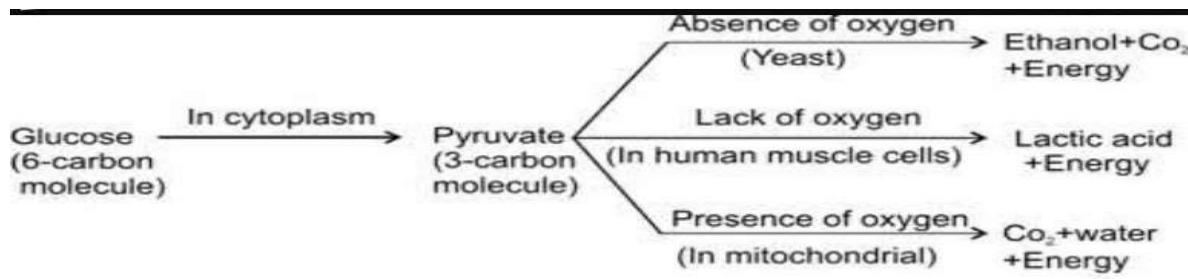
Intestine – intestinal juice - digests carbohydrates, fats and



RESPIRATION

Aerobic respiration :- complete breakdown of food in the presence of oxygen , large amount of energy .

Aerobic respiration :- Incomplete breakdown of food in the absence of oxygen , small amount of energy.



(Break down of glucose by various pathways)

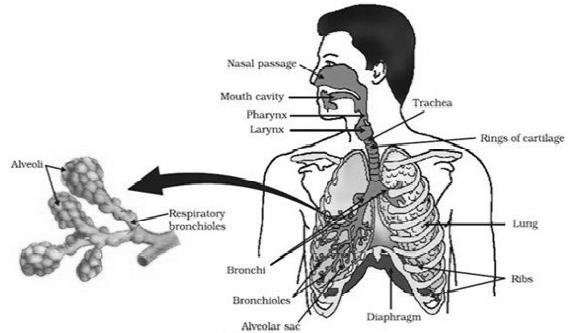
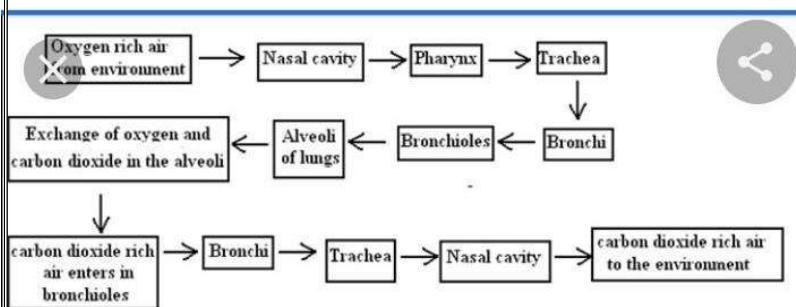
Exchange of gases in plants :- in leaves (stomata), in stems (lenticels), roots.

Exchange of gases in animals:-

In aquatic animals :- Through gills and body surface .

In terrestrial animals:- Moist skin (earthworm, frogs), spiracles and air tubes,(cockroach) , lungs (birds, reptiles and mammals)

Human Respiratory System



TRANSPORTATION

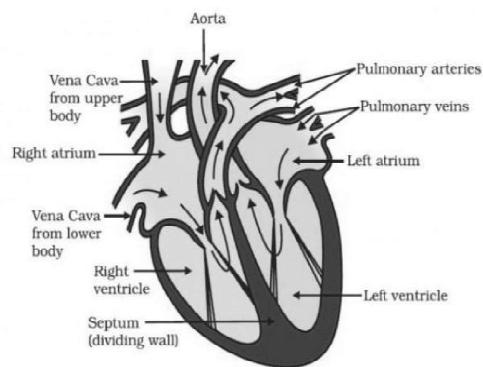
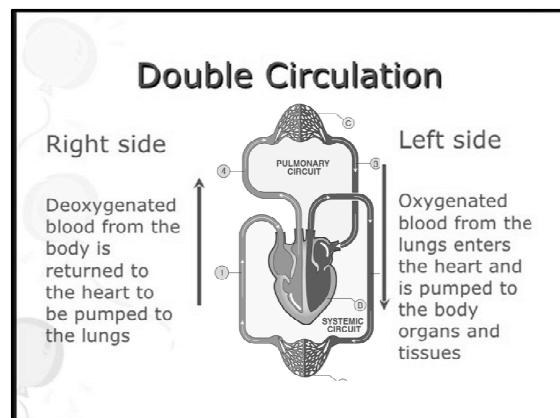
1.Human circulatory system consists of blood, the heart and network of blood vessels.

2.Blood:- is a specialized connective tissue consisting of plasma , RBCs, WBCs and platelets.

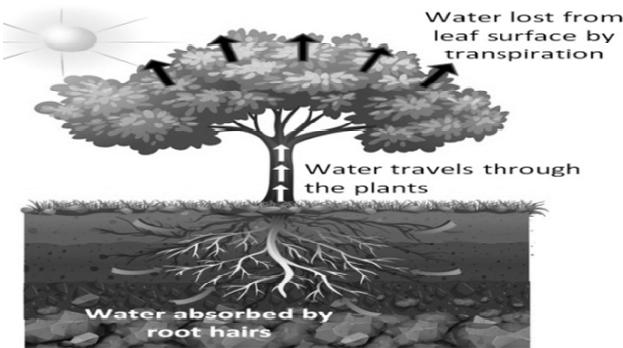
3.Lymph :- Is similar to blood with less proteins. It absorbs fat from intestine and drains back excess fluid to blood.

4.Blood pressure :- force exerted by the blood on the walls of blood vessels . It is measured by sphygmomanometer.

The normal range of BP in human is 120/80 mmHg



TRANSPORT OF WATER AND MINERALS IN PLANTS



Transportation in plants :-

- * Xylem transport transport water and minerals . It occurs due to transpiration pull and root pressure.
- * Phloem transport the food by using energy (translocation) .

EXCRETION

Unicellular animals excrete through their body surface (diffusion).

Nephrons are structural and functional units of kidneys .

Formation of urine :- it involves three stages-

- * Ultra filtration in glomerulus .
- * Selective reabsorption of useful substances
- * tubular secretion

STRUCTURE OF A NEPHRON

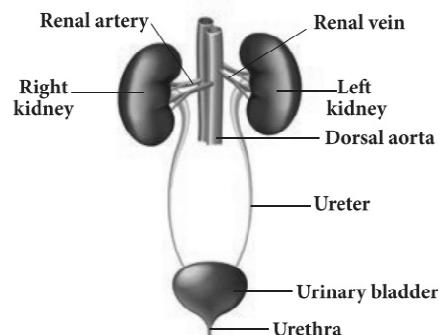
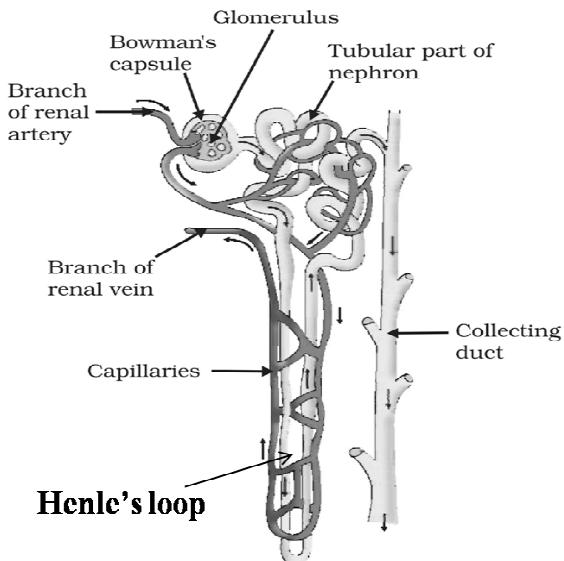


Figure 8.5 Excretory system

Excretion in plants

Gaseous waste products are excreted through stomata and lenticels.

Liquid waste products (water , gums resins etc) are excreted through stomata or hydathodes.

Solid waste products are stored in cellular vacuoles . plants get rid of them by falling their leaves .

Practice questions

- Q. Main function of Henle's loop is _____
(a) Passage of urine (b) Filtration of blood
(c) Formation of urine (d) Conservation of urine

Ans:- (b) Filtration of blood

- Q. Glucose is mainly reabsorbed in _____

- (a) Henle's loop (b) DCT
(c) PCT (d) Nephron

Ans 1.2(c) PCT

Q. Does aerobic respiration differ from anaerobic respiration?

Ans Aerobic Respiration — Takes place in the presence of oxygen. Anaerobic Respiration — Takes place in the absence of oxygen

Q. Name the pigment, which can absorb solar energy?

Ans The pigment which can absorb solar energy is Chlorophyll pigment which is present in chloroplast cells.

Q. How does amoeba engulf its food?

Ans Amoeba engulfs its food by the process of phagocytosis, by trapping the food in a food vacuole formed with the help of finger-like projections called pseudopodia.

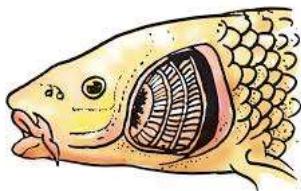
Q. What are the end products formed during fermentation in yeast? Under what condition a similar process takes place in our body that lead to muscle cramps.

Ans. The end products formed during anaerobic respiration or fermentation in yeast are carbon dioxide and ethanol along with ATP. A similar process is seen in our body when there is lack of oxygen in muscles, leading to the muscle fatigue. It results due to the accumulation of lactic acid produced during anaerobic respiration of glucose. The energy or ATP produced during anaerobic respiration is much less as compared to aerobic respiration.

Q. Name the respiratory organs of and make a diagram ?

- (i) fish
(ii) earthworm

Ans – Fish-Gill , Earthworm-Moist skin .

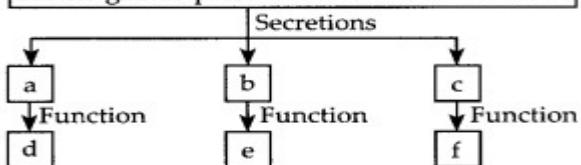


Q. Name the energy currency in the living organisms. When and where is it produced?

Ans-The energy currency in living organisms is called “ATP(Adenosine Tri-Phosphate)”. ATP is produced in living cells during cellular respiration. 2 ATP is produced in the cytoplasm of the cell when glucose breaks down to ethanol and carbon dioxide in the absence of oxygen.

Q . Complete the following flow chart as per the given instructions.

Gastric glands present in the wall of stomach.



Ans- a – Hydrochloric acid (HCl)

b – Protein digesting enzyme pepsin

c – Mucus

d – HCl makes medium acidic for the activation of an enzyme pepsin.

e – Pepsin acts in acidic medium which breaks down proteins into peptones.

f – Mucus protects the inner lining of stomach from corroding action of HCl.

Q.(a) In the process of respiration, state the function of alveoli.

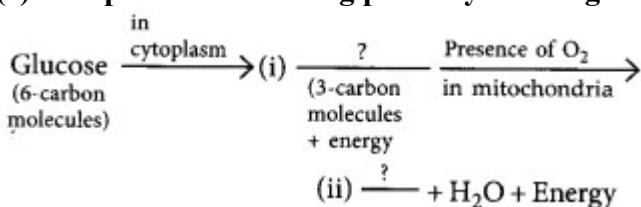
Ans In the process of respiration, alveoli provide the surface within the lungs for the exchange of oxygen and carbon dioxide from blood during the process of breathing in and breathing out.

(b) Rate of breathing in aquatic organisms is much faster than that in terrestrial organisms.

Give reasons.

Ans 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

(c) Complete the following pathway showing the breakdown of glucose.

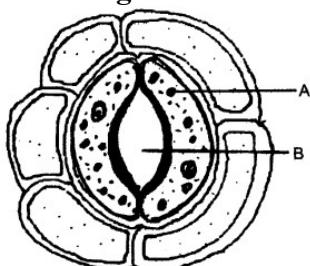


Ans i) PYRUVIC ACID/ PYRUVATE ii) CO₂

Q. Stomata of desert plants remain closed during day time. How do they take up CO₂ and perform photosynthesis?

Ans Such plants undergo CAM photosynthesis as they open up their stomata during night and take in CO₂. Stomata remains close during the day time to prevent the loss of water by transpiration. They store the CO₂ in their cells until the sun comes out and they can carry on with photosynthesis during the day time.

Q: The diagram below represents a structure found in a leaf.



Study the same and answer the questions that follow:

(i) Name the piece labelled A and B

Ans A Guard and B Stomata

(ii) What is the biological term for the above structure?

Ans – Stomatal apparatus

OR

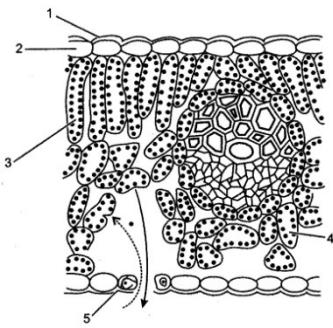
(i) What is the function of the part labelled A?

Ans- They control the opening and closing of the stomata.

(ii) Where is this structure likely to be found in a leaf?

ANS .On the epidermis of the leaf.

Q : The figure below represents the vertical section of a leaf:



Name the parts labelled (any three)

Ans:-1. Cuticle2. Upper epidermis3. Palisade tissue4. Spongy parenchyma5. Guard cell of stomata.

(ii) What do the two arrows (dotted and solid) indicate in the day time and at night ?

Ans :- In the daytime, the dotted arrow shows the path of carbon dioxide while solid arrow shows the path of oxygen. At night, the dotted arrow shows the path of oxygen while the solid arrow shows the path of carbon dioxide.

(iii) How many leaf veins have been shown in this section ?

Ans:-Only one leaf vein has been shown in this section.

Q. Read the following and answer questions :

Sanjana is suffering from a frequent stomach pain and vomiting. She went to the Doctor. The doctor asked her to go for an ultrasound. In the report, a stone was found in her gall bladder. Doctor asked her to remove the gall bladder by operation. But she was reluctant to go for the operation.

(i) The role of gall bladder in human body is:

(a) To store bile (b) To secrete bile (c) To emulsify fats (d) To digest fats

Ans:- (A)

(ii) Removal of gall bladder

(a) Effects the digestion of proteins (b) Has no effect on the person's health

(c) Effect the secretion of bile (d) Effects the digestion of fats

Ans:- (B)

(iii) Which of the following statements is correct about bile?

(a) It helps in emulsification of fats (b) It helps in digestion of carbohydrates

(c) It helps in absorption of digested food d) It helps in egestion of undigested food

Ans:- (A)

(iv) Which part of alimentary canal receives bile from the liver?

(a) Stomach (b) Small intestine (c) Large Intestine (d) Oesophagus

Ans:- (B)

Q: (a) Draw a diagram to show open stomatal pore and label on it:

(i) guard cells (ii) chloroplast

Ans- Refer NCERT Figure 6.3.

(b) State two functions of stomata.

Ans- Functions of stomata: Its prime function is to exchange the gases by closing and opening the pores in the leaves. It assists in eradicating excess water from the leaves.

It removes oxygen and takes in carbon dioxide at the time of photosynthesis. It assists in monitoring the movement of water via transpiration.

Q (a) Veins are thin walled and have valves. Justify?

Ans : Veins collect the blood from different organs and bring it back to the heart. The blood is no longer under pressure, so the walls are thin with valves to ensure that blood flows only in

one direction

(b) In birds and mammals, the left and right side of the heart are separated. Give reasons?

Ans : The separation keeps oxygenated and deoxygenated blood from mixing allowing a highly efficient supply of oxygen to the body. This is useful in animals that have high energy needs (birds and mammals) which constantly use energy to maintain their body temperature.

Q. Read the given passage and answer any of the four questions from Q.1. to Q.4.

Oxygen-rich blood from the lungs comes to the thin-walled upper chamber of the heart on the left. The left upper chamber (A) then relaxes. It then contracts and the blood is allowed to enter the next chamber (B), as it expands. When the muscular left lower chamber of heart contracts the blood is pumped out to the body via aorta. Deoxygenated blood reaches from the body to the upper chamber on the right side of heart (C) and it expands. As this part contracts, the corresponding lower chamber (D) dilates. This transfers the blood to right ventricle, which in turn pumps it to the lungs for oxygenated.

(1) Which of these correctly represents the label A, B, C and D in the above passage?

(A) A- Left atrium, B- Left Ventricle, C- Right atrium, D- Right ventricle

(B) A- Right ventricle, B- Left atrium, C- Left Ventricle, D- Right atrium

(C) A- Right atrium, B- Right ventricle, C- Left atrium, D- Left ventricle

(D) A- Left ventricle, B- Right atrium, C- Right ventricle, D- Left atrium

ANS:- A

Q. What is blood? Write down four functions of blood

ANS:- The blood are transporting oxygen and nutrients to the lungs and tissues. forming blood clots to prevent excess blood loss. carrying cells and antibodies that fight infection. bringing waste products to the kidneys and liver, which filter and clean the blood.

Q. Explain the events in the cardiac cycle. Describe 'double circulation'.

Ans. The cardiac cycle is the performance of the human heart from the beginning of one heartbeat to the beginning of the next. It consists of two periods: one during which the heart muscle relaxes and refills with blood, called diastole, following a period of robust contraction and pumping of blood, called systole.

Double Circulation: During a cardiac cycle, blood flows through the heart twice which is called double circulation. In human heart, the deoxygenated blood circulates through the right side of the heart and oxygenated blood moves through the left side of the heart.

CONTROL AND COORDINATION

Stimuli: The change in the environment to which an organism responds.

Coordination: Working together of various organs of an organism in a systematic manner to produce a proper response.

Phyto-hormones: These are plant hormones.

Auxin: It is a plant hormone which promotes cell enlargement and growth in plants.

Gibberellins: A plant hormone which promotes cell differentiation and breaking dormancy of seeds and buds.

Cytokinin: A plant hormone which promotes cell division and the opening of stomata.

Abscisic Acid: It helps in inhibiting the growth of the plant and promotes wilting and falling of leaves and food.

Tropism: A growth movement of a plant which determines direction with the stimulus.

Nastism: A growth movement of a plant which does not determine direction with a stimulus.

Phototropism: Movement of plants towards light.

Geotropism: Movement of plants towards the gravity of earth.

Chemotropism: Movement of plants towards chemicals.

Hydrotropism: Movement of plants towards the water.

Thigmotropism: Movement of plants towards a response to the touch of an object.

Control and Coordination in Animals

Stimuli: The change in the environment to which the organism responds.

Coordination: Working together of various organs of an organism in a systematic manner to produce a proper response.

Neuron: Functional unit of the nervous system.

Synapse: A microscopic gap between a pair of adjacent neurons.

Receptor: A cell in a sense organ which is sensitive to stimuli.

Motor nerves: It carries the message from the brain to body parts for action.

Sensory nerves: It carries the message from body to brain.

Olfactory receptor: It detects smell by the nose.

Gustatory receptor: It detects taste by a tongue.

Thermoreceptor: It detects heat and cold by a skin.

Photoreceptor: It detects light by eye.

Reflex action: Sudden movement or response to the stimulus which occurs in a very short duration of time and does not involve any will or thinking of the brain.

Brain: An organ present in the skull which controls and regulates the activity of the whole body and is known as president of the body.

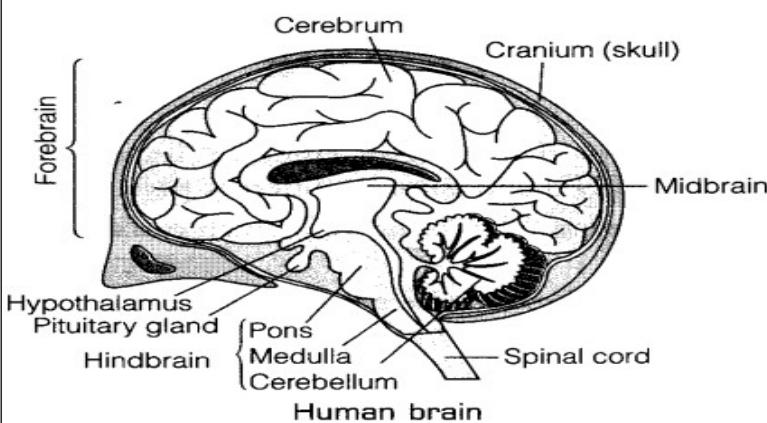
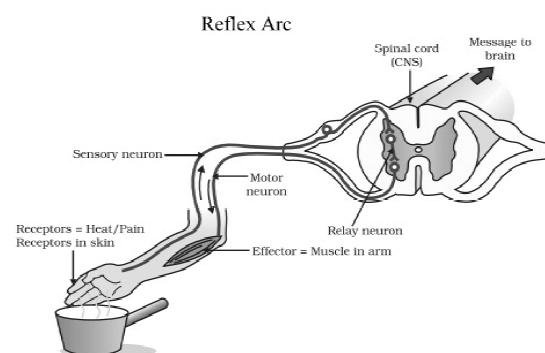
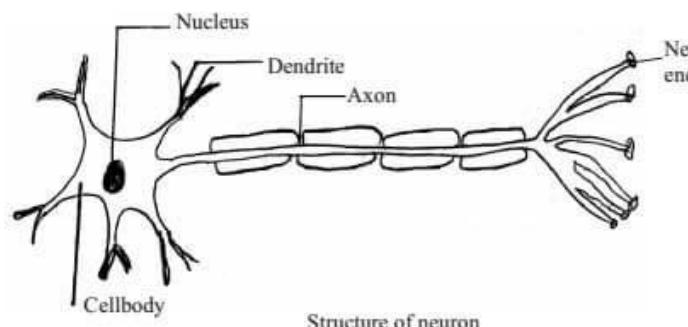
Cerebrum: Main thinking part of brain present in the forebrain area which controls all voluntary actions.

Cerebellum: It is present in the hindbrain area and helps in maintaining posture and balance of the body.

Medulla: It is present in the hindbrain area and helps in controlling voluntary actions of the brain.

Spinal cord: It is a cylindrical structure of nerve fibres enclosed in the vertebral column which helps in the conduction of nerve impulses to and from the brain.

Important Diagrams and Pictures



Practice questions

Q. Name the part of the neuron where information is acquired.

Ans 1- Dendrite

Q. Which phenomenon is responsible for movement of Sunflower in accordance with the path of the sun?

ANS-Phototropism

Q. Why do plant roots always grow down not up?

Ans. Geotropism

Q. Why are endocrine glands called ductless gland?

Ans. Do not have ducts

Q. How does our body maintain blood sugar level?

Ans. - When blood sugar rises, cells in the pancreas release insulin, causing the body to absorb glucose from the blood and lowering the blood sugar level to normal

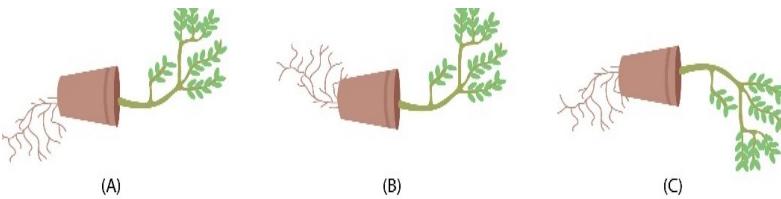
Q. Why the leaves of Mimosa pudica get contracted when we touch them?

Ans. When touched the stimulus reaches the base of the leaf and the water in the vacuoles of the cells of the leaf loses water to the adjacent cell

Q. Why our body starts sweating when temperature increases?

Ans.. our hypothalamus (a small region in your brain) tells eccrine sweat glands distributed all over your body that it's time to start cooling you down by producing sweat.

Q. In the figure below a, b, c which appears more accurate and why?



Ans. (A)

Q. Why do food that we eat taste bland when we have a cold?

Ans. When we have a cold, the body produces excess mucus, and this mucus prevents the hair cells from sending the information to the brain, as a result, the food that we eat feels tasteless

Q. Why are diabetic patients treated by insulin? Explain.

Ans. Helps Prevent diabetes complications by keeping your blood sugar within your target range.

Q. Why is the use of iodised salt advisable?

Ans. Helps create the hormones that regulate heart rate and blood pressure. Also minimize risk of Goiter.

Q. Why do leaves drop off seasonally?

Ans. They stop producing auxin.

Q.. Rohan saw mango fruits on a tree in his kitchen garden all the fruits were green but after a few days when Rohan went to his garden maximum fruits turned yellow. What could be the reason?

Ans. Abscisic acid and ethylene are regulators of ripening

Q. A person suffered a head injury, due to which he faces breathing problem. No problem was detected with his respiratory system. What could be the cause of this problem?

Ans. Related to pons.

Q. Design an experiment to demonstrate hydrotropism.

Ans a) 1 and 2 beakers are taken.

b) Beaker 1 is filled with moist soil, which is used to sow the seeds.

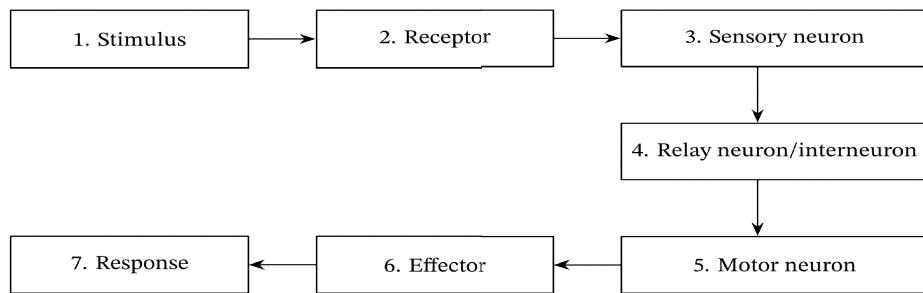
- c) In one part of beaker 2, dry soil is added, while in another section, moist soil is added, and the seeds are sown.
 d) Place a tiny beaker of water next to it as well.
 e) Keep it for a while to allow the plants to flourish.

Q. What are the differences between nastic and tropic movement?

Ans. . Tropic movement and nastic movements are both in response to external stimuli, but tropisms are relying on the path of the stimulus nastic movements do not rely on the path of a stimulus.

Q Represent schematically the path of a reflex action

Ans.



Evaluation based questions

Q.All reflexes are involuntary but all involuntary actions are not reflexes. Justify your answer.

Ans. Involuntary action is the set of muscle movements that do not require thinking. But it is controlled by the brain for example beating the heartbeat. Reflex action – Reflex action is rapid and spontaneous action in response to any stimulus which doesn't involve the brain.

Q. Ram was studying in his room. Suddenly he smells something burning and sees smoke in the room. He rushes out of the room immediately. Was Ram's action voluntary or involuntary? Why?

Ans. Ram's action was voluntary because rushing out of the room was under conscious Control

Q Many children in a remote mountain village complain of swollen necks, the number of children with swollen necks keeps increasing every month, a villager Tukaram who is superstitious, thinks that village is cursed by a devil. Mukesh, another villager who thinks it as a disease, suggests consultation with a doctor.

(A)Do you agree with Tukaram or Mukesh and why?

(B) Swollen necks are the symptom of which disease?

(a)Diabetes (b) Obesity (c) Goitre (d) Hypertension

Ans. A) Mukesh, goitre is caused due to deficiency of iodine.

B)Goitre

Q. Animals such as elephants, dolphins, and whales actually have larger brains, but humans have the most developed cerebrum. It's packed to a cavity inside our skulls and is highly folded. Why our brain is highly folded?

Ans. increase the surface area of the brain

Q Plants grown under normal light has higher amount of fresh flowers compared with plants grown under different coloured lights. Normal light appears to have 70% of its flowers being healthy whereas the average health of the plants under different light colours were roughly 34%.

From the above information answer the following. The plant produces maximum fresh flowers when exposed to normal light. Justify.

Ans. development of flower all the light colours are contributing differently but not a single colour

Q. Adrenaline is secreted directly into the blood and carried to different parts of the body. The target organs or the specific tissues on which it acts include the heart. As a result, the heart beats faster, resulting in supply of more oxygen to our muscles. The blood to the digestive system and skin is reduced due to contraction of muscles around small arteries in these organs. This diverts the blood to our skeletal muscles. The breathing rate also increases because of the contractions of the diaphragm and the rib muscles. All these responses together enable the animal body to be ready to deal with the situation. Such animal hormones are part of the endocrine system which constitutes a second way of control and coordination in our body.

- i) Which of the following hormone is known as flight and fight hormone?
a) Thyroxin b) Adrenaline c) ADH d) Oxytocin
- ii) Adrenaline hormone increases _____
a) Blood pressure b) Blood glucose level c) Arteriosclerosis d) Oxygen uptake
- iii) Adrenaline is a part of which hormonal system?
a) Endocrine system b) Exocrine system c) a and b both d) None of these
- iv) This hormone is produced under condition of stress which stimulates glycogenolysis in the liver of human beings
a) Insulin b) Thyroxin c) Cytokinin d) Adrenaline

Ans- 30. i) Adrenaline ii) Blood pressure iii) Endocrine system iv) adrenaline

Q. 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. Another example of plant hormones are gibberellins which, like auxins, help in the growth of the stem. Cytokinin promote cell division, and it is natural then that they are present in greater concentration in areas of rapid cell division, such as in fruits and seeds. These are examples of plant hormones that help in promoting growth. But plants also need signals to stop growing. Abscisic acid is example of a hormone which inhibits growth.

- (i) _____ is a gaseous plant hormone.
a) Auxin b) Ethylene c) Abscisic acid d) Gibberellin
- ii) Application of _____ can delay abscission of fruits and leaves at early stages
a) gibberellic acid b) ethylene c) auxin d) cytokinin
- iii) Find the incorrect match
a) Abscisic acid -- Stomatal closure b) IAA -- Cell wall elongation
c) Cytokinin -- Cell division d) Gibberellic acid -- Leaf abscission
- iv) Name the plant hormone which increases the activity of cambium in the wooden plants?
a. Gibberellins b. Cytokinins c. Auxins d. Ethylene

Ans- 31 i) Ethylene ii) Auxin iii) Gibberellic acid -- Leaf abscission iv) Gibberelline

Q. Read the case/passage and answer the questions given below.

To carry out a simple function such as eating food there has to be coordination of the eyes, hands and the mouth. The eyes have to focus on the food, the hands have to pick it up and take it to the mouth where it will be chewed. All these actions have to be coordinated in such a manner that they follow a particular sequence and the action is completed. A similar mechanism is also needed for internal functions of the body. This function is carried out by the nervous system. It is composed of

- (a) Specialised cells which can detect, receive and transmit different kinds of stimuli. These are called neurons.
- (b) Nerve fibres which are certain bundles of extended processes of nerve cells. The individuals also have to adjust

to the changing conditions around them and vary their responses. At the same time, the internal conditions of the body should be maintained constant. This is called homeostasis. The internal conditions of the body are maintained at a constant by controlling the physiology of the organisms.

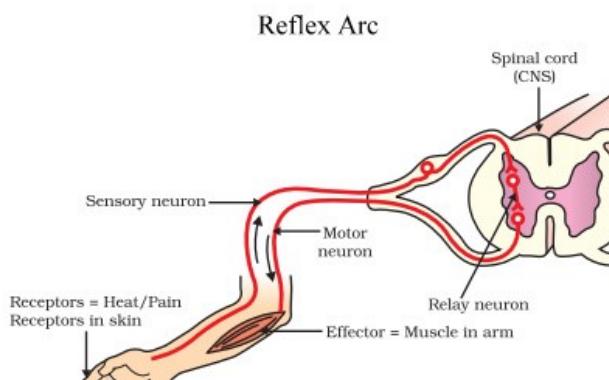
- (i) What function does the central nervous system perform?
- (ii) What happens when the dendrite tip of a nerve cell receives a signal?

Ans . a)The central nervous system is comprised of the brain and the spinal cord which process the information received from the receptors on/in the body.

b.i) The central nervous system is the body's processing centre. The brain controls most of the functions of the body, including awareness, movement, thinking, speech, and the 5 senses of seeing, hearing, feeling, tasting and smelling.

ii)Upon receiving a signal, the dendrite tip of a nerve cell sets off a chemical reaction which creates an electrical impulse in them.

Q. The simplest form of response in the nervous system is reflex action. This is a rapid, automatic response to a stimulus which is not under the voluntary control of the brain. It is described as an involuntary action. Thus, a reflex action is one which we perform automatically. It is a comparatively simple form of behaviour in which the same stimulus produces the same response every time.



1.Moving our hand away on touching a hot plate is an example of reflex Action. State true or false.

i)True

False

2. A reflex action is not an automatic response to a stimulus.

i) True

False

3. The pathway (or route) taken by nerve impulses in a reflex action is called

i) Reflex arc

ii) Reflex action

Ans- 33. i) True ii) False iii) reflex arc

How do Organisms Reproduce

Reproduction is the biological process by which new individual organisms – "offspring" – are produced from their "parent" or parents.

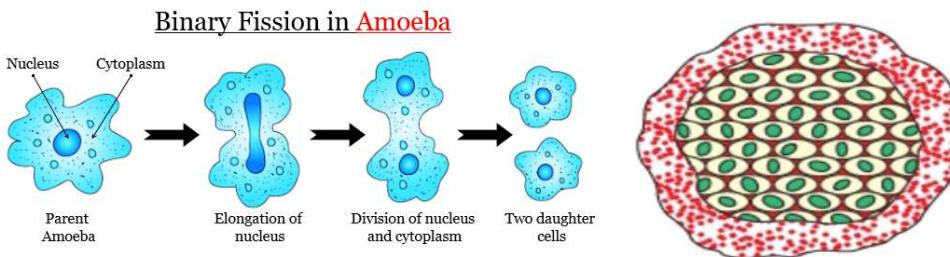
Types of Reproduction:-

1. Asexual Reproduction – In this type, offspring that are genetically identical to a single parent.
2. Sexual reproduction- In this type, two parents contributes genetic information to produce an offspring.

DIFFERENT METHODS OF ASEXUAL REPRODUCTION

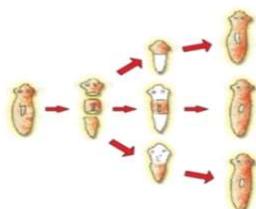
1. **FISSION**: the parent cell divides/splits into two daughter cell-Binary Fission; splits into many cells-multiple Fission.

.B) Multiple fission in Plasmodium



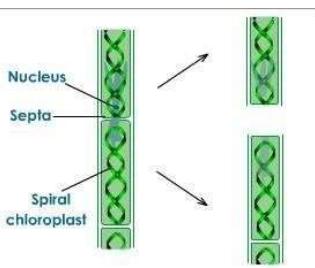
2. **REGENERATION**: When the simple animals like Hydra Planaria develop a new individual from their broken older part it is known as regeneration. It is carried out by specialized cells which grow large numbers of cells.

2. Regeneration in Planaria

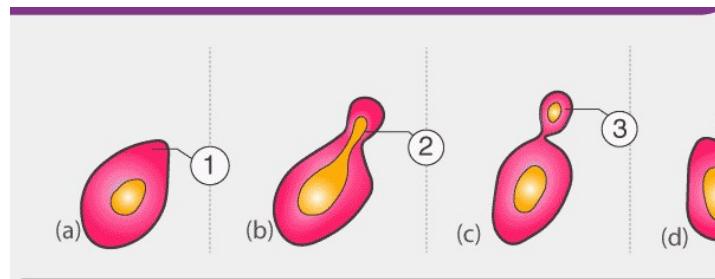
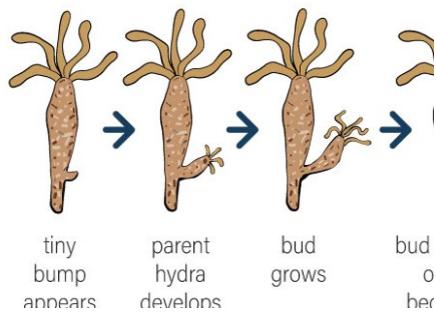


FRAGMENTATION: It is the accidental process when

the broken pieces of an organism (fragments) grow into a complete organism.



4. **BUDDING**: In this process, a new organism is developed from a small bud. A bud which is formed detaches to develop into a new organism.



5. VEGETATIVE PROPAGATION: A mode of reproduction in which part like the stem, root, leaves develop into new plant under favorable conditions.

Benefits

1. Plants can bear flowers, fruits earlier than those produced from seeds
- .2. Growing Banana, orange, rose, jasmine that have lost the capacity to produce seeds.
3. Genetical similarity is maintained in the plants.
eg. Sugarcane, rose, grapes by layering or grafting.

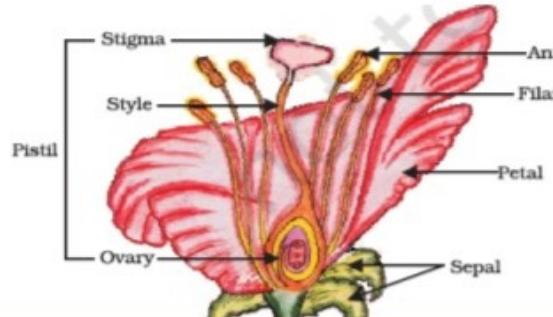
SEXUAL REPRODUCTION

When reproduction takes place as a result of fusion between two gametes, one from each parent, it is called sexual reproduction.

- This process of fusion between two gametes is called fertilization.
- The formation of gametes involves exchange of chromosomal (genetic) fragments between homologous chromosomes causing genetic recombination which leads to variation.

SEXUAL REPRODUCTION IN PLANTS

Parts of a Flower



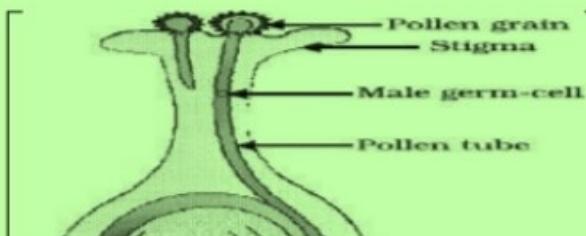
Sexual Reproduction in Plants-

Pollination-The process of transfer of pollen grains from an anther to the stigma of the flower.

Two types of pollination are:

(i) **Self-pollination**: The transfer of pollen grains from the anther to the stigma of the same flower or another flower of the same plant.

(ii) **Cross-pollination**: The transfer of pollen grain from the Anther to the stigma of another



flower or another flower of a different species.

Fertilization-Fertilization is the process of joining of male and female gamete to form a zygote e.g. in sexual reproduction. **Post fertilization changes**

Ovary- develops into Fruit **Ovule**-

REPRODUCTION IN HUMAN BEING

Humans use a Sexual Mode of reproduction. It needs sexual maturation which includes creation of the germ cells ie,

egg (ova) in the female and sperm in the male partner & this period of sexual maturation is called Puberty. Human beings have a well developed male and female reproductive system.

MALE REPRODUCTIVE SYSTEM

- The formation of male germ cell (sperms) takes place in the testes.
- A pair of testes are located inside scrotum situated outside the abdominal cavity. It is meant to keep relatively a low temperature needed for the production of sperms by testes.
- Testes release a male sex hormone called testosterone whose function is to:
 1. Regulate the production of sperm
 2. Brings about changes in appearance seen in boys at the time of puberty.

The secretion of prostate gland and seminal vesicle produce the fluid that nourishes and transports sperm (seminal fluid).

FEMALE REPRODUCTIVE SYSTEM

- The female germ cells or eggs are made in the ovaries, a pair of which is located in both side of abdomen.
- At the puberty, some of these Eggs start maturing. One egg is produced every month by one of the ovaries.
- Fertilization occurs in the fallopian tube of female genital tract.
- The fertilized egg also called zygote ($2n$) gets implanted in the lining of the Uterus, and start dividing. Actually uterus is richly supplied with blood to nourish the growing embryo. If zygote is not formed, the inner wall of uterus breaks which causes bleeding through vagina. This process is called MENSTRUATION.
- The Embryo gets nutrition from the mother's blood with the help of a special tissue called PLACENTA. It provides a large surface area for glucose and oxygen to pass from the mother to the embryo. Similarly the wastes from developing embryo are removed to mother's blood through placenta.

REPRODUCTIVE HEALTH

Reproductive Health means a total well-being in all aspects of reproductive, ie., physical emotional, social and behavioral.

Contraception: It is the avoidance of pregnancy. It can be achieve by Methods of contraception.

PHYSICAL BARRIER:-

- 1.Use of condoms, Diaphragm & cervical caps.
- 2.Copper-T or loop is placed in uterus to prevent pregnancy.

CHEMICAL METHOD:-

Oral contraceptive(OCs) - changes the hormonal balance to check the egg release in females. OCs cause side effect

SURGICAL METHOD:-

- 1.Vasectomy, the vas deferens of male is blocked to prevent sperm transfer.
- 2.Tubectomy, the fallopian tube of female is blocked to prevent egg to reach uterus

SEXUALLY TRANSMITTED DISEASE(STDs) – These are the infectious diseases transmitted through sexual contact .AIDS ,Gonorrhea, syphilis, genital herpes, warts are few commonly STDs.

Practice questions

Q. Explain the role of placenta in the development of human embryo.

Ans- **structure provides oxygen and nutrients to a growing baby.**

Q. Surgical methods can be used to create a block in the reproductive system for contraceptive purposes. Name such parts where blocks are created in male and female.

Ans- **(i) Male – Vasectomy – ligation of vas deferens. (ii) Female – Tubectomy – ligation of Fallopian tube**

Q. Name the method by which Hydra reproduces commonly. Is this method sexual or asexual?

Ans -Budding

Q. Protozoans reproduce by binary fission as well as multiple fission. In your opinion which process is better and why?

Q. State one function each of the following parts of human male reproductive system:

- (i) Vas deferens
- (ii) Testis
- (iii) Prostate Gland

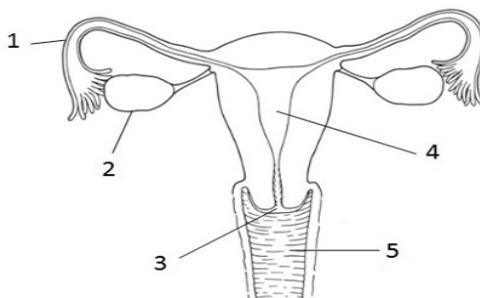
Ans- (i) Vas Deferens : It helps in the passage of sperms.
(ii) Testes : It produces sperms and male sex hormone- testosterone.
(iii) Prostate gland : It secretes alkaline fluid which is discharged into the urethra. It protects sperms from acidity of male urethra.

Q. List three distinguishing features between sexual and asexual types of reproduction.

Ans--

Asexual Reproduction	Sexual Reproduction
Involves participation of single parent	Involves participation of two parents
Does not involve fusion of gametes	Involves fusion of two gametes
Produces offspring that are identical to parent	Produces offspring that are not identical to either of the two parents

Q.



1. A. Name the parts 1,2,3,4 and 5 in the diagram.
 - B. Name the two surgical methods of birth control.
- Ans-1A-Fallopian tube 2- ovary 3- cervix 4- uterus 5- vagina**

1B- Vasectomy in males, Tubectomy in females.

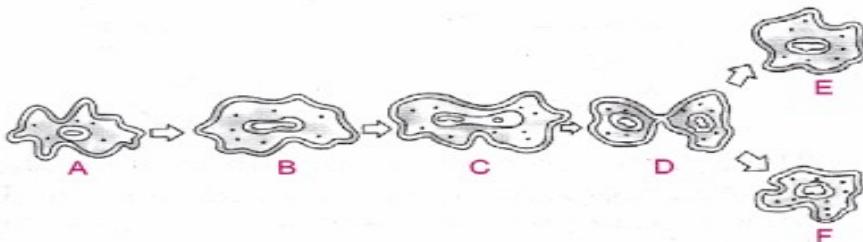
2. Differentiate two types of pollination that occurs in flowers.

Ans- Self pollination: that occurs within the same plant. **Cross-pollination:** that occurs between two flowers of two different plants but of the same kind.

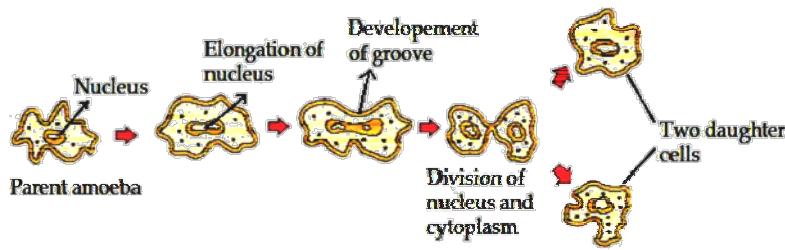
3. What is vegetative propagation? Write two of its advantages.

Ans- Vegetative propagation is a mode of asexual reproduction in which new plants are obtained from vegetative parts of the plants such as shoots or stem for the propagation of new plants. Two advantages of vegetative propagation are : (i) Plants which do not produce seeds are propagated by this method.

Q.



1. Analysis the above diagram and mention the different stages of Binary fission.



ANS- Binary fission in Amoeba

2. Reproduction is one of the most important characteristics of living beings. Give any two reasons in support of the statement.

Ans- It is one of the most important characteristics of the living organism. This is the method which allows the survival of the species. If reproduction does not take place, no living being will survive on the earth and all the organisms will go extinct.

State the changes that take place in the uterus when female gamete/egg is not fertilised.

Ans- Ans ; menstruation

Q. Name the following

Reproductive part that produce the female hormone

Site of fertilization

Entry of sperm

Ans –A-Ovary, B- Fallopian tube , C-Vagina

Q.Site of fertilization in mammals is

- | | |
|------------|--------------------|
| (a) ovary | (b) uterus |
| (c) vagina | (d) fallopian tube |

Ans : (d) fallopian tube

Q.Which of the following is embedded in the uterine wall?

- | | |
|--------------|-------------------|
| (a) Zygote | (b) Embryo's head |
| (c) Placenta | (d) Eggs |

Ans : (c) Placenta

Q.DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R).

Mark the correct choice as:

- Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion(A).
- Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
- Assertion (A) is true but reason (R) is false.
- Assertion (A) is false but reason (R) is true.
- Both Assertion and Reason are false.

Q.Assertion : HIV-AIDS is a bacterial disease.

Reason : It spreads through sharing of food and water.

Ans : (e) Both Assertion and Reason are false.

Q.Assertion : At puberty, in boys, voice begins to crack and thick hair grows on face.

Reason : At puberty, there is decreased secretion of testosterone in boys.

Ans : (c) Assertion (A) is true but reason (R) is false.

Q.Assertion : Pollen grains from the carpel stick to the stigma of stamen.

Reason : The fertilised egg cells grow inside the ovules and become seeds.

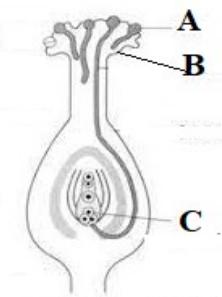
Ans : (d) Assertion (A) is false but reason (R) is true.

Q.Assertion : Scrotum is present outside the abdominal cavity.

Reason : It stores sperms which require a lower temperature than the normal body temperature.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Q.



A.Name the part marked A in the diagram.

B. How does A reach part B?

C. What happens to the part marked C after fertilization is over.

Ans-A-Pollen grains, B-Stigma, C- Ovule

B- Through pollen tube .

C-Ovule becomes seed.

Q. In a group discussion ,In a biological lab three students were discussing the process of formation of seeds in the flowering plants. One of them said, pollination is main step in the formation of seed. The second student said "Does pollination also occur in grasses which possess small and dull flowers?" How does the pollination occur in rose? Said the third student.

What is pollination?

What are the different agencies which help in pollination?

How does pollination occur in grasses and rose.

Ans-A- **Pollination is the act of transferring pollen grains from the male anther of a flower to the female stigma.**

B-WIND , WATER,ANIMALS(INSECTS)

C-Grass- by wind, Rose -by insects

Q.Organisms such as Hydra use regenerative cells for reproduction in the process of budding. In Hydra, a bud develops as an outgrowth due to repeated cell division at one specific site. These buds develop into tiny individuals and when fully mature, detach from the parent body and become new independent individuals.

1.How does hydra reproduce?

Fragmentation

Binary fission

Budding

Vegetative propagation

Ans: C.Budding

2.Hydra cut into a number of pieces will

Die

Sporulate

Develop sex organ

Regenerate to form new individual

Ans: D. Regenerate to form new individual

Q. Stamens and pistil are the reproductive parts of a flower which contain the germ-cells. The flower may be unisexual (papaya, watermelon) when it contains either stamens or pistil or bisexual (Hibiscus, mustard) when it contains both stamens and pistil. Stamen is the male reproductive part and it produces pollen grains that are yellowish in colour. Pistil is present in the centre of a flower and is the female reproductive part. It is made of three parts. The swollen bottom part is the ovary, middle elongated part is the style and the terminal part which may be sticky is the stigma. The ovary contains ovules and each ovule has an egg cell. The male germ-cell produced by pollen grain fuses with the female gamete present in the ovule. This fusion of the germ-cells or fertilisation gives us the zygote which is capable of growing into a new plant.

1. Receptive part of pistil is

- | | |
|----------|----------|
| Placenta | C. Ovary |
| Stigma | D. Style |

ANS : B. Stigma

2. Fertilization in flowering plants produces

- | | |
|----------|-------------|
| Zygote | C. Placenta |
| Nucellus | D. Gametes |

ANS : A. Zygote

3. Seed is formed from

- | | |
|--------------------|-----------------------|
| unfertilized ovary | C. Fertilized ovule |
| Fertilized ovary | D. Unfertilized ovule |

ANS : C. Fertilized ovule

4. In flower the male organ is

- | | |
|--------|-----------|
| Stamen | C. Carpel |
| Sepal | D. Petal |

ANS: A. Stamen

5. In flower the female organ

- | | |
|-----------|----------|
| A. Stamen | C. Sepal |
| B. Pistil | D. Petal |

ANS : B. Pistil

HEREDITY AND EVOLUTION

Accumulation of Variations

Genetics: Branch of science that deals with heredity and variation.

Heredity: It means the transmission of features/ characters/ traits from one generation to the next generation.

Variation: The differences among the individuals of a species/ population are called variations.

- There are two types of variations

Somatic variation: Takes place in the body Example: boring of pinna, cutting of tails in dogs

Genetic variation: Takes place in the gametes/cells. (Reproductive cells)

Example: human height, skin colour.

Traits: Trait is a specific characteristic of an individual . Traits can be determined by genes, environmental factors or by a combination of both. Traits are essentially physical characteristics. These include length of the body, body

shape, colour pattern, eyesight.

Traits are of two types

Acquired: Those characters which are obtained during the lifetime by any organism. For example - dancing, swimming, cycling, knowledge etc.

Inherited : Those characters which are present since birth and can be transferred from one generation to another.

For example- eye colour, hair colour, height, complexion etc.

Accumulation of Variation during Reproduction

- Variations appear during reproduction whether organisms multiply asexually or sexually.

Asexual Reproduction

Variations are fewer.

Occurs due to small, inaccuracies in DNA copying

(mutation)

Sexual Reproduction

Variations are large.

Occurs due to crossing over and separation of chromosomes, (mutation).

Importance of Variation

- Depending upon the nature of variations different individuals would have different kinds of advantage. For Example- bacteria that can withstand heat will survive better in a heat wave.
- It increases the chances of its survival in a changing environment. Free ear lobes and attached ear lobes are two variants found in human populations.
- There will be only minor differences between them, generated due to small inaccuracy in copying of DNA.
- If sexual reproduction is involved, greater diversity will be generated.

Gene: It is a section of DNA that provides information for one protein in a cell.

Genes control the trait. It is a unit of inheritance.

Chromosome: Each gene set is present as separate independent pieces called chromosomes. Each cell will have two copies of each chromosome, one from each parent. The total number of chromosomes in the offspring will be 46, 23 from mother and 23 from father

Mendel and His Work on Inheritance

Gregor Johann Mendel (1822-1884): Started his experiments on plant breeding and hybridization

- Mendel was known as the Father of Genetics

Plant selected by Mendel: Pisum Sativum (garden pea). Mendel used a number of contrasting characters for garden pea.

Characters: Seven pairs of contrasting characters in garden pea .

Flower colour

Flower position

Seed colour

Seed shape

Pod shape

Pod colour

Height of plant

Genetic Terminology

Gene: Mendel used the term factor for a gene. A gene is the unit of DNA responsible for the inheritance of character.

Allele: A pair of genes that control the two alternatives of the same character e.g., TT/tt.

Heterozygous: The organism in which both the genes of a character are unlike e.g., Tt.

Homozygous: The organism in which both the genes of a character are similar e.g., TT, tt.

Dominant: The gene which expresses itself in F1 generation is known as dominant gene.

Recessive: The gene which is unable to express itself in presence of the dominant gene.

Genotype: It is the genetic constitution (genetic makeup) of an organism which determines the characters.

Phenotype: It is the physical appearance of an individual. (Tall or short)

Mendel's Experiments: Mendel conducted a series of experiments in which he crossed the pollinated plants to study one character (at a time)

TT, tt ----- Pure or homozygous condition

Tt ----- Heterozygous condition or Hybrid

Phenotypic ratio: Ratio among numbers of individuals with different external features, e.g., 3:1

Genotype → Genetic makeup [TT, Tt or tt]

Genotypic ratio: Ratio among numbers of individuals with different genetic makeup, e.g., 1:2:1

Monohybrid Cross:

- Cross between two pea plants with one pair (monohybrid cross) contrasting characters,

Example: Tall or Short Plants

Dihybrid Cross

- A cross made between two plants having two pairs of contrasting characters is called dihybrid cross.

Example- round green seed and wrinkle yellow seed

Mendel's laws of inheritance

Law of dominance

- Some alleles are dominant while others are recessive. An organism with at least one dominant allele will display the effect of the dominant allele.

Law of segregation

- During gamete formation, the alleles for each gene segregate from each other so that each gamete carries only one allele for each gene.

Law of independent assortment

- Genes for different traits can segregate independently during the formation of gametes.

Mechanism of Heredity: Most of the characters or traits of an organism are controlled by the genes. Genes are actually segments of DNA guiding the formation of proteins by the cellular organelles. These proteins maybe enzymes, hormones, antibodies, and structural components of different types of tissues. In other words, DNA/ genes are responsible for structure and functions of a living body. Genotype of an individual controls its phenotype.

Sex Determination

- Phenomenon of decision or determination of sex of an offspring.

Factors Responsible for Sex Determination

Environmental: In some animals the temperature at which the fertilised eggs are kept decides the gender.

Example- in snails, some lizards and turtle.

In some animals like humans gender of individual is determined by a pair of chromosomes called sex chromosomes.

Sex Chromosomes: In human beings there are 23 pairs of chromosomes. Out of these 22 pairs of chromosomes are called autosomes and the last pair of chromosomes that help in deciding gender of that individual are called sex chromosomes. XX – female; XY – male.

- Male produces two genetic types of sperms, half with X and other half with Y chromosome. The female produces only one genetic type of ova, all carrying X chromosome.
- This shows that all children will inherit an X chromosome from their mother regardless whether they are boys or girls.
- Thus sex of children will be determined by what they inherit from their father, and not from their mother.

Practice questions

Q In case of round yellow and green wrinkled, which is dominant trait set?

Ans: Round and wrinkled

Q What is the function of genes in an organism?

Ans: Genes are the building blocks of life. They also lead to the expression of particular physical characteristics and traits like hair or eye color.

Q Guinea pig having black colour when crossed with Guinea pig having the same colour produced 100 offspring, out of which 75 were black and 25 were white. Now find out - which trait is dominant and which is recessive?

Ans: Black is dominant and white is recessive

Q List two contrasting visible characters of Garden pea, Mendel used for his experiments?

Ans : Height -tall and short

Pod shape: round and wrinkled

Assertion and Reason :

Q For question numbers 5 and 6 two statements are given-one labelled as Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given ahead:

- (a) Both 'A' and 'R' are true and 'R' is correct explanation of the Assertion.
- (b) Both 'A' and 'R' are true but 'R' is not correct explanation of the Assertion.
- (c) 'A' is true but 'R' is false.
- (d) 'A' is false but 'R' is true.

i) **Assertion:** Two pink coloured flowers on crossing resulted in 1 red, 2 pink and 1 white flower progeny.

Reason: It is due to double fertilization.

ANS-(C)

ii) **Assertion:** The sex of a child in human beings will be determined by the type of chromosome he/she inherits from the father.

Reason: A child who inherits 'X' chromosome from his father would be a girl (XX), while a child who inherits a 'Y' chromosome from the father would be a boy (XY).

ANS-(A)

Q Study the following cross showing self pollination in F1, fill in the blank and answer the question that follow:

Parents	RRYY	×	rryy
	Round, yellow		Wrinkled, green
F1	Rr Yy	×

ANS- RrYy

Q. In a pea plant, the trait of flowers bearing purple colour (PP) is dominant over white colour (pp). Explain the inheritance pattern of F1 and F2 generations with the help of a cross following the rules of inheritance of traits. State the visible characters of F1 and F2 progenies.

ANS- 1.Purple trait - PP

2. White trait -pp

Visible Characters of F1 progeny all flowers are purple coloured (Pp). In F2 progenies 3 are purple coloured and 1 is white colour .

So, the phenotypic ratio is 3:1. (1 PP, 2 Pp, 1 pp)

Q A study found that children with light-coloured eyes are likely to have parents with light-coloured eyes. On this basis, can we say anything whether the light eye colour trait is dominant or recessive? Why or why not?

ANS-No. From the given statement, we cannot say with certainty whether light eye colour is dominant or recessive. However, since both children and their parents have light eye colour, the possibility is that light eye colour is a recessive trait.

Q In a monohybrid cross between tall pea plants denoted by TT and short pea plant by tt, Sehaj Anant obtained only tall plants denoted by Tt in F1 generation. However in F2 generation she obtained both tall and short plants. Using the above information explain the law of dominance.

Ans: Mendel's law of dominance states that: "When parents with pure, contrasting traits are crossed together, only one form of trait appears in the next generation. The hybrid offsprings will exhibit only the dominant trait in the phenotype." Law of dominance is known as the first law of inheritance.

Q. Sex determination in man depends upon 23rd pair of chromosomes, called the sex chromosomes. If it were a

homologous pair-XX, it would be a female. If it were a heterozygous pair – XY, it would be a male. Based on this statement, answer these questions:

(i) How many types of eggs/ova and how many type of sperms female and male human being will produce respectively?

Ans Female have 22+X and 22+X Male : 22+ X and 22 + Y

Q. After self-pollination in pea plants with round, yellow seeds, following types of seeds were obtained by Mendel:

SEEDS	NUMBERS
Round, yellow	630
Round, green	216
Wrinkled, yellow	202
Wrinkled, green	64

Analyse the result and describe the mechanism of inheritance which explains these results.

ANS- ANS: Law of independent assortment : 9:3:3:1

Q. An angiosperm plant having red flowers when crossed with the other having same colour flower produced 40 progenies, out of which 30 were red coloured flowers, 10 plants were with white flowers. Find out:

(i) What is the possible genotype of parent plants?

ANS- Both parent plants are heterozygous for a dominant allele that causes the red colour. The dominant allele is for red flowers (R) and the recessive allele is for white flowers (r), hence the genotype of the parents is Rr.

(ii) What is the cross called and what is phenotype ratio?

ANS- This cross is known as a monohybrid cross. The chance is that 75 percent will be red and 25 percent will be white.

Q. A man with blood group ‘A’ marries a woman with blood group ‘O’ and their daughter has blood group O. Is this information enough to tell you which of the traits-blood group A or O is dominant? Why or why not?

ANS- No, This information is not sufficient to determine which of the traits - blood group A or O - is dominant. Thus is because we do not know about the blood group of all the progeny.

Q. A cross was carried out between pure breed tall pea plant with pure dwarf pea plant and F1 progeny was obtained. Later, F1, progeny was selfed to obtain F2 progeny. Answer the following questions:

(a) What is the phenotype of the F1 progeny and why?

(b) Give the phenotypic ratio of the F2 progeny.

(c) Why is F2 progeny different from the F1 progeny?

ANS- a) The phenotype of F1 progeny is Tt because F1 or hybrid plants were not intermediate between the two alternate forms of a character. They resembled only one parent. In a cross between tall and dwarf of pea plants the F1 plants were all tall.

b) The phenotypic ratio of F2 progeny is 3: 1.

c) F1 progeny resembled only one parent which is dominant in nature but in F2 progeny phenotypically three plants are tall and one plant is dwarf. But according to genotype ratio one plant is pure tall two are hybrid tall and one plant is a pure dwarf.

Q Why is it that asexual reproduction produces exact copies but sometimes minor variations are seen in next progeny?

Ans- In case of asexual reproduction, variation is significantly less since only a single parent is involved. Very small changes occur due to inaccuracies during DNA copying that pass on to the progeny. Thus, offsprings of asexual reproduction are more or less genetically similar to their parents.

Q If YYRR is round yellow, what do the following represent?

(i)Yyrr (ii) yyRR

Ans- wrinkle Yellow ii) Round green

Q. Do genetic combination of mothers play a significant role in determining the sex of a new born? Comment on it.
ANS- No, mothers have no role in determining the sex of a new born. As the 23rd pair of chromosomes in female cells have a pair of X chromosomes, all children will inherit an X chromosome from the mother.

Q. In some animals, the temperature at which fertilized eggs are kept determines whether the animal developing in the egg will be male or female. In other animals, such as snails, individuals can change sex that is sex is not genetically determined. In human beings, sex of individuals is largely genetically determined. All chromosomes in human beings are not paired. We have 22 pairs and one pair of sex chromosomes which is odd and not always a perfect pair.

(i) Which pair of chromosomes are present in Male?

ANS- c)XY

(ii) How many pairs of chromosomes are called autosomes?

ANS-b) 22

(iii) Who is responsible for birth of male child?

ANS a) Father

Q A husband has 46 chromosomes, his wife has 46 chromosomes and their offspring has 46 pairs of chromosomes which is obtained by the fusion of male and female gametes?

a) Do the gametes possess same numbers of chromosomes as are present in individual?

a) Do the gametes possess same numbers of chromosomes as ANS-No, they contain half the number of chromosomes ie 23

b) How 46 chromosomes are restored in the zygote?

ANS-During gamete formation reduction division (meiosis) takes place and after the fertilization it restores the no. ie 46

Q. In one of his experiments with pea plants, Mendel observed that when a pure tall pea plant is crossed with a pure dwarf pea plant in F₁ generation only tall plants appear.

a) What happens to the traits of the dwarf plants in this case?

ANS-The dwarf trait is recessive that is it can only be expressed when present in homozygous condition.

b) When the F1 generation plants were self fertilized he observed that in the plants of second generation (F2) both tall and dwarf plants were present. Why it happened?

Q. Each cell will have two copies of each chromosome, one each from the male and female parents. Every germ cell will take one chromosome from each pair and these may be of either maternal or paternal origin. When two germ cells combine they will restore the normal number of chromosomes in the progeny. Ensuring the stability of the DNA of the species. Such a mechanism of inheritance expresses the result of the Mendel experiment, and is used by all sexually reproducing organism. But asexually reproducing organism also follows similar rules of inheritance.

i) When two germ cells combine, they restore the normal number of chromosomes because each parent contributes.

Chromosomes are contributed from father.

c) Chromosomes are contributed from mother.

d) None of the above.

ii) Germ cells are also called :

- a) sex cells b) gametes c) both a and b d) none of the above

iii) Each cell will form its copy by :

- a) replication of DNA b) mitosis division c) cell division d) none of the above

iv) DNA copies generated will be similar but may not be identical to the original :

- a) true b) false

Q. Mendel used a number of contrasting visible characters of garden peas – round/wrinkled seeds, tall/short plants, white/violet flowers and so on. He took pea plants with different characteristics – a tall plant and a short plant, produced progeny by crossing them, and calculated the percentages of tall or short progeny.

a) Mendel selected pea plant for his experiments :

i) seven

pairs of contrasting characters ii) cheaper

iii) easy to handle

iv) all the above

flower is :

violet flower iv) blue flower

b) The visible contrasting character for white

i) red flower ii) yellow flower iii)

Q. The rules for inheritance of such traits in human beings are related to the fact that both the father and the mother contribute practically equal amounts of genetic material to the child. This means that each trait can be influenced by both paternal and maternal DNA. Thus, for each trait there will be two versions in each child.

a) Which of the following is responsible for the storage of genetic material?

- i) DNA ii) RNA iii) Protein iv) Ribosome

ANS-i) DNA

b) Each trait can be influenced by both paternal and maternal DNA:

- i) true ii) false

Ans-i) true

c) How many versions will be there in each child for each trait:

- i) one ii) two iii) three iv) four

Ans- ii) two

Q. The most obvious outcome of the reproductive process still remains the generation of individuals of similar design. The rules of heredity determine the process by which traits and characteristics are reliably inherited. And an alternative form of a gene that is located at a specific position on a specific chromosome is known as allele. Heredity means transmission of traits from one generation to next.

i) An alternative form of specific gene in the genetics is:

- a) genes b) nucleus c) allele d) cell

Ans-c) allele

ii) Transfer of character is:

- a) transformation b) evolution c) heredity d) all the above

Ans-c) heredity

iii) Which type of letter is used to show dominant allele:

- a) specific symbols b) capital letter c) numbers d) small letter

Ans:b) capital letter

LIGHT: REFLECTION AND REFRACTION

Light travels in a straight line- Speed of light in vacuum /air = 3×10^8 m/s.

Reflection- Bouncing back of light when it strikes on a polished surface like mirror.

Laws of reflection-

- (i) Angle of incidence= Angle of reflection.
- (ii) The incident ray, the reflected ray and the normal at the point of incidence all lie in the same plane.

Concave mirror- Concave mirror is a part of a hollow sphere whose outer part is silvered and the inner part is reflecting surface.

Convex mirror- It is a part of a hollow sphere whose outer part is reflecting surface and inner part is silvered.

Centre of curvature- Centre of a hollow sphere of which the spherical mirror forms a part is called centre of curvature. Denoted by C.

Radius of curvature- Radius of a hollow sphere of which the spherical mirror forms a part is called radius of curvature. Denoted by R.

Pole- The mid point of a spherical mirror is called Pole. Denoted by P.

Aperture- The diameter of the part of a spherical mirror exposed to the incident light is called aperture of mirror.

Principal axis- A line joining the centre of curvature and pole of a spherical mirror and extended on either side is called Principal axis of spherical mirror.

Principal focus- A point on the principal axis of a spherical mirror where the rays of light parallel to the principal axis meet or appear to meet after reflection from spherical mirror is called Principal focus. Denoted by F.

Focal length- Distance between the pole (P) and the principal focus (F) of a spherical mirror is called focal length of spherical mirror.

$f = R/2$, where R is the radius of curvature.

Focal length and radius of curvature of a concave mirror are negative.

Focal length and radius of curvature of a convex mirror are positive.

Radius of curvature of plane mirror= ∞ (infinite)

Focal length of a plane mirror = ∞ (infinite)

Sign conventions for reflection by spherical mirrors

- (i)All distances are measured from the pole of a spherical mirror.
- (ii)Distances measured in the direction of incident light are taken as positive. Distances measured in the direction opposite to that of the incident light are taken as negative.
- (iii)The upward distances perpendicular to the principal axis are taken as positive, while the downward distances perpendicular to the principal axis are taken as negative.

Mirror formula- The relation between u, v and focal length (f) of a spherical mirror is known as mirror formula. That is $1/u + 1/v = 1/f$.

Linear magnification- Linear magnification produced by a mirror is defined as the ratio of the size of the image to the size of the object. Denoted by m.

$m = h'/h = -v/u$.

Linear magnification produced by a plane mirror= + 1.

Refraction of light- The bending of light rays when they pass obliquely from one medium to another medium is called refraction of light.

A transparent medium through which light travels fast is known as optically rarer medium.

A transparent medium through which light travels slow is called as optically denser medium.

Laws of refraction-

- (i) Incident ray, refracted ray and the normal to the surface separating two media all lie in the same plane.
- (ii) The ratio of the sine of the incident angle ($\angle i$) to the sine of the refracted angle ($\angle r$) is constant.

$$\sin i / \sin r = \text{constant.}$$

This constant is known as the refractive index of second medium w.r.t. the first medium.

Absolute refractive index of a medium is defined as the ratio of the speed of light in vacuum (c) to the speed of light in the medium (v) . That is $n = c/v$

Relative refractive index of medium 2 w.r.t. the medium 1 is defined as the ratio of the speed of light in medium 1 to the speed of light in medium 2.

$$n_{21} = n_2 / n_1$$

A medium whose refractive index is large is known as optically denser medium.

A medium whose refractive index is small is known as optically rarer medium.

Lenses are of two types: (i) Convex lens or converging lens- It is thick in the middle and thin at the edges.

(ii) Concave lens or diverging lens- It is thin in the middle and thick at the edges.

Convex lens converges the rays of light falling on it and acts as a magnifying glass.

Concave lens diverges the rays of light falling on it.

Principal axis of a lens is a line joining the centre of curvatures of two spherical surfaces forming a lens.

Optical centre of a lens is a point inside or outside a lens through which rays of light pass without deviation.

Principal focus of a lens is a point on the principal axis where all the rays of light parallel to the principal axis meet or appear to meet after refracting through the lens.

Focal length of a lens is the distance between the optical centre and the principal focus of the lens.

Focal length of a convex lens is positive.

Focal length of a concave lens is negative.

$$\text{Lens formula} = -1/u + 1/v = 1/f.$$

Magnification produced by a lens : $m = \text{Size of image} / \text{Size of object} = h' / h$. Also $m = v/u$

Power of lens : $P = 1/f$ (in m) = $100/f$ (in cm)

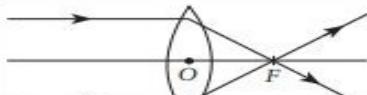
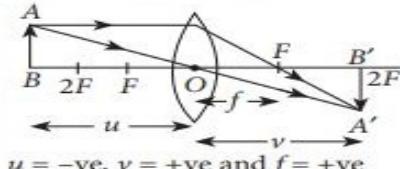
Unit of power is dioptre (D).

Power of a lens is 1 dioptre if its focal length is 1 m or 100 cm.

Power of a convex lens is positive, Power of a concave lens is negative.

Image formation by a convex lens :

► **Image formation by lenses :**

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

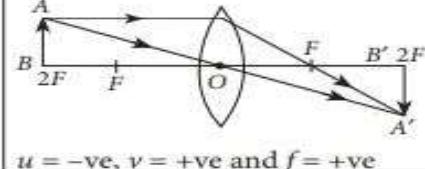
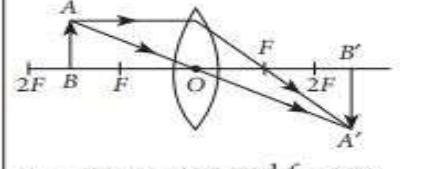
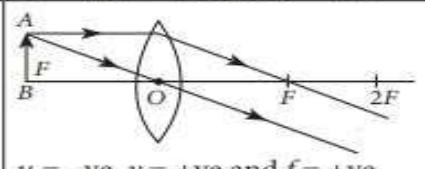
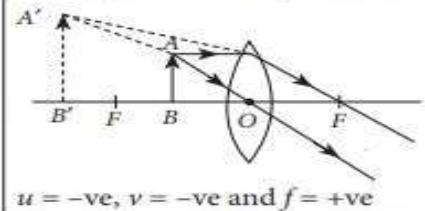
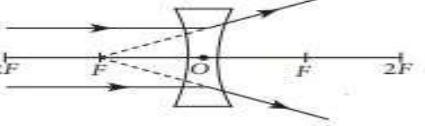
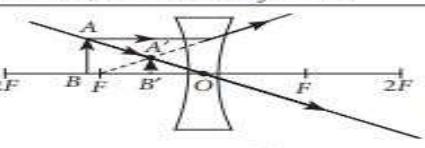
(c)		At $2F$	At $2F$	Real, inverted and same sized
(d)		Between F and $2F$	Beyond $2F$	Real, inverted and enlarged
(e)		At F	At infinity	Real, inverted and enlarged
(f)		Between F and O	On the same side of the lens	Virtual, erect and enlarged

Image formation by a concave lens :

Concave lens				
	Ray diagram	Position of object	Position of image	Nature of image
(a)		At infinity	At F	Virtual, erect and highly diminished
(b)		Between infinity and O	Between F and O	Virtual, erect and diminished

Human eye and colourful world

Human eye is like a camera.

Parts of human eye are- Cornea, Iris, Lens, Ciliary muscles, Retina, Optic nerve.

Cornea is the outermost part of eye.

Iris controls the size of the pupil and pupil controls and regulates the entering the eye.

Lens of a human eye is a convex lens which focus the light on the eye to make the image of an object.

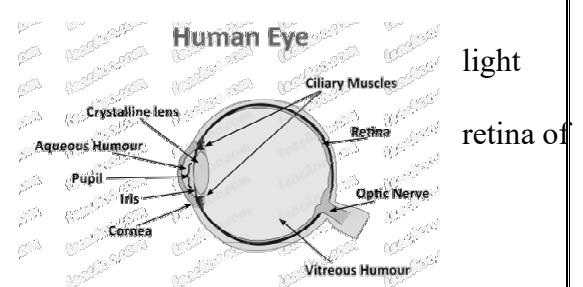
Ciliary muscles increases or decreases the focal length of the eye lens.

Retina acts as the screen or film to obtain the image of an object.

Optic nerve carries signal to the brain for interpretation.

Accommodation of an eye is the ability of eye lens to change its focal length to form sharp images of objects at different positions from the eye on the retina of the eye.

Near point of a normal human eye is 25 cm.



Far point is the farthest position of an object from a human eye so that the sharp image of the object is formed on the retina.

Range of vision is the distance between the near point and the far point of an eye.

For normal human eye , the range of vision is 25 cm to infinity.

Power of accommodation of a normal human eyeis about 4 dioptre.

Defective eye – The eye which is unable to see the objects clearly is known as defective eye.

Common defects in a human eye are :

Hypermetropia or long sightedness or far -sightedness.

Myopia or short- sightedness or near- sightedness.

Presbyopia (iv) Astigmatism.

Hypermetropia- A human eye which can see distant object clearly but cannot see clearly the near objects is said to be suffered with a defect called hypermetropia.

Causes of hypermetropia- It is due to (i) increase in the focal length of eye lens (ii) the decrease in the size of eye ball.

Hypermetropia can be corrected by using a convex lens of suitable focal length.

Myopia- A human eye which can see near object clearly but cannot see clearly the distant objects is said to be suffered with a defect called Myopia.

Causes of Myopia- It is due to (i) elongation of the eye ball (ii) The excessive curvature of the cornea.

Myopia can be corrected by using a concave lens of suitable focal length.

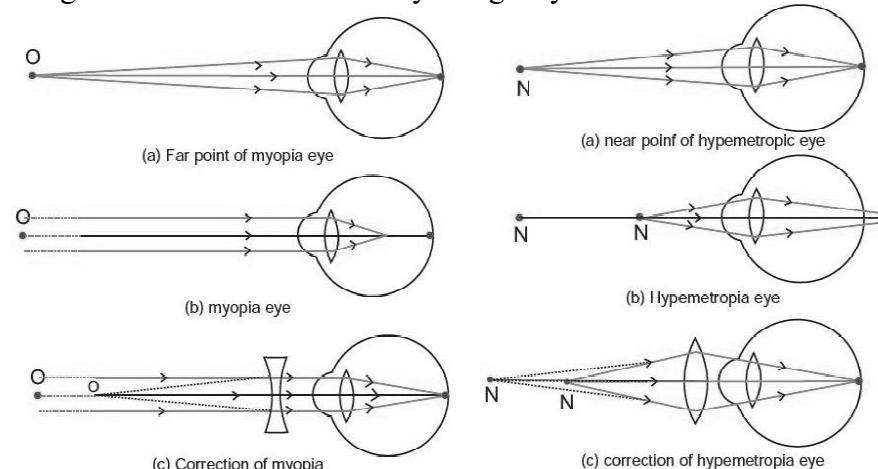
Presbyopia- A human eye which cannot see clearly the near objects in old age is said to be suffered with a defect called Presbyopia.

Cause of Presbyopia- It arises because of the decrease in the flexibility of the human eye lens.

Presbyopia can be corrected by using a bi- focal lens consisting of a concave and convex lens.

Astigmatism- A human eye which cannot focus on both horizontal and vertical lines simultaneously suffers from astigmatism.

Astigmatism can be corrected by using a cylindrical lens.



Cataract- A human eye in which a opaque membrane is formed over the eye lens suffers from cataract.

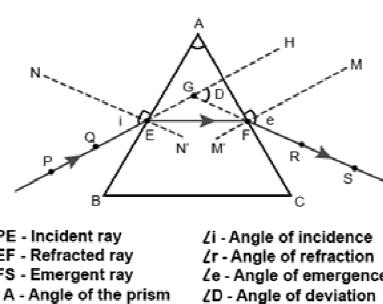
Cataract can be corrected by performing surgery.

Prism is a homogenous transparent refracting medium bounded two non- parallel surfaces inclined at some angle.

Angle of prism- The angle between two non-parallel refracting surfaces is called angle of prism.

Angle of deviation- The angle between the directions of incident and the emergent ray of light is called angle of deviation of the light passing through the prism.

Dispersion of white light- The phenomenon of splitting white



by at least
surfaces is
ray of light
ray of light
light into

seven colours when it passes through a glass prism is called **dispersion of white light**.

Spectrum- A band of seven colours of white light is called spectrum.

Red colour deviates the least while passing through a glass prism.

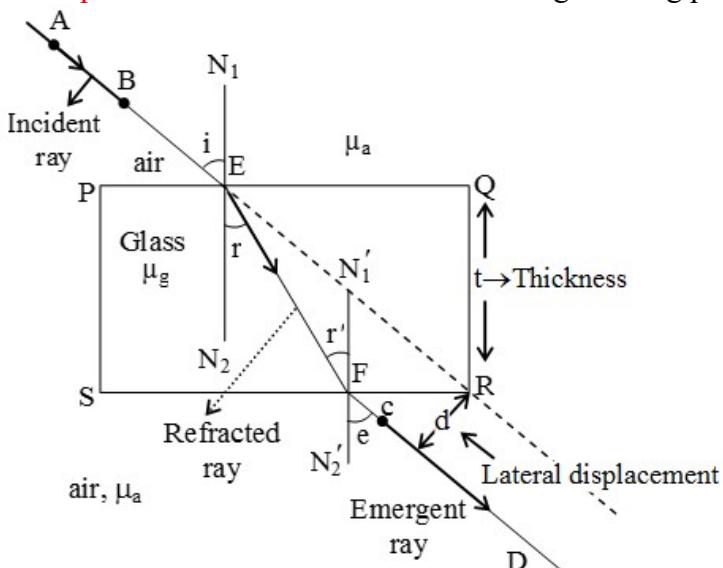
Violet colour deviates the most while passing through a glass prism.

Glass prism splits colours of white light passing through it and does not produce any colour by itself.

Rainbow is the example of dispersion of sunlight.

Rainbow is formed by tiny drops of water suspended in the atmosphere.

Atmospheric refraction- The refraction of light taking place in the atmosphere is known as atmospheric refraction.



Twinkling of stars takes place due to atmospheric refraction of light emitted by the stars.

When light falls on tiny particles , this light is absorbed by these particles. Then these particles re- emit light in all directions. This process is known as Scattering of light.

In a clear atmosphere of the earth, colours of small wavelengths like violet, and blue are scattered more than red colour.

In a polluted atmosphere of the earth (containing dust and smoke particles) , the scattering of colours of higher wavelengths is more than the scattering of smaller wavelengths.

Practice questions

Q. What is meant by power of accommodation of eye ?

Ans. Ability to adjust focal length of eye.

Q. Write function of the following parts of Human eye-

(i) Retinna (ii) Lens (iii) Cornea

Q. Image of an object is formed at focus of a convex lens. Where is the object located?

Ans. Very far or Infinity

Q. Name the following-

(i) Used in shaving mirror (ii) Used as rear view mirror (iii) Used as magnifying glass

Ans. Concave mirror, Convex mirror, Convex lens.

Q. Arrange the following colour of lights in increasing order of wavelength.

(i) Red (ii) Green (iii) Blue

Ans. (iii), (ii), (i)

Q. Radius of curvature of a convex mirror is 20cm.What is the value of its focal length?

Ans. 10cm.

Q. Focal length of a convex lens is 20 cm. Calculate its power.

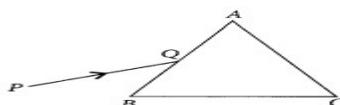
Ans. +5D

Q. In a concave mirror of focal length 20cm, the object and image are located at the same point.

(i) What is the distance of object? (ii) What is the distance of Image?

Ans. 40 cm each

Q A narrow PQ of white light is passing through a glass prism ABC as shown in the diagram. Trace it on your answer sheet and show the path of the emergent beam as observed on the screen DE.



phenomenon observed.

(i) Write the name and cause of the

(ii) Where else in nature is this phenomenon observed?

(iii) Based on this observation, state the conclusion which can be drawn about the constituents of white light.

Ans. Dispersion, Rain bow, It consists of seven colour

Q. Make a diagram to show how hypermetropia is corrected ? The near point of hypermetropic eye is 1 m. What is the power of the lens required to correct this defect. Assume that the near point of the normal eye is 25 cm

Ans. Convex lens of Power 3D. Use lens formula to get this value.

Q. The following table gives the value of refractive indices of a few media.

Medium	1 Ice	2 Water	3 Kerosene	4 Flint glass	5 Ruby	6 Diamond
Refractive index	1.31	1.333	1.44	1.66	1.71	2.42

Name the medium having highest optical density.

Name the medium having lowest optical density.

What happens when light passes through water to flint glass?

In which medium light travel faster?

Ans. (a) Diamond, (b) Ice (c) Speed will decrease/Ray is bent towards the normal (d) Ice

Q. How will you use two identical prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light? Draw the diagram

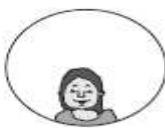
Ans. The second prism will be placed in inverted position in contact with the first.

Q. An object is situated at 8 cm from a convex lens of focal length 10 cm. Find the position and nature of image. Draw ray diagram to illustrate the formation of image,

Ans. Image Virtual, erect, distance of image 40 cm.

Ray diagram using a convex lens.

Q. Images of a child in two mirrors are shown below.



Mirror 1

Mirror 2

Identify these mirrors.

Ans. Concave, Convex

Q. The ability of a medium to refract light is also expressed in terms of its optical density. Optical density has a definite connotation. It is not the same as mass density. We have been using the terms 'rarer medium' and 'denser medium' quite often in the chapter of light. It actually means 'optically rarer medium' and 'optically denser medium', respectively. When can we say that a medium is optically denser than the other ? In comparing two media, the one with the larger refractive index is optically denser medium than the other. The other medium of lower refractive index is optically rarer.

Optical density is:

Mass/Volume

Ability to refract light

Ability to reflect light

None of these

An optically rarer medium is one in which :

Speed of light is more.

Speed of light is less.

Speed equals to speed of sound

None of these

An optically denser medium is one in which :

Speed of light is more

Speed equals to speed of sound

Speed of light is less

None of these

When light travels from an optically denser medium to an optically rarer medium :

It bends towards the normal

It bends away from the normal

It passes without deviation

Depends upon the two media in contact

Ans. (i)- b,(ii)-a, (iii)-c,(iv)-a

Q. These consist of two statements – Assertion (A) and Reason (R). Answer these questions (1-3) selecting the appropriate option given below:

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

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

(c) A is true but R is false

(d) A is False but R is true

1. (A) Focal length of a concave mirror is negative.

(R) Concave mirror is used as a shaving mirror.

Ans-(b)

2. (A) A Myopic person can't see distance objects properly.

(B) It is corrected by a concave lens.

Ans-(b)

3.(A) A light ray is refracted whenever it passes from one medium to another.

(B) In all kind of refraction bending of light ray takes place.

Ans-(c)

Q. Shyam participated in a group discussion in his interschool competition on the practical application of light and was very happy to won a award for his school. That very evening his father gave treat to celebrate Shyam's win. Shyam while sitting saw image of a person sitting at his backside in his curved plate and could see that person's mobile drop in flower bed. Person was not aware until Shyam went and informed him.

He thanked Shyam for his clever move.

a)From which side of his plate Shyam observed the incident –

i)outward curved ii)inward curved iii)plane surface iv) mirror

b)Part of plate from which Shyam observed the incident acted like a-

i)concave mirror ii)convex mirror iii)plane mirror iv) lens

c)The nature of the size of the image formed in above situation is –

i)real, inverted and magnified

ii)same size , laterally inverted

iii)virtual, erect and diminished

iv)real , inverted and diminished

d)Magnification of the image formed by convex mirror is –

i)0 ii) more than 1 iii)equal to 1 iv)less than 1

Ans.

ii)inwards curved

ii)convex mirror

ii)virtual , erect and diminished

iv)less than 1

ELECTRICITY

Charge: It is an inherent property of the body due to which the body feels attractive and repulsive forces. There are two types of electric charges:

Positive and (ii) Negative

Like charges are repelling each other.

Unlike charges attract each other.

Conductors and insulators: Those substances through which electricity can flow are called conductors. All the metals like silver, copper, aluminum etc. are conductors.

Those substances through which electricity cannot flow are called insulators. Glass, ebonite, rubber, most plastics, paper, dry wood, etc., are insulators.

Potential Difference: The amount of work done in moving unit positive charge from one point to another in an electric field is known as potential difference. Potential difference = Work done/Quantity of charge transferred
If a W joule of work has to be done to transfer Q coulombs of charge from one point to another point, then the potential difference V between the two points is given by the formula:

Potential difference, $V = W/Q$

The SI unit of potential difference is volt (V).

1 volt: One volt is defined as the potential difference between two points in a current carrying conductor when 1 joule of work is done to move a charge of 1 coulomb from one point to another. Therefore, $1 \text{ volt} = 1 \text{ joule}/1 \text{ coulomb}$

Voltmeter: The potential difference is measured by means of an instrument called voltmeter. The voltmeter is connected in parallel across the points where the potential difference is measured. A voltmeter has high resistance.

Electric Current: The electric current is the rate of flow of electric charges (called electrons) in a conductor.

If a charge of Q coulombs flows through a conductor in time t seconds, then the magnitude I of the electric current flowing through it is given by

Current, $I = Q/t$

The SI unit of electric current is ampere and it is denoted by the letter A. Electric current is a scalar quantity.

Ammeter: Current is measured by an instrument called ammeter. The ammeter is connected in series with the circuit in which the current is to be measured. An ammeter should have very low internal resistance.

Ohm's Law: At constant temperature, the current flowing through a conductor is directly proportional to the potential difference across its ends. If I is the current flowing through a conductor and V is the potential difference across its ends. Then according to Ohm's law

$$V \propto I$$

$$V = IR$$

Where R is a constant called 'resistance' of the conductor. The value of this constant depends on the nature, length, area of cross-section and temperature of the conductor.

Resistance of a Conductor: The property of a conductor due to which it opposes the flow of current through it is called resistance. The resistance of a conductor is numerically equal to ratio of potential difference across its ends to the current flowing through it. i.e.
Resistance = Potential difference/Current

$$R = V/I$$

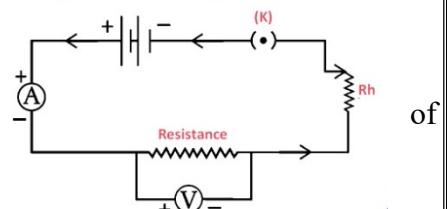
The SI unit of resistance is ohm, which is denoted by symbol Ω

$$R = 1 \text{ volt}/1 \text{ ampere} = 1 \text{ ohm}$$

Thus, the resistance of a conductor is said to be 1 ohm if 1 ampere current flows through the conductor when a potential difference of 1 volt is applied across it.

Factors affecting the Resistance of a Conductor: The resistance of the conductor depends:
on its length, on its area of cross-section, on the nature of its material.

Diagram to verify Ohm's law



The resistance of a given conductor is directly proportional to its length. $R \propto l$

The resistance of a given conductor is inversely proportional to its area of cross-section.

$R \propto 1/A$

By combining the equations (i) and (ii), $R \propto l/A$

$$R = \rho (l/A)$$

Where ρ is called specific resistance or resistivity of the conductor. When $l = 1\text{m}$, $A = 1\text{m}^2$, we have $\rho = R$. Thus, the resistivity of a conductor is the resistance of unit length and unit area of cross-section of the conductor. The SI unit of resistivity is ohm metre (Ωm).

Combination of Resistance: The resistance can be combined in two ways:

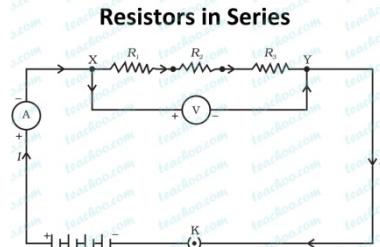
In series

In parallel

Resistance in series:

In series, the total potential difference, $V = V_1 + V_2 + V_3$

Applying Ohm's law to the entire circuit $V = IR$



Applying Ohm's law to each resistance separately, we have

$$V_1 = IR_1; V_2 = IR_2; V_3 = IR_3 \dots \text{(iii)}$$

From equations (i), (ii) and (iii), we have $IR = IR_1 + IR_2 + IR_3$

$$R = R_1 + R_2 + R_3$$

Resistance in parallel:

In parallel, the total current: $I = I_1 + I_2 + I_3$

Applying Ohm's law to the entire circuit $I = V/R$

Applying Ohm's law to each resistance separately, we have $I_1 = V/R_1; I_2 = V/R_2; I_3 = V/R_3$

From equations (i), (ii) and (iii), we have $V/R = V/R_1 + V/R_2 + V/R_3$

$$1/R = 1/R_1 + 1/R_2 + 1/R_3$$

Heating Effect of Current: When an electric current is passed through a high resistance wire, it becomes very hot and produces heat. This effect is called the heating effect of current.

When an electric charge Q moves against a potential difference V , the amount of work done is given by,

$$W = Q \times V$$

$$\text{But, current, } I = Q/t, Q = I \times t$$

$$\text{From Ohm's law: } V = I \times R$$

$$\text{Now, putting all these values in equation (i), we have Work done, } W = I^2 \times R \times t$$

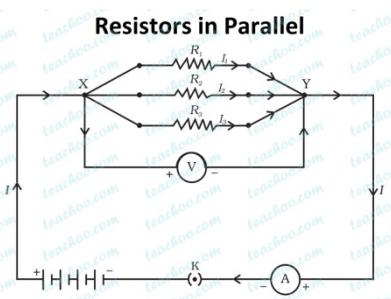
This work done is converted into heat energy for maintaining the flow of current I through the conductor for t second.

$$\text{Heat produced, } H = I^2 \times R \times t \text{ joules. (It is also known as Joule's law of Heating)}$$

Applications Of Heating Effect of Current:

(i) In electrical heating appliances: All electrical heating appliances are based on heating effect of current. For example, appliances, such as electric iron, water heaters and geysers, room heaters, toaster, hot plates are fitted with heating coils made of high resistance wire such as nichrome wire.

(ii) Electric filament bulb: The use of electric filament bulbs (ordinary electric bulbs) is also based on the heating



effect of current. Inside the glass shell of electric bulb there is a filament. This filament is made from a very thin high bulb resistance tungsten wire. When current flows through this filament, it gets heated up. Soon, it becomes white hot and starts emitting light.

Electric Power: The rate at which work is done by an electric current is known as electric power.

Power = Work done/Time

$$P = W/t = (V \times Q)/t$$

The work done by current I when it flows for time t under a potential difference V is given by:

$$W = V \times I \times t \text{ joules} \quad [\text{Because } W = VQ \text{ and } Q = It] \text{ Putting}$$

$$P = (V \times I \times t)/t = VI$$

$$P = I^2R \quad [\text{Because } V = IR]$$

$$P = V^2/R \quad [\text{Because } I = V/R]$$

The unit of electric power is watt. Power = $V \times I$

1 watt = 1 volt x 1 ampere

Electrical energy = Power x Time $E = P \times t$

The electrical energy consumed by an electrical appliance depends upon

(i) Power rating of the appliance

(ii) Time for which it (appliance) is used. The SI unit of electrical energy is joule.

1 joule is the amount of electrical energy consumed when an appliance of 1 watt is used for 1 second.

Commercial Unit of Electrical Energy: Kilowatt hour is the commercial unit of electrical energy. One kilowatt hour is the electrical energy consumed when an electrical appliance having 1kW power rating is used for 1 hour.

Energy used = Power x Time $1 \text{ kWh} = 1 \text{ kW} \times 1 \text{ h}$

$$= 1000 \text{ w} \times 60 \times 60 \text{ s}$$

$$= 1000 \text{ Js} - 1 \times 3600$$

$$= 3600000 \text{ J} = 3.6 \times 10^6 \text{ J}$$

Practice questions

Q. Name the instrument used to measure the electric potential difference.

(Ans: Voltmeter)

Q. Mention the factor that maintains the flow of charge through a conductor.

(Ans: Potential Difference)

Q. Write down the relation between the potential difference between two points A and B in a conductor, work done W in moving a unit charge from point B to A and the charge q .

(Ans: Potential Difference=Work/Charge)

Q. How is the direction of electric current related to the direction of flow of electrons in a wire? (Ans: Opposite to flow of electron)

Q. What is the minimum resistance which can be made using five resistors each of $1/4 \Omega$?

(Ans: Resistance is minimum when resistors are attached in parallel)

Q. Calculate the potential difference between the two terminals of a battery if 100 J of work is required to transfer 20C of charge from one terminal of the battery to the other.

(Ans: $V=W/Q$) ($2M$)

Q. Why are metals good conductors of electricity while glass is a bad conductor of electricity? Give reasons. Which

metal has least resistance?

Q. Why alloys are commonly used in electrical heating devices? Give reason

(Ans: High resistivity which does not change with temperature)

Q. Why is an ammeter likely to be burnt out if it is connected in parallel in a circuit? (Ans: if connected in parallel the resultant resistance of circuit decreases and excessive current passes through Ammeter)

Q.(i) State Joule's Law of Heating.

(ii) A wire of resistance 5Ω is bent in the form of a loop or closed circle. What is the effective resistance between the two points at the ends of any diameter of the circle.

(Ans: $1/R = 2/5 + 2/5 = 1.25 \Omega$)

Q.(i) With the help of a suitable circuit diagram prove that the reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances.

(ii) In an electric circuit two resistors of 12Ω each are joined in parallel to a 6 V battery. Find the current drawn from the battery?

(Ans: $R = V/RP$; Ans= 1A)

Q. Why does resistance of a metallic conductor increase with increase in temperature?

(Ans: with increases in temperature thermal velocities of electrons also increases therefore no. of collision also increases)

Q. Heat is generated continuously in an electric heater but the temperature of its element becomes constant after some time. Why?

(Ans: rate at which heat is produced becomes equal to rate at which the heat is lost)

Q. ρ (rho) is called the electrical resistivity of the material of the conductor. The SI unit of resistivity is Ωm . It is a characteristic property of the material. The metals and alloys have very low resistivity in the range of $10^{-8} \Omega m$ to $10^{-6} \Omega m$. They are good conductors of electricity. Insulators like rubber and glass have resistivity of the order of $10^{12} \Omega m$ to $10^{17} \Omega m$. Both the resistance and resistivity of a material vary with temperature.

How is resistivity different from resistance?

Which type of matters have low and high electrical resistivity?

What term do we use for matter having high and low resistivity?

Ans. (i) resistivity does not depend on temperature but resistance depend, (ii) Alloys (iii) Insulator, conductors respectively.

Q. A common application of Joule's heating is the fuse used in electric circuits. It protects circuits and appliances by stopping the flow of any unduly high electric current. The fuse is placed in series with the device. It consists of a piece of wire made of a metal or an alloy of appropriate melting point, for example aluminum, copper, iron, lead etc. If a current larger than the specified value flows through the circuit, the temperature of the fuse wire increases. This melts the fuse wire and breaks the circuit. The fuse wire is usually encased in a cartridge of porcelain or similar material with metal ends. The fuses used for domestic purposes are rated as 1 A, 2 A, 3 A, 5 A, 10 A, etc.

How Joule's law of heating protects an electrical circuit?

How is a fuse connected in a circuit? And why?

Which is characteristics of the material used for making electrical fuse?

Ans.(i) electric fuse (ii) Series (iii) High resistivity and low melting point.

Q. There is a frill of 20 Bulbs connected in series in a room. One bulb gets fused. The remaining 19 are again joined in series and connected to the same supply. Will the light increase or decrease in the room?

(Ans: The light will increase. $P = V^2/R$, when one bulb is removed, the resistance of the frill decreases and hence

the power output will increase)

Q.Why does resistance of a metallic conductor increase with increase in temperature?

(Ans: with increases in temperature thermal velocities of electrons also increases therefore no. of collision also increases)

Q.Heat is generated continuously in an electric heater but the temperature of its element becomes constant after some time. Why?

(Ans: rate at which heat is produced becomes equal to rate at which the heat is lost)

Q.What is electrical resistivity? In a series electrical circuit comprising of a resistor having a metallic wire, the ammeter reads 5A. the reading of ammeter decreases to half when the length of the wire is doubled. Why?

(Ans: $R = \rho xl/a$ and $V=IR$)

Q.You are given three resistors of $10\ \Omega$, $10\ \Omega$ and $20\ \Omega$ to a battery of emf 4V, a key, an ammeter and a voltmeter. Draw a circuit diagram showing the correct connection of a given components such that the voltmeter gives a reading of 2.0 V connected across $10\ \Omega$.

(Ans. Series of $10\ \Omega$ and $10\ \Omega$ is connected across $20\ \Omega$ in parallel.

Net resistance of circuit = $10\ \Omega$

Current drawn from cell = 0.4 A

Potential difference across $10\ \Omega$; $V = R I = 10 \times 0.2$
= 2V

Q.If the current I through a resistor is increased by 100% (assume that temperature remains unchanged), the increase in power dissipated will be?

(Ans: Ans:300%; when the current becomes double, dissipation of heat will multiply by 2 =4. This means there will be an increase of 300%. $P=I^2 R$)

Q.Will the resistivity of wire change with change in area of cross- section? (Ans: Resistivity is the property of material and does not depend upon Area or Length)

Q.In a house hold electric circuit, the electrical appliances are connected in parallel to one another. Give two reasons for this. An electrician puts a fuse of rating 5 A in that part of domestic electrical circuit in which an electrical heater of 1.5 KW, 220 V is operating. What is likely to happen in this case and why? What change, if any, needs to be made?

(Ans: $I=V/P, 1500/220, 6.8\ A$, hence current in the circuit is more than the rating of fuse the fuse will blow off.)

Q.Why is resistance less when joined in parallel? The filament of incandescent bulb has high or low resistance?

(Ans: $R \propto 1/A$)

Q.Out of two electric bulbs of 50W-220V and 100W-220V, which one will glow brighter when they are connected in (i) Series (ii) Parallel?

(Ans : 100 W bulb will glow brighter ; $P=V^2/R$)

Q.Two conductors, one having resistance R and another $2R$ are connected in turn across a DC source. If the rate of heat produced in the two conductors is Q_1 and Q_2 respectively, what is the value of Q_1/Q_2 ?

(Ans: $Q=V^2/R*t$; $Q_1/Q_2=R_2/R_1=2R/R=2$)

Q.Will the resistivity of wire change with change in area of cross- section?

(Ans: Resistivity is the property of material and does not depend upon Area or Length)

Q Write down the formula which states the relation between potential difference, current and resistance.

(Ans: $V=IR$)

Q Assertion (A): The metals and alloys are good conductors of electricity.

Reason (R): Bronze is an alloy of copper and tin and it is not a good conductor of electricity.

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

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

(A) is true, but (R) is false.

(A) is false, but (R) is true.

(Ans: Metals and alloys are good conductors of electricity. Bronze is an alloy of copper and tin which are metals and thus is a good conductor of electricity.)

Q Assertion (A): Alloys are commonly used in electrical heating devices like electric iron and heater.

Reason (R): Resistivity of an alloy is generally higher than that of its constituent metals but the alloys have low melting points than their constituent metals.

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

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

(A) is true, but (R) is false.

(A) is false, but (R) is true (Ans: (a))

Q. The maximum resistance which can be made using four resistors of each $\frac{1}{2} \Omega$ is? (Ans:

$R_s = 1/R_1 + 1/R_2 + 1/R_3 + \dots + 1/R_n$;

Ans: 2Ω) (2M)

Q. Two wires A and B are of same metal, have the same area of cross section and have their length in ratio of 2:1. What will be the ratio of currents flowing through them respectively, when the same potential difference is applied across the length of each of them?

(Ans: $I_A/I_B = R_B/R_A = L_B/L_A = 2/1$)

Q. The table given below gives the resistivity of three samples in ohm metre:

Samples	A	B	C
Resistivity	1.6×10^{-8}	7.5×10^{-7}	44×10^{-6}

Which of them is a good conductor? Which is an insulator? Why?

A wire of resistance 4Ω is doubled on it. Calculate the new resistance of the wire. (Ans: if wire of resistance 4Ω doubled on it, then the new resistance will become 4 times and $R_n = n^2 R$, n =times the wire is elongated)

Q.(i) What is meant by the statement "The resistance of a conductor is 1Ω "

(ii) Define "Electric Power". Write an expression relating electric power, potential difference and resistance.

iii) How many 132Ω resistors in parallel are required to carry $5A$ on a $220V$ line?

(Ans: $R = V/I$, $n = 132/44 = 3$ Resistors)

Q.a) Should resistance of an ammeter be high or low? Give reason

b) How does use of electrical fuse protects appliance

Ans.(a) Low,(b) By breaking the circuit.

Q. Rakesh of class X set up a circuit by using of a nichrome wire, voltmeter, ammeter and four cells of $1.5V$ each.

S.No	Number of cells used in the circuit	Current through the Nichrome wire, I(ampere)	Potential difference across the nichrome wire, V(volt)
1	1	0.1	0.4
2	2	0.2	0.9
3	3	0.3	1.2
4	4	0.4	1.7

Abhishek observed that if he connects one cell (1.5 V) in circuit potential show 0.4 V. after that he observed for two, three and four cells he could not understand why voltmeter show less potential difference. Saket come to Rakesh and told him the reason. He prepares data for each cell by volt meter and ammeter which are given below:- Read the above paragraph and answer the following:

- Q-(i) Give the reason told by Saket to show less potential difference shown by the voltmeter?
 Q-(ii) How many cells were used in the circuit when the resistance of nichrome wire was maximum?
 Q-(iii) When the graph is drawn for readings of voltmeter and ammeter; it will be a straight line. (Yes or No).
 Q-(iv) If the graph obtained is straight line does it follow ohms law or not? (Yes/No)
 Q-(v) The number of cells in the two cases when resistance in the both cases was same are
 1 and 2 (b) 2 and 3 (c) 1 and 3 (d) 2 and 4

Ans.(i) Due to low current in the circuit as Nichrome has high resistivity (ii) 2 (iii) No (iv) Yes (v) (c)

Q.. Substances through which charges cannot pass are called Insulators. Glass, Pure water and all gases are insulators. Insulators are also called Dielectrics. In insulators electrons are strongly bound to their atoms and cannot get themselves freed. Thus, free electrons are absent in insulators. Insulators can easily be charged by friction. This is due to the reason that when an electric charge is given to an insulator, it is unable to move freely and remains localised. But this does not mean that conductors cannot be charged by friction. The only difference in their case is that the charge is not localised and flows to earth if it finds a conducting path (Like our body). A metal rod can be charged by rubbing it with fur or silk if it is held in a handle of glass or Amber(i.e. Insulator)

a) Do insulators have free electrons?

Ans. No

b) Calculate the current in a wire if 1500 C charge is passed through it in 5 Minutes?

$$\text{Ans. } I = 1500/300 = 5\text{A}$$

c) A plastic piece rubbed with wool found to have a negative charge of 3×10^{-7} C. calculate the numbers of electrons transferred.

$$(\text{Ans: } q=ne; n=q/e=1.875 \times 10^{12})$$

e) Electrons and conventional current flows in which direction?

Ans. Mutually opposite.

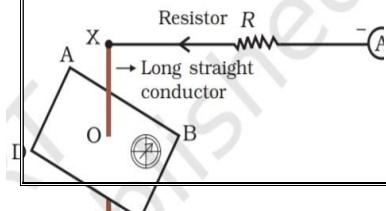
f) Why metal rod get charged by rubbing on a insulator?

Ans. Due to transfer of electrons .

MAGNETIC EFFECT OF ELECTRIC CURRENT

Hans Christian Oersted

Oersted showed that electricity and magnetism are related to each other. This played a crucial role in understanding ELECTROMAGNETISM. His research was later used in radio, television etc.



The unit of magnetic field strength is named Oersted in his honour.

Oersted Experiment :-

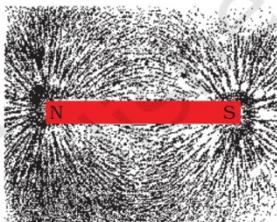
On passing the current through the copper wire XY in the circuit, the compass needle which is placed near the conductor gets deflected. If we reverse the direction of current, the compass needle deflect in reverse direction. If we stop the flow of current, the needle comes at rest. Hence, it concludes that electricity and magnetism are linked to each other. It shows that whenever the current will flow through the conductor, then the magnetic field around it will develop.

Magnetic Field – It is the region surrounding a magnet, in which force of magnet can be detected. It is a vector quantity, having both direction & magnitude.

Compass needle– It is a small bar magnet, whose north end is pointing towards the north pole and the south end is pointing towards the south pole of earth.

Magnetic field lines

When a bar magnet is placed on a card board and iron filings are sprinkled, they will arrange themselves in a pattern as shown below.



The lines along which the iron filling align themselves represent magnetic field lines.

Hence, the magnetic field line is a path along which a hypothetical free north pole tends to move towards the south pole.

Characteristics of Magnetic field lines :

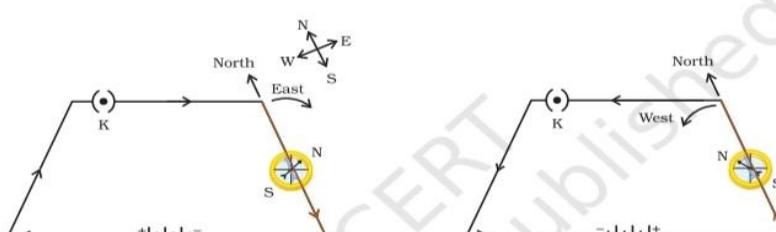


(1) The direction of magnetic field lines outside the magnet is always from north pole to south pole of bar magnet and are indicated by an arrow. Inside the magnet, the direction of field lines is from its south pole to north pole. Thus magnetic field lines are closed curve.

(2) The strength of the magnetic field is expressed by the degree of closeness of magnetic field lines. Closer the lines, more will be the strength and farther the lines, less will be the magnetic field strength.

(3) Two field lines will never intersect each other. If they intersect, then at the point of intersection the compass needle will show two directions of magnetic field which is not possible.

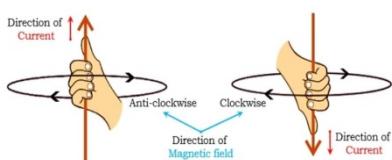
7. Magnetic field due to Current Carrying Conductor.



The above electric circuit in which a copper is placed parallel to a compass needle, shows the deflection in the needle gets reversed, when the direction of current is reversed. Hence **electricity and magnetism are related to each other.**

Right Hand Thumb Rule :-

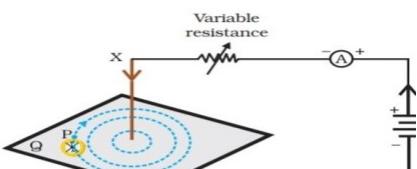
Maxwell Right Hand Thumb Rule



It is a convenient way of finding the direction of magnetic field associated with the current carrying conductor. Hold the straight current carrying conductor in your right hand such that your thumb points towards the direction of current, then your folded fingers around the conductor will show the direction of magnetic field.

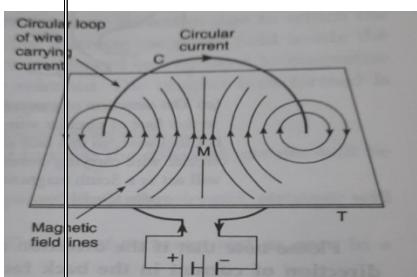
Magnetic Field due to Current through a Straight Conductor

The current carrying conductor is intercepted by cardboard placed at right angle to the current carrying conductor. There are some iron fillings sprinkled on the cardboard. When current flows through the conductor, the iron filings arrange themselves along the magnetic field.



Magnetic Field due to Current through a circular Loop

Every point on the wire carrying current gives rise to the magnetic field, appearing as a straight line at the centre of the loop. By applying the Right hand Thumb rule, we can find the direction of the magnetic field at every section of the wire.



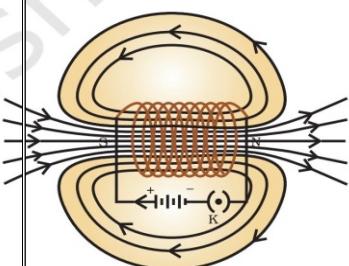
Solenoid— A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called solenoid.

Magnetic field due to a current in a solenoid

Using R.H. Thumb Rule, we can draw the pattern of magnetic field lines around a current carrying solenoid.

- One end of the solenoid behaves as a magnetic north pole, while the other end behaves as the South Pole.
- The field lines inside the solenoid are in form of parallel straight lines, that implies that magnetic field inside the solenoid is same at all points i.e. field is uniform inside the solenoid .

Magnetism of the solenoid can be increased



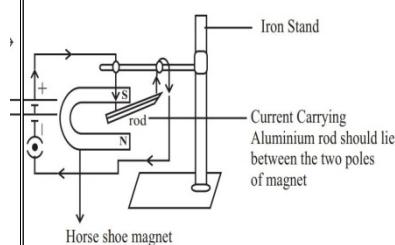
By increasing the number of turns of the coil

By increasing the strength of current

By using a metal core like soft iron

Force on a current carrying conductor in a magnetic field.

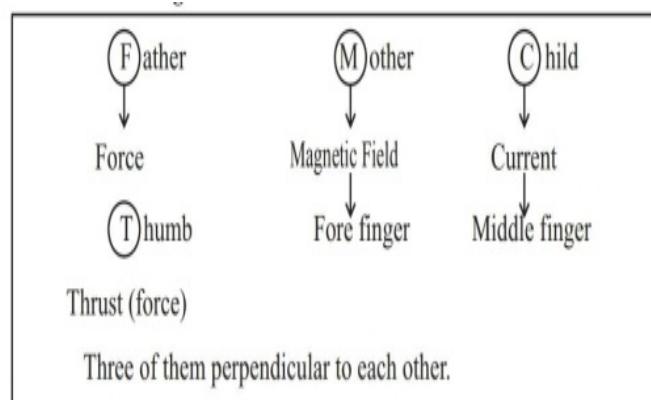
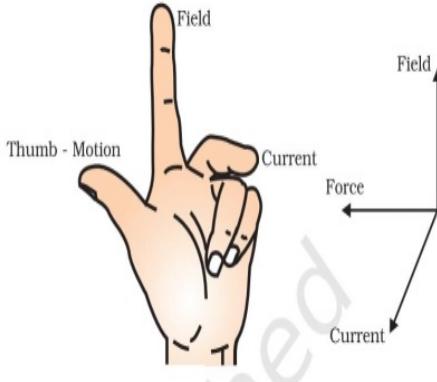
Andre Marie Ampere suggested that the magnet also exert an equal and opposite force on the current carrying conductor.



We will observe that the rod will displace i.e. the rod will experience a force, when it is placed in a magnetic field, in a perpendicular direction to its length.

- The direction of the exert force will be reversed if the direction of current through the conductor is reversed.
- If we change the direction of the field by interchanging the two poles of the magnet, again the direction of exert force will change.
- Therefore the direction of exerted force depends on
 - (1) direction of current
 - (2) direction of magnetic field lines.

Fleming's Left Hand Rule



According to this rule, stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular to each other.

If the fore finger represents the direction of the magnetic field & middle finger represents the direction of current, then the thumb will point in the direction of motion or force acting on the conductor.

Functioning of electric motors is based on this rule. It converts electrical energy into mechanical energy.

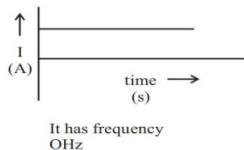
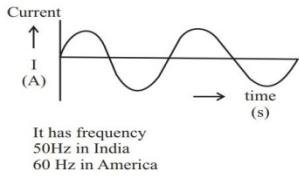
Galvanometer-



It is an instrument that can detect the presence of a current in a circuit. If the pointer is at zero (the centre of scale) then there will be no flow of current. If the pointer deflects on either side right or left, this will show the direction of current. Represented by

Direct Current and alternative current

- 1) Direct current (DC):- Does not change its direction with time it is unidirectional.
- 2) Alternate Current (AC) :- Changes the direction periodically after equal interval of time.



Advantages of Alternate Current (AC) over Direct Current (DC)

Electric power can be transmitted to longer distances without much loss of energy. Therefore cost of transmission is low.

In India the frequency of AC is 50Hz. It means after every 1/100 second it changes its direction.

Domestic Electric Circuits :-

In our homes, the electric power supplied is of potential difference $V = 220V$

It consist of three wires :-

(1) Wire with red insulation cover – LIVE WIRE (POSITIVE)

Live wire is at high potential of 220V

(2) Wire with black insulation cover – NEUTRAL WIRE (NEGATIVE)

Neutral wire is at zero potential

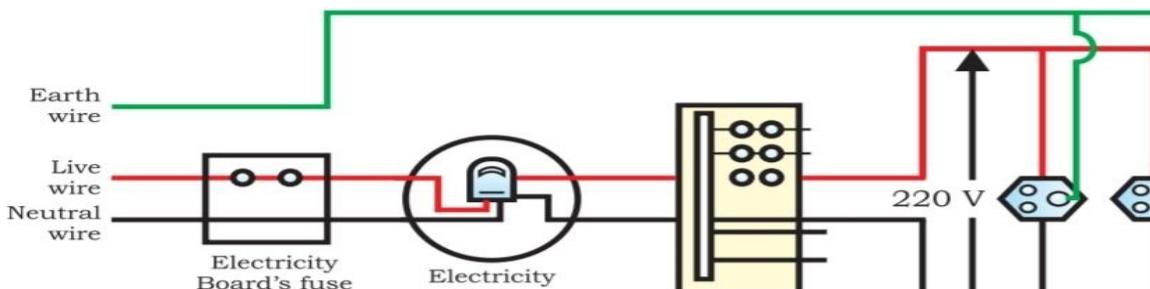
Therefore, the potential difference between the two is 220V.

(3) Wire with Green insulation cover – EARTH WIRE

It is connected to a copper plate deep in the earth near the house.

Earthing-A safety measure: The metallic body of the appliances is connected with the earth wire as a safety measure.

Earth wire provides a low resistance to the current hence any leakage of current to the metallic body of the appliances, keep its potential equal to that of earth. That means zero potential and the user is saved from severe electric shocks.



Fuse:-

Electric fuse is an important component of all domestic Circuits. A fuse in a circuit prevents damage to the appliances and the circuit due to overloading.

Overloading can occur when the live wire and the neutral wire come into direct contact. In such a situation, the current in the circuit abruptly increases. This is called short- circuit.

The use of an electric fuse prevents the electric circuits and appliances from possible damage by stopping the flow of unduly high electric current.

Overloading can also occur due to an accidental hike in the supply voltage.

Overloading may be caused by connecting too many appliances to a single socket.

Practice questions

Q. What do you understand by direct current?

Ans. Direct current, abbreviation DC, flow of electric charge that does not change direction. Direct current is produced by batteries, fuel cells, rectifiers, and generators with commutator

Q. What do you mean by magnetic field lines?

Ans. Magnetic field lines are the continuous loops which starts from north pole & stops at south pole. They never intersect.

Q. Which source produce alternating current?

Ans. An AC generator produces alternating current

Q. List two properties of magnetic field line.

Ans. They never cross one another. They flow from the south pole to the north pole within the magnet and north pole to south pole outside the magnet.

Q. Why does a compass needle get deflected when brought near a bar magnet?

Ans. The compass needle has a magnet inside it, and when it is brought near the magnet, it gets deflected due to magnetic force between the two magnets. The South of the needle points towards magnetic North of the bar magnet and the North of needlepoint away from the North of the bar magnet. (Like pole attracts and unlike pole repels)

Q. Draw magnetic field lines around a bar magnet.

Ans . Suitable diag. to be drawn.

Q. Why two magnetic field lines do not intersect each other?

Ans; Two magnetic field lines do not intersect each other due to the fact that the resultant force on a north pole at any point can be only in one direction. But if the two magnetic lines get intersect one another, this means that resultant force on a north pole placed at the point of interaction will be along two directions, which is not possible.

Q.What precaution should be taken to avoid the overloading of domestic electric circuits?

Ans. 1 Too many electrical appliances should not be used at the same time.

2. So many appliances should be connected to the same socket.

3. Appliances should be used within the safe limit of electric circuit.

Q. Name two safety measures commonly used in electric circuits and appliances.

Ans:An electric fuse is connected in series. It protects the circuit from overloading and prevents it from short-circuiting.

Q. What is the Fleming's left hand rule ?Explain with example.

Ans. Correct explanation of Fleming left hand's rule and example with diag. to be drawn.

Q. Write advantages of A.C. over D.C. and disadvantages of D.C.

Ans. There are many advantages and disadvantages of AC system over DC system.

Advantages:(i) The generation of AC is cheaper than that of DC. (ii) When AC is supplied at higher voltages, the transmission losses are small compared to DC transmission. (iii) AC can easily be converted into DC with the help of rectifiers.

Disadvantages: (i) Alternating voltages cannot be used for certain applications e.g. charging of batteries, electroplating, electric traction etc. (ii) At high voltages, it is more dangerous to work with AC than DC.

Q. Give reason for the following

- (i) There is either a convergence or a divergence of magnetic field lines near the ends of a current carrying straight solenoid.
- (ii) The current carrying solenoid when suspended freely rests along a particular direction.

Ans: i) There is either a convergence or a divergence of magnetic field lines near the ends of a current carrying straight solenoid depending upon direction of current in the Solenoid.

- (ii) The current carrying solenoid when suspended freely rests along a particular direction.

Q. A compass needle is placed near a current carrying straight conductor. State your observation for the following cases and give reasons for the same in each case.

- (a) Magnitude of electric current is increased.
- b) The compass needle is displaced away from the conductor

Ans. (a) Deflection will increase (b) Deflection will decrease

Q. What is solenoid? Draw the pattern of magnetic field lines of

- (i) a current carrying solenoid and (ii) a bar magnet.

List two distinguishing features between the two fields

Ans: i) Solenoid : A coil of many circular turns of insulated copper wire shape of cylinder is called solenoid.

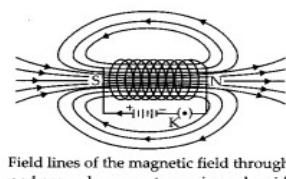
The pattern of magnetic field lines inside the solenoid indicates that the is the same at all points inside the solenoid. That is, the field is uniform solenoid.

(ii) Magnetic field lines around a bar magnet.

Following are the distinguishing features between the two fields.

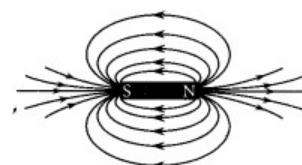
magnet is a permanent magnet whereas solenoid is an electromagnet, therefore produced by solenoid is temporary and stay till current flows through it.

(b) Magnetic field produced by solenoid is more stronger than magnetic field magnet.



Field lines of the magnetic field through and around a current-carrying solenoid

wrapped in the
magnetic field
inside the



(a) A bar
field
of a bar

Q. An electric oven of a 2kW power rating is operated in a domestic circuits(220 volt) that has a current rating of 5 A. What result do you expect? Explain .

Ans.: $I = 2000W/220V = 9A$

Q.. State how the magnetic field produced by a straight current carrying conductor at a point depends on (a) current through the conductor (b) distance of point from conductor.

Ans: Strength of magnetic field produced by a straight current-carrying wire at a given point is

- (a) directly proportional to the current passing through it.
- (b) inversely proportional to the distance of that point from the wire.

Q. List two methods of producing magnetic field /source of magnetic field

Ans. The two methods of producing the magnetic field are: 1) Passing the current through any conductor. 2) The permanent magnet also produces the magnetic field around it.

Q. When a current carrying conductor is kept in a magnetic field state the position when maximum force acts on it?

Ans . The force experienced by a current carrying conductor placed in a magnetic field is the maximum when the conductor is kept perpendicular to the direction of the magnetic field.

Q. How will you use a solenoid to magnetise a steel bar?

Ans. Place a steel bar inside a solenoid and let the constant current pass through it for some time. When a constant current is flowing through the solenoid there is a constant magnetic field inside the solenoid and the steel bar get magnetized.

Q. On which factors does the magnetic field produced in a solenoid depend?

Ans. Magnetic fields depends on:-
1. No. of turns in circular coil. (B directly proportional to no. of turns.)
2. Magnitude of current passing through it (B directly proportional to current)

Q. What does the degree of closeness of magnetic field line indicates?

Ans. The degree of closeness of the field lines in a magnetic field indicates the strength of magnetic field in the region.

Q. How can it be shown that a magnetic field exist around a wire through which a direction current is passing.

Ans. If we were to bring near a wire a compass needle then it would show deflection which basically proves that there is an existant magnetic field since the wire is carrying current.

Q. What is the advantage of the third wire of earth connection in domestic appliances?

Ans. The main advantage of third wire earth connection in domestic electric appliances is to absorb the excess electricity passing through electrical appliance and in turn protects it from damage.

Q. How do you locate a current carrying wire concealed in a wall ?

Ans. A current-carrying wire concealed in a wall can be located due to the magnetic effect of current by using a plotting compass. If a plotting compass is moved on a wall, its needle will show deflection at the place where current-carrying wire is concealed.

Q. How is AC different from DC?

Ans. The major difference between AC and DC is the direction in which electric current flow. In Alternating current, current keeps switching directions periodically – forward and backward. While in the direct current it flows in a single direction steadily.

Q. Why is a fuse wire made of Tin- lead alloy? Not copper wire.

Ans. A fuse wire is made of tin alloy because it has low melting point, so that it may melt easily, whereas a copper wire cannot be used as a fuse wire because it has a high melting point due to which it will not melt easily when a short circuit takes place

Q. State the energy changed which takes place when a magnet is moved in side a coil having a Galvanometer at its end. Name these phenomena

Ans- When a magnet is moved towards a coil having a galvanometer between it's ends then mechanical energy changes to the electrical energy. (b) The phenomenon is known as Electromagnetic Induction.

Q. You have just paid the electricity bill for your house .

1. What was it that your family consumed for which you had to pay?

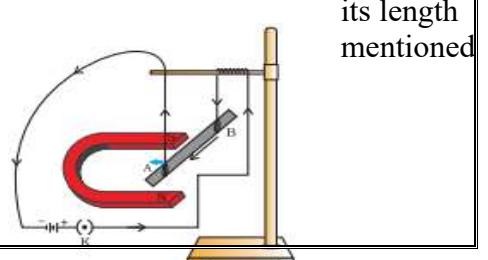
2. In What unit was it measured ?

Ans-1. Consumed as electrical energy.

2. Energy was measured in kilowatt hour(kwh)

Q. A current carrying straight conductor experiences a force perpendicular to and the magnetic field. Design an activity for the verification of the above statement and describe it with a labeled diagram

Ans. Take a small aluminium rod AB (of about 5 cm).



Using two connecting wires suspend it horizontally from a stand, as shown in Fig.

Place a strong horseshoe magnet in such a way that the rod lies between the two poles with the magnetic field directed upwards.

For this put the north pole of the magnet vertically below and the south pole vertically above the aluminium rod (Fig. 13.12).

Connect the aluminium rod in series with a battery, a key and a rheostat.

Now pass a current through the aluminium rod from end B to end A.

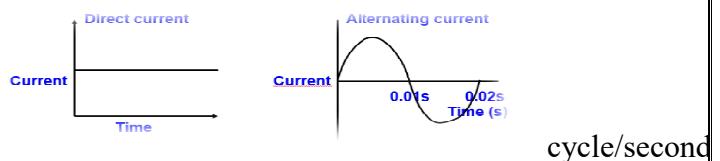
It is observed that the rod is displaced towards the left.

You will notice that the rod gets displaced.

Reverse the direction of current flowing through the rod and observe the direction of its displacement. It is now towards the right.

Q. In the diagram shown -

- Name the type of current in two cases .
 - Identify any one source for each type of these currents
 - What is the frequency of current in case to in India ?
- Ans. i)DC,AC ii)Cell/Battery,AC Generator ,iii) 50



Q. One of the wire in domestic circuits supply, usually with red insulation cover, is called live wire. Another wire with black insulation is called neutral wire. The earth wire which has insulation of green colour, is usually connected to a metal plate deep in the earth near the house. This is used as safety measure, specially for those appliances that has metallic body. Overloading can occur when the live wire and the neutral wire come in to direct contact, in such a situation the current in the circuit abruptly increases. This is called short circuiting. A fuse is in a circuit prevents damage to the appliances and the circuit due to overloading.

Answer the following questions:-

1 When do we say that an electrical appliance is earthed?

Ans. When metal body of electrical appliances is connected to a wire which is connected to a metal plate buried inside the earth. Electrical appliances is said to be electrically earthed.

2 Mention the function of earth wire in electrical line.

Ans. Earth wire insures that any leakage of current to the metallic body of the appliances keeps its potential to that of earth that is zero, and the user may not get electric shock.

3. How an electric fuse is connected in a domestic circuit?

Ans. Electric fuse is connected in series in a domestic circuit.

4. When overloading and short circuiting are said to occur?

Ans. It occurs when live wire comes in contact with neutral wire. Overloading occurs when large amount of current flows through the appliances.

5 What is live wire?

Ans. One of the wire in domestic circuits supply, usually with red insulation cover, is called live wire.

Q. What is the usual capacity of the fuse wire in the line to feed .

1. Light and fans? 2. Appliances of 2k.watt or more power?

Ans.1. Capacity of lights and fans 5amp.

2. Appliances which are having capacity of 2kw or more they required 15amp.

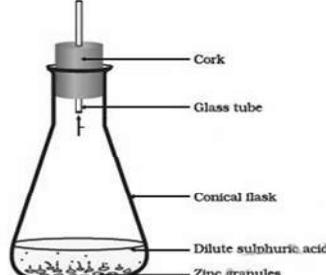
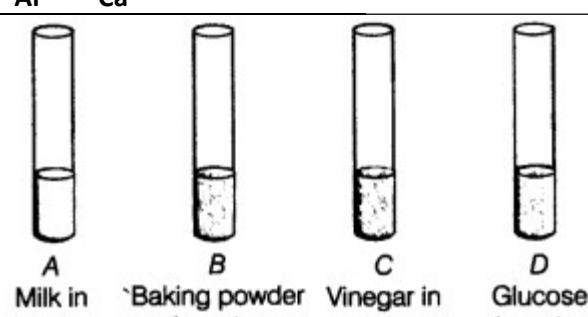
Q. List the factors on which the strength of the magnetic field due to a straight conductor carrying current depend. How should these be changed to decrease magnetic field at a point ?

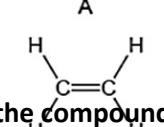
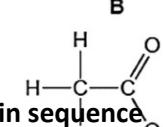
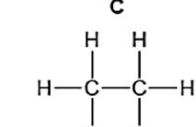
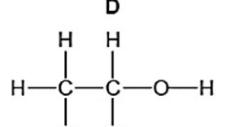
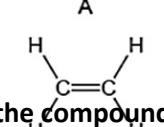
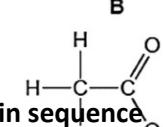
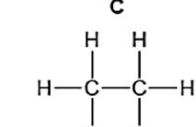
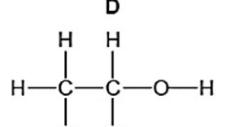
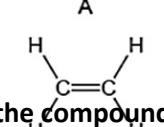
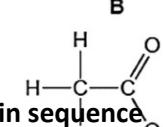
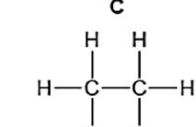
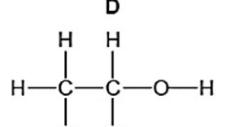
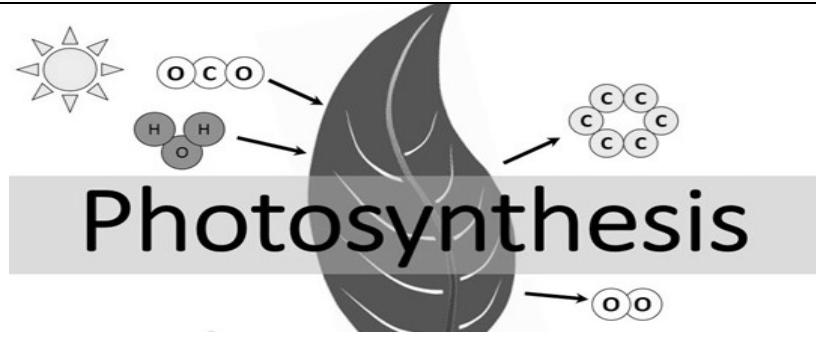
Ans. 1. Strength of the current

2. Distance of the point from the conductor.

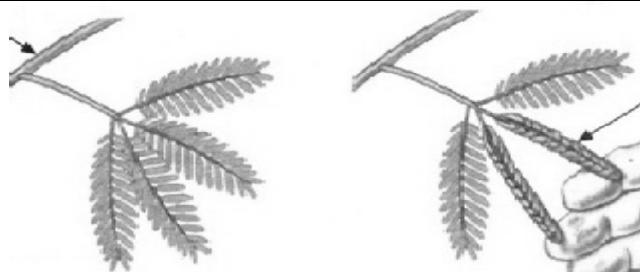
3. By decreasing the strength of the current. Magnetic field at the point can be decreased.

Sample question paper -1

Q.No	Questions	Marks
1	Which of the following would change the colour of this pH paper greenish-blue? (a)Lemon juice (b)vinegar (c)common salt (d)antacid	1
2	Which of the following processes does not involve either oxidation or reduction? (a) Formation of slaked lime from quick lime (b) Heating Mercuric Oxide (c) Formation of Manganese Chloride from Manganese oxide (d) Formation of Zinc from Zinc blende	1
3	Before burning in air, the magnesium ribbon is cleaned by rubbing with a sand paper to: a. Make the ribbon surface shinier b. Remove the layer of magnesium oxide from the ribbon surface c. Remove the layer of magnesium carbonate from the ribbon surface d. Remove the moisture from the ribbon surface	1
4	What happens in above reaction? (a)Zinc Sulphate and Water is formed (b)Zinc Sulphate and Hydrogen gas is formed (c)Zinc Hydride and Supher Dioxide is formed (d)No reaction take place	1
		
5	Identify the least reactive and most reactive metal (Al, K, Au, Ca) "Ca" "K" "Au" "Al" "Au" "K" "Al" "Ca"	1
6	 Milk in water Baking powder in water Vinegar in water Glucose in water	1
	<p>Look at the figure which shows solutions taken in test tubes A, B, C and D. What colour is expected, when a piece of red litmus paper is dropped in each test tube?</p> <p>In test tube "A" convert blue in colour In test tube "B" convert blue in colour In test tube "C" convert blue in colour In test tube "D" convert blue in colour</p>	

7	<p>The formulae of four organic compounds are shown below. Choose the correct name of the compound in sequence</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">A</td><td style="text-align: center;">B</td><td style="text-align: center;">C</td><td style="text-align: center;">D</td></tr> <tr> <td></td><td></td><td></td><td></td></tr> </table> <p>(a)ethene, ethane, ethenoic acid, ethanol (b)ethene, , ethenoic acid, ethane, ethanol (c)ethene, ethanol, ethane, ethenoic acid, (d)ethene, ethane, , ethanol, ethenoic acid</p>	A	B	C	D					1
A	B	C	D							
										
8	 <p>Photosynthesis</p> <p>Which Two substances are the product of photosynthesis?</p> <p>CO₂ and O₂ H₂O and C₆H₁₂O₆ CO₂ and C₆H₁₂O₆ C₆H₁₂O₆ and O₂</p>	1								
9	<p>Where does digestion of fat take place in our body ?</p> <p>Small intestine Large intestine Mouth Stomach</p>	1								
10	<p>The stomata of a leaf is not involved in-</p> <p>Gases exchange during photosynthesis Gases exchange during respiration Transpiration None of these</p>	1								
11	<p>If a tall pea plant is crossed with a pure dwarf pea plant then, what percentage of F1 and F2 generation respectively will be tall?</p> <p>25%, 25% 50%, 50% 75%,100% 100%, 75%</p>	1								

12



1

Observe the above figure and identify the movement plants.

Phototropic movement

Geotropic movement

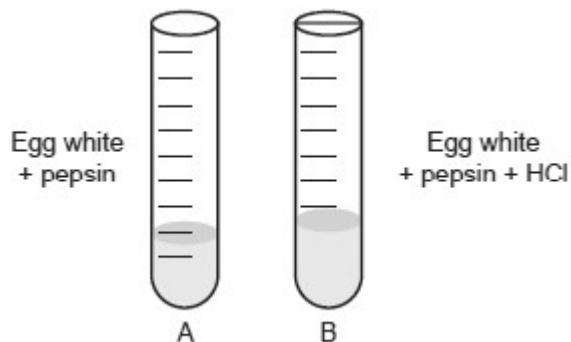
Hydrotropic movement

Nastic movement

13

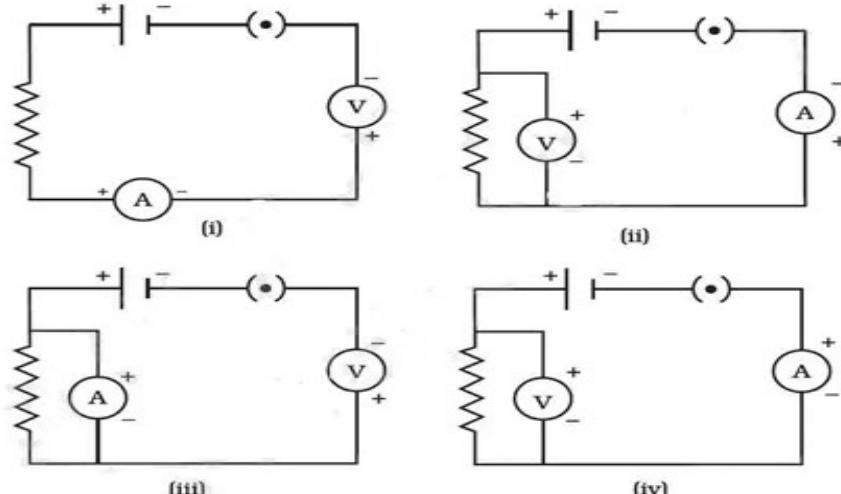
A student sets up an experiment to study the role of enzymes in digestion of food. In which test tube, the digestion of protein will occur?

- (a) Test tubes A as pepsin will breakdown protein into simple molecules.
- (b) Test tube B as HCl will breakdown protein into simple molecules.
- (c) Test tube A as pepsin will breakdown into simple molecules.
- (d) Test tube B as HCl will activate pepsin for breakdown of protein into simple molecules.



1

14



Identify the correct circuit diagram:

- (i) and (ii)
- (ii) only
- (ii) and (iii)
- (iii) and (iv)

15	When electric current is passed, electrons move from: (a) High potential to low potential (b) Low potential to high potential (c) Do not move (d) Out of the conductor	1
16	When a bar magnet is broken into two pieces? (a) we will have a single pole on each piece (b) each piece will have two like poles (c) each piece will have two unlike poles (d) each piece will lose magnetism	1

Q. no 17 to 20 are Assertion - Reasoning based questions.

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

Both A and R are true and R is the correct explanation of A

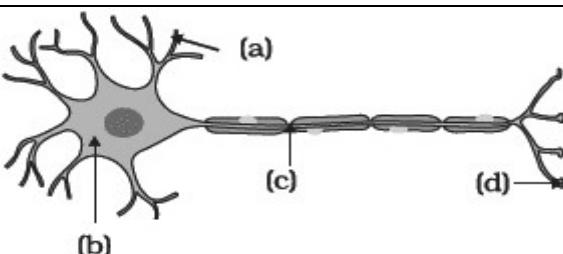
Both A and R are true and R is not the correct explanation of A

A is true but R is false

A is False but R is true

17	(A) When air is passed through lime water , it turns milky. (R) air contains 78% nitrogen and 21% oxygen.	1
18	(A) Nephrons are excretory units of kidneys. (R) It has no role in secretion of urine.	1
19	(A): Mendel selected the pea plant for his experiments. (R) : Pea plant is cross-pollinating and has unisexual flowers.	1
20	(A): The magnitude of the magnetic field at a point on the axis of a current carrying solenoid is inversely proportional to the current flowing through the solenoid. (R) : The magnitude of the magnetic field at a point on the axis of a current carrying solenoid is directly proportional to the number of turns per unit length of a solenoid.	1

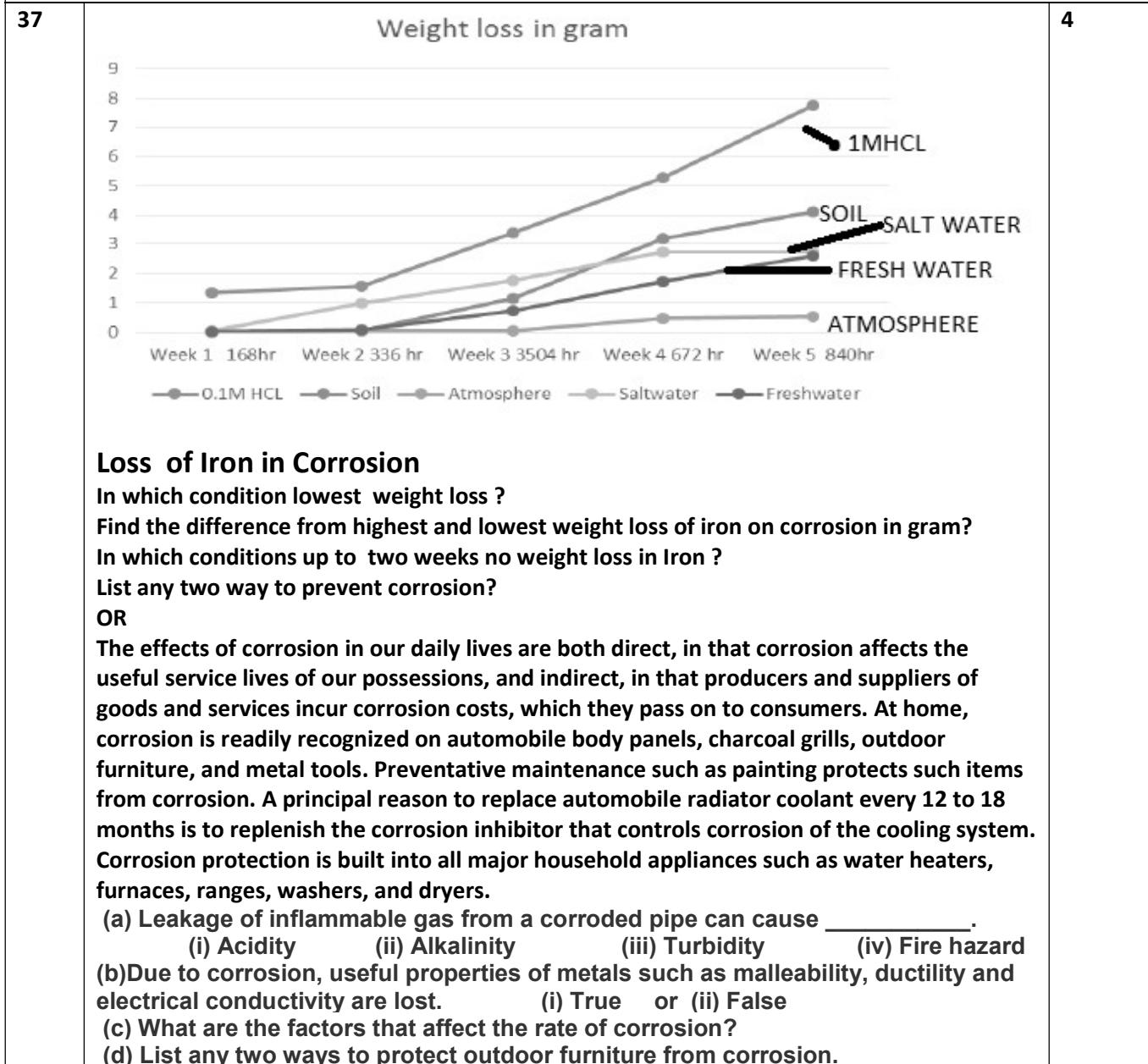
Section "B" Q.NO. 21 to 26

21	The following diagram displays a chemical reaction. Observe it and answer the following questions: Identify the type of chemical reaction that will take place and define it. How will the colour of salt change? 	2
22	 Label the parts of neuron	2
23	Which glands are associated with the alimentary canal?	2
24	How is the amount of urine produced regulated ?	2

	OR What are the four steps of urine production?	
25	Why does the sky appear dark instead of blue to an astronaut ? OR Why the planet do not twinkled ?	2
26	What is meant by biological magnification	2
Section "C" Q.NO. 27 to 33		
27	Write the balanced reactions for the following (i) Potassium Bromide (aq) + Barium iodide (aq) → Potassium iodide (aq) + Barium Bromide(aq) (ii) Zinc carbonate (s) → Zinc oxide (s) + carbon dioxide (g) (iii) Hydrogen (g) + chlorine (g) → Hydrogen chloride	3
28	A compound 'X' is used for drinking, has pH =7. Its acidified solution undergoes decomposition in presence of electricitiy to produce gases 'Y' and 'Z' The volume of Y is double than Z. Y is highly combustible whereas Z is supporter of combustion. Identify X, Y & Z and write the chemical reactions involved	3
29	Draw a well label diagram of Filtering unit in kidney OR (a)Leaves of a healthy potted plant were coated with vaseline. Will this plant remain healthy for long ? Give reason for your answer. (b)What will happen to the rate of photosynthesis in a plant under the following circumstances ? cloudy day in morning but bright sunshine in the afternoon no rainfall in the area for a considerable time.	3
30	Jitendra is a student of class X and Raju is studying in class VII. Jitendra told Raju that he would show a magic to him. Jitendra had a lens. He focused the rays of sunlight on the bare arm of Raju. After few seconds, Raju felt pain and removed his arm away. Jitendra was laughing at Raju. a. Name the type of lens Jitendra had. b. Why did Raju feel pain ? c. Write any two uses of this lens.	3
31	A narrow PQ of white light is passing through a glass prism ABC as shown in the diagram. Trace it on your answer sheet and show the path of the emergent beam as observed on the screen DE. 	3
	(i) Write the name and cause of the phenomenon observed. (ii) Where else in nature is this phenomenon observed? (iii) Based on this observation, state the conclusion which can be drawn about the constituents of white light. OR Make a diagram to show how hypermetropia is corrected ?The near point of hypermetropic eye is 1 m.What is the power of the lens require to correct this defect. Assume that the near point of the normal eye is 25 cm	
32	A common application of Joule's heating is the fuse used in electric circuits. It protects circuits and appliances by stopping the flow of any unduly high electric current. The fuse is placed in series with the device. It consists of a piece of wire made of a metal or an alloy of	3

	<p>appropriate melting point, for example aluminium, copper, iron, lead etc. If a current larger than the specified value flows through the circuit, the temperature of the fuse wire increases. This melts the fuse wire and breaks the circuit. The fuse wire is usually encased in a cartridge of porcelain or similar material with metal ends. The fuses used for domestic purposes are rated as 1 A, 2 A, 3 A, 5 A, 10 A, etc.</p> <p>(i) How Joule's law of heating protects an electrical circuit?</p> <p>(ii) How a fuse is connected in a circuit? And why?</p> <p>(iii) Which type of metals can be used for making electrical fuse?</p>	
33	<p style="text-align: center;">Ozone Layer Depletion</p> <p>What is ozone ? What are the causes and harmful effects of depletion of ozone layer?</p>	3
Section "D" Q.NO. 27 to 33 Long Answers		
34	<p>A compound 'C' (molecular formula, $C_2H_4O_2$) reacts with Na- metal to form a compound 'R' and evolves a gas which burns with a 'pop' sound. Compound 'C' on treatment with an alcohol 'A' in presence of an acid forms a sweet-smelling compound 'S' (molecular formula, $C_3H_6O_2$). On addition of NaOH to 'C', it also gives 'R' and water. 'S' on treatment with NaOH solution gives back 'R' and 'A'. Identify C, R, A, S and write down the reactions involved.</p> <p>OR</p> <p>An organic compound 'A' is an essential constituent of cough syrup . Oxidation of 'A' yields an organic acid 'B' which is present in vinegar. Name the compounds 'A' and 'B' and write their structural formula. What happens when 'A' and 'B' react in the presence of an acid catalyst? Write the chemical equation for the reaction.</p>	5
35	<p>(a) Draw a diagram of the human female reproductive system and label the part (i) that produces eggs. (ii) where the fusion of egg and sperm takes place. (iii) where zygote is implanted. (b)What happens to a human egg when it is not fertilised? OR What are the different methods of contraception ? Explain</p>	5
36	<p>Define resistance of a conductor. State the factors on which resistance of a conductor depends. Name the device which is often used to change the resistance without changing the voltage source in an electric circuit.</p> <p>Calculate the resistance of 50 m length of wire of cross section area 0.01 millimeter square and of resistivity 5×10^{-8} ohm meter</p>	5

Section "E"		
Q.NO. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.		



38	<p>Heredity in Sexually-Reproducing Organisms</p> <p>In sexually reproducing organisms, the mode of heredity gets more complicated. Instead of each individuals giving rise to their own offspring by simply copying the DNA, two organisms must combine their DNA to create offspring. This method is much more complex, but leads to more variation in the offspring, which can increase their chances of success in a changing world. Most sexually-reproducing organisms exists as diploids, with two alleles of each gene. In order to reproduce sexually, these organisms must produce haploid cells through the process of meiosis. Meiosis consists of two</p>	4
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Q.

consecutive cellular divisions, in which the number of alleles is reduced to one per gene. In some organisms, like humans, these haploid cells develop into gametes, which seek gametes of the opposite sex so *fertilization* can take place. Other organisms, such as ferns, have a separate life cycle as a haploid organism, which produces many gametes. In both systems, the parents pass traits on to the offspring in a complex, multiple-allele system. The interactions of these alleles can produce different phenotypes, which add to the variety seen.

Is it more chance of variation in sexually reproducing organism ?

How haploid cell is differ from diploid cell ?

Define heredity.

Expand DNA

-
OR

Cellular DNA is the information source for making proteins in the cell. A section of DNA that provides information for one protein is called the gene for that protein. We know that plants have hormones that can trigger growth. Plant height can thus depend on the amount of a particular plant hormone. An enzyme that is important for this process works efficiently, a lot of hormone will be made, and the plant will be tall.

(a) What is the information source for making proteins in the cell?

i) RNA ii) cellular DNA iii) hormone iv) none of them

(b) Plant height can thus depend on:

(i) the amount of a particular plant hormone (ii) efficient work of the enzyme

(iii) both a and b (iv) none of them

(c) If a lot of hormone will be made then?

(iii) plants will have wrinkled seeds (iv) plants will have green seeds

(d) Expand RNA

39 The following table gives the value of refractive indices of a few media.

4

	1	2	3	4	5	6
Medium	Ice	Water	Kerosene	Flint glass	Ruby	Diamond
Refractive index	1.31	1.333	1.44	1.66	1.71	2.42

Name the medium having highest optical density.

Name the medium having lowest optical density.

What happens when light passes through water to flint glass?

In which medium light travel faster?

What is the function of an earth wire in electrical instruments? Why is it necessary to earth the metallic electric appliances?

Ans. It ensure that any leakage of current in the electrical instrument flows to the earth without causing any harm to the user, it is necessary to earth metallic electrical devices to make safe the users from electric shock.

Q.. What is the patterns of field lines inside a solenoid? What do they indicate?

Ans. The magnetic field is in the form of parallel line. It indicates a uniform magnetic fields.

Q. State two ways by which the strength of an electromagnet can be increased.

Ans. By increasing no. of turns in solenoid, Increasing the strength of current in the solenoid.

Science (086) Class X

Sample Question Paper 22-23

Max. Marks: 80 Time Allowed: 3 hours

General Instructions:

This question paper consists of 39 questions in 5 sections.

All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

Section A consists of 20 objective type questions carrying 1 mark each.

Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.

Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words

Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.

Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

SECTION - A

Select and write one most appropriate option out of the four options given for each of the questions 1 – 20

Science (086) Class X

Sample Question Paper -2, 2022-23

Max. Marks: 70 Time Allowed: 3 hours

General Instructions:

This question paper consists of 39 questions in 5 sections.

All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

Section A consists of 20 objective type questions carrying 1 mark each.

Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.

Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words

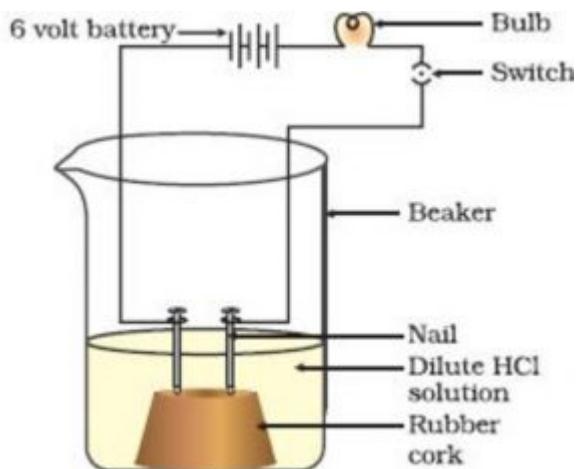
Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.

Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

SECTION – A

Select and write one most appropriate option out of the four options given for each of the questions 1-20

Q.1The apparatus given below in the adjoining figure was set up to demonstrate electrical conductivity.



Bulb will not glow because electrolyte is not acidic.

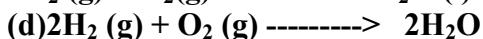
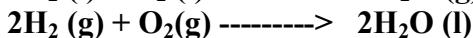
Bulb will glow because HCl is a strong acid and furnishes ions for conduction.

Bulb will not glow because circuit is not complete.

Bulb will not glow because it depends upon the type of electrolyte solution.

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

Q.2 In which of the following chemical equations, the abbreviations represent the correct states of the reactants and products involved at reaction temperature?



Q.3 The electronic configurations of three elements X, Y and Z are given below:

X- 2, 8 ; Y- 2,8,7; Z- 2,8,2 Which of the following is correct:

X is a metal.

Y is a metal.

Z is a non-metal.

Y is a non-metal and Z is metal

Q.4 Which of the following statements are correct for carbon compounds?

Most carbon compounds are good conductors of electricity.

Most carbon compounds are poor conductors of electricity.

Force of attraction between molecules of carbon compounds is not

Very strong.

Force of attraction between molecules of carbon compounds is not

Very strong.

Q.5 Which of the following pairs will give displacement reactions?

FeSO₄ solution and copper metal.

AgNO₃ solution and copper metal.

CuSO₄ solution and silver metal.

NaCl solution and copper metal.

Q.6 When a bee stings, immediately paste of lime is put on the sting. Why?

Bee sting is made of a base.

Bee sting contains an acid called formic acid it gets neutralized with CaO.

Bee sting is acidic because it contain HCl this is neutralize.

All the above.

Q.7 Which of the following will give a pleasant smell if ester when heated with ethanol and A small quantity of sulphuric acid?

CH₃COOH

CH₃CH₂OH

CH₃OH

CH₃CHO

Q.8 Which is the correct sequence of body parts in the human alimentary canal?

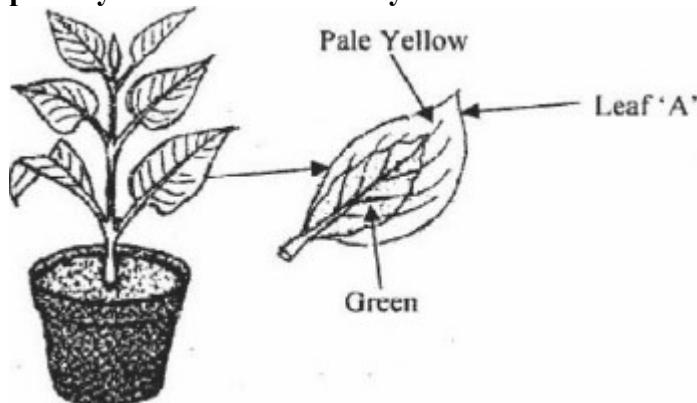
Mouth > stomach > small intestine > large intestine > oesophagus.

Mouth > oesophagus > stomach > small intestine > large intestine.

Mouth > stomach > oesophagus > small intestine > large intestine.

Mouth > oesophagus > stomach > large intestine > small intestine.

Q.9 Observe the experimental setup shown below. This is variegated leaf, in which part of this leaf photosynthesis occur and why?



Pale yellow part because of presence of chlorophyll.

Green part because of absence of chlorophyll.

Pale yellow part because of absence of chlorophyll.

Green part because of presence of chlorophyll.

Q.10 A man with blood group A marries a woman having blood group O. What will be the blood group of the child?

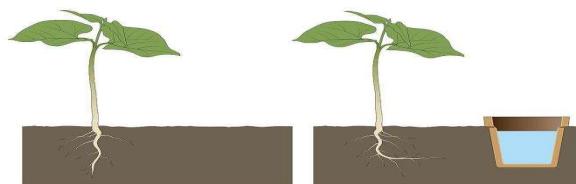
O \only

A only

AB

Equal chance of acquiring blood group A or a blood group O.

Q.11 Observe the three figures given below. Which type of tropism shown by the following figure. Choose correct option from the following option.



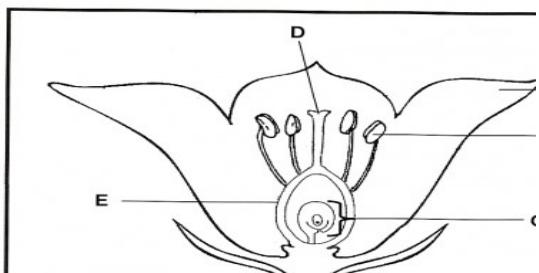
Phototropism and hydro tropism

Chemo tropism and thigmo nestism

Geo tropism and hydro tropism

Hydro tropism and photo tropism

Q.12 Match the labelled parts of the given figure with the correct option.



A	B	C	D	E
Petal	ovary	anther	style	ova
Sepal	anther	ova	stigma	ovary
Petal	anther	ova	stigma	ovary
Petal	anther	ovary	style	ova

Q.13 An electric bulb is connected to a 220 V generator. The current is 0.50 A. what s the power of the bulb?

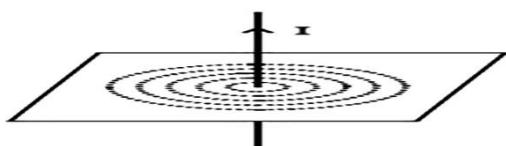
440 W

110 W

55 W

0.0023 W

Q.14 The pattern lines is as shown below, give correct option from the following:



Magnetic field increases with increase in current.

Magnetic field decreases with increase in current.

Magnetic field increases with increase in length of conductor.

Magnetic field decreases with decrease in length of conductor

Q.15

Electrical resistivity of a given metallic wire depend upon:

Its length

Its thickness

Its shape

Nature of material

Q.16 The phenomenon electromagnetic induction is:

The process of changing a body.

The process of generating a magnetic field due to current passing through coil.

Producing induced current in a coil by relative motion between a magnet and a coil.

The process of rotating a coil of an electric motor.

Q. no 17 to 20 are Assertion - Reasoning based questions.

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

Both A and R are true and R is the correct explanation of A

Both A and R are true and R is not the correct explanation of A

A is true but R is false

A is False but R is true

Q.17 Assertion: Heat is required for the decomposition of lead nitrate.

Reason: decomposition reaction are endothermic.

Q.18 Assertion: Sex is determined by different factors in various species.

Reason: In human beings the sex of the child depend on whether the paternal chromosome is X and Y.

Q.19 Assertion: Left ventricle of heart has a thicker wall than that of the right ventricle.

Reason: Left ventricle need to pump blood to near by lungs only.

Q.20 Assertion: It is not necessary that every magnet has one north and one south pole.

Reason : It is basic fact the magnetic poles occur in pairs.

SECTION – B

Q. no. 21 to 26 are very short answer questions

Q.21 State the purpose for which litmus is used in laboratories.

State the purpose for white pH paper is used in laboratories.

OR

Out of the two-hydrochloric acid and acetic acid, which one is considered a strong acid and why?

Q.22 A product is formed in our muscles due to breakdown of glucose when is a lack of oxygen. Name the product and also mention the effect of build up of this product.

**Differentiate between fermentation in yeast and aerobic respiration on the basis
of end products formed.**

Q.23 What will happen if:

Peristaltic movement do not occur all along the oesophagus?

Rings of cartilage are not present in the trachea?

Q.24 Name the following parts of human excretory system:

(a)Part in which urine is produced. (b) Part which stores the urine.

(c)Part which connect (a) and (b).(d) Part from which urine is passed out.

**Q.25 What is meant by dispersion of white light? Draw a diagram to show the dispersion
Of white light by a glass prism.**

OR

How will you use two identical prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light? Draw the diagram.

Q.26 Compare the advantages of cloth bags over polythene bags.

SECTION - C

Q.no. 27 to 33 are short answer questions

Q.27 $C + O_2 \longrightarrow CO_2 + 94.00 \text{ kcal}$



Identify the types of reaction mentioned above in (i) and (ii). Give one example for each type in the form of a balanced chemical equation.

Q.28 (a)Show the formation of MgO by the transfer of electrons.

(b)Name the cation and anion.

(c)Write two properties of ionic compounds.

Q.29 The plants were wilting in a garden and Gardner watered the plants. The plants became fresh again.

Which parts of the plant is responsible for conducting water in it. How does the process of conduction of water take place in plants?

OR

Leaves of a healthy potted plant were coated with vaseline. Will this plant remain healthy for long? Give reasons for your answer.

**Q.30 Name the type of mirror which facilitates:
shaving.**

Observing large images of the teeth of patient.

Observing rare view in vehicles.

Give reason to justify your answer in each case.

Q.31 An object is situated at 8 cm from a convex lens of focal length 10 cm. Find the position and nature of image. Draw ray diagram to illustrate the formation of image,

Q.32 What is a solenoid? Draw a pattern magnetic field lines of (i) a current carrying solenoid and (ii) a bar magnet. List two distinguishing features between the two fields,

OR

Why don't two magnetic field lines ever intersect each other? Explain.

"The magnetic field is said to be uniform inside a current carrying solenoid.

Why?

State Fleming's left hand rule.

Q.33 Pesticides like DDT which are sprayed to kill pest on crops are found to be present in the soil, ground water and water bodies. Explain how do they reach these places.

SECTION - D

Q.no. 34 to 36 are Long answer questions.

Q.34 A compound X undergoes addition reaction with H₂ to form compound Y Having molecular mass 30 g/mole. X discolourises bromine water and burns With smoky flame. Identify X and Y and write chemical equations of the Reactions involved.

Write the structural formulae of (i) butanone and (ii) pentanoic acid.

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

Reason to justify your answer,

OR

Define homologous series of organic compounds. Mention any two

Characteristics of homologous series.

Describe a chemical test to distinguish between ethanol and ethanoic acid.

Identify functional group in pentanone.

Q.35 Name the human male reproductive organ that produces sperms and also secretes a hormone. Write the functions of the secreted hormone.?

Name the parts of the human female reproductive system where:

Fertilisation takes place.

Implantation of the fertilised egg occurs.

(iii) Explain how the embryo gets nourishment inside the mother's Body?

OR

Explain what happens when:

Testosterone is released in male.

Pollen grain falls on the stigma of the flower.

Egg fuses with sperm cell.

Planaria is cut into many pieces.

Buds are formed on the notches of the bryophyllum leaf.

Q.36 Although an electric kettle and toaster were used simultaneously in the kitchen to Prepare breakfast for the family, yet the two devices could work efficiency due to Fuse used in the electric circuit.

What is a fuse? Write the material used in fuse wires. How is a fuse connected In an electric circuit?

State the ratings of fuse used in an electric circuit.

What is the function of a fuse? How does it perform its function?

A devices uses 1 kW electric power when operated at 220 V. calculate

The rating of the fuse to be used.

SECTION - E

Q.no. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

Q.37

Read the following cases and answer the questions given below:

Metals are widely used in our daily life for large number of purposes. Some of the metals are used in making jewellery and coins, some are employed making utensils and furniture, and some in the construction of heavy machinery, tools transport vehicles and many in the manufacturing of other equipment's. metals often find application as catalysis in various industrial process such as hydrogenation of vegetable oils, manufacture of ammonia, sulphuric acid, nitric acid, dyes, drugs etc.

Metals, through in small quantities, have also been

Recognized as essentials for various biological processes. For example, iron is a constituent of blood

Pigment and magnesium of plant pigment.

Name most abundant metal in the earth's crust.

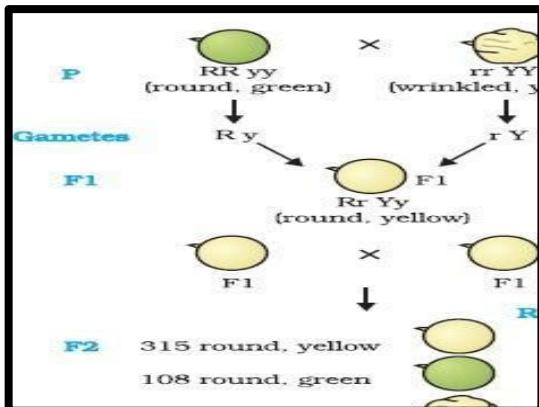
Which property of metals is used for making bells & Strings of musical instruments like sitar & violin?

Why food cans are coated with tin and not with Zinc?

Which metal is used as catalyst in the preparation of Ammonia gas by habers process?

Q.38

EXPRESSION OF TRAITS



Observe the above diagram carefully and answer the following questions.

(a) What does the above figure show?

(b) Which traits from the above figure are dominant?

- a) Round green
- b) Round yellow
- c) Wrinkled yellow
- d) Wrinkled green

(c) Which traits from the above figure are dominant?

- a) Round green
- b) Round yellow
- c) Wrinkled yellow
- d) Wrinkled green

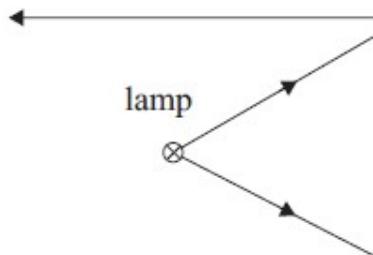
(d) When we cross tall plant with short plant which plant will morphologically appear in F1 generation?

- a) Short
- b) Both
- c) Tall
- d) In between tall and short

Q.39 MONA'S SPOTLIGHT

Mona is trying to design a spotlight for her school production. She experiments with a lamp in front of a mirror, as shown in the diagram below.

Qa.



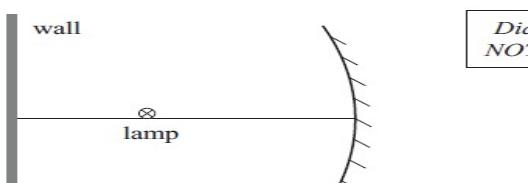
State the name of the position where she has placed the lamp.

Qb. She then places the lamp further from the mirror and notices that a light ray from the lamp reflects straight back to the lamp, as shown in the diagram below.



(i) State the name of the position of the lamp & Explain why the light ray reflects as shown.

QC. Mona now moves the lamp closer to the mirror, as shown in the diagram below. She sees a clear image of the lamp on the wall. The height of the image is twice the height of the lamp. The focal length of the mirror is 25 cm.



What is the position of lamp?

QD.

Mona attaches her mirror to the wall beside another, different mirror. When she looks at the mirrors, she sees two different images of herself as shown in the diagram below. Identify the type of mirror?



Mirror 1



Mirror 2

KENDRIYA VIDYALAYA SANGATHAN RAIPUR REGION

MODEL SAMPLE QUESTION PAPER -3 ,2022-23

CLASS-X SCIENCE(086)

Max. Marks:80

Time Allowed : 3 hours

General Instructions:

This question paper consists of 39 questions in 5 sections.

All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

Section A consists of 20 objective type questions carrying 1 mark each.

Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.

Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.

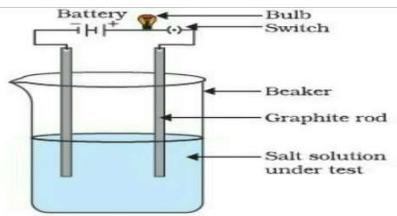
Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.

Section E consists of 3 source -based /case-based units of assessment of 04 marks each with sub-parts.

SECTION-A

Select and write one most appropriate option out of the four options given for each of the questions 1-20

Q.1 The experiment is set up as shown in the figure to test a few solutions which contain hydrogen.



Which of the following observations are correct ?

When a solution of glucose is used, the bulb does not glow.

When a solution of ethanol is used, the bulb does not glow.

When a solution of sodium hydroxide is used, the bulb does not glow.

When a solution of hydrochloric acid is used, the bulb glows.

(i), (ii) and (iv) only.

(i), (ii) and (iii) only.

(i) and (ii) only.

(iii) and (iv) only.

Q.2 Which is direct synthesis ?



None of these

Q.3 On adding a strip of aluminium to 50 ml of a solution of FeSO_4 in a test tube , the correct observation for change in colour of solution is

Pale green coloured solution turned turned colourless.

Colourless solution turned pale green.

Pale green coloured solution remained pale green.

(d) Colourless solution turned blue.

Q.4 Study the diagram given below and identify the gas formed in the reaction.



Carbon dioxide which extinguishes the burning candle.

Oxygen due to which the candle burns more brightly.

Sulphur dioxide which produces a suffocating smell.

Hydrogen which while burning produces a popping sound.

Q.5 In a double displacement reaction such as the reaction between sodium sulphate solution and barium chloride solution :

Exchange of atoms takes place.

Exchange of ions takes place.

A precipitate is produced.

An insoluble salt is produced.

The correct option is :

(B) and (D)

(A) and (C)

Only (B)

(d)(B), (C) and (D)

Q.6 An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. The following statement is true for solutions 'A' and 'B'.

A is strongly basic and B is a weak base.

A is strongly acidic and B is a weak base.

A has pH greater than 7 and B has pH less than 7.

(d) A has pH less than 7 and B has pH greater than 7.

Q.7 Oils on treating with hydrogen in the presence of palladium or nickel catalyst form fats. This is an example of

Addition reaction.

Oxidation reaction.

Substitution reaction.

(d) Displacement reaction.

Q.8 When a person eats some egg white, proteins and water enter the stomach. Which substances are found leaving the stomach and small intestine ?

	Leaving the stomach	Leaving the small intestine
	Amino acids and water	Amino acids and water
(b)	Fatty acids, glycerol and water	Fatty acids, glycerol and water
(c)	Protein and water	Fatty acids and glycerol
(d)	Protein, amino acids and water	Water

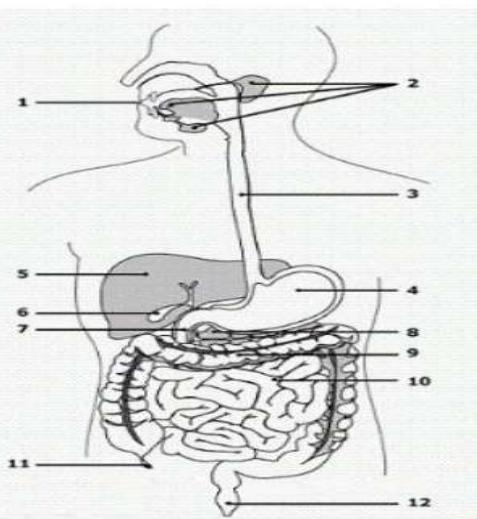
Q.9 The diagram shows the human gut. Which numbered structures secrete digestive enzymes ?

1,2,3,4

5,6,7,8

2,3,5,8

2,4,8,10



Q.10 Select the incorrect statement.

The frequency of certain genes in a population changes over several generations resulting in evolution.

Reduction in the weight of an organism due to starvation is genetically controlled.

Low weighted parents can have heavy weighted progeny.

(d) Traits which are not inherited over generations do not cause evolution.

Q.11 Electrical impulse travels in a neuron from

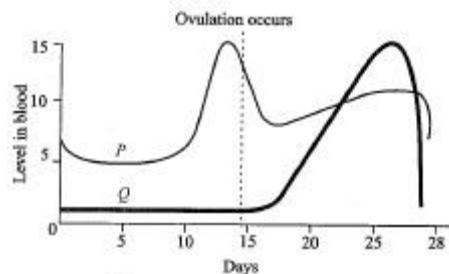
Dendrite -axon—axonal end—cell body.

Cell body - dendrite—axon—axonal end.

Dendrite—cell body - axon - axonal end.

(d) Axonal end—axon - cell body - dendrite

Q.12 The given graph shows the hormonal changes during a normal menstrual cycle. What would be a likely consequence if the hormone represented by graph Q is lacking in an adult female ?



The uterine lining might not be sufficiently stable for implantation of fertilized ovum.

Levels of the hormone represented by graph P would be higher than normal.

Fertilization of ovum would fail to occur.

(d) There would be no significant effect since the functions of the hormones overlap.

Q.13 A conductor has a length L, and area of cross section A. The resistance of this conductor will be minimum if

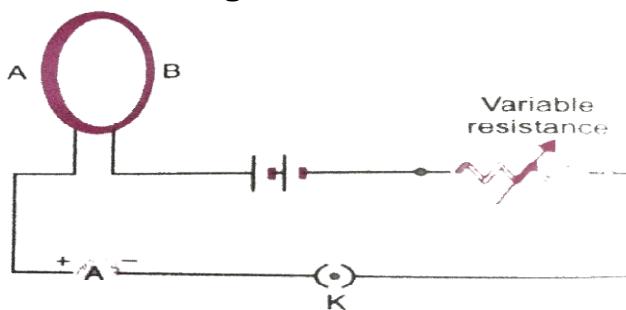
Length is doubled, area is halved.

Length is tripled, area is doubled.

Length is halved, area is doubled.

(d) Length and area both are halved.

Q.14 A circular loop placed in a plane perpendicular to the plane of paper carries a current when the key is ON. The current as seen from points A and B (in the plane of paper and on the axis of the coil) is anti-clockwise and clockwise respectively. The magnetic field lines point from B to A. The N-pole of the resultant magnet is on the face close to



A

B

A if the current is small, and B if the current is large.

(d) B if the current is small and A if the current is large.

Q.15 A strip of copper and another of silicon are cooled from room temperature to 32 K. Which of the following is true regarding this ?

Resistance of copper strip decreases because it has positive temperature coefficient of resistance.

Resistance of copper strip increases because it has negative temperature coefficient of resistance.

Resistance of silicon strip decreases because it has negative temperature coefficient of resistance.

Resistance of silicon strip increases because it has positive temperature coefficient of resistance.

Q.16 A positively charged particle (alpha particle) projected towards west is deflected towards north by a magnetic field. The direction of magnetic field is

Towards north.

Towards east.

Downward

Upward.

Q. No. 17 to 20 are Assertion – Reasoning based questions.

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

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

Both A and R are true and R is not the correct explanation of A.

A is true but R is false.

(d) A is false but R is true.

Q.17 Assertion: Most of the combustion reactions are exothermic

Reason : Products are more stable than reactants in exothermic reactions.

Q.18 Assertion : Evolution is an extremely slow process

Reason : New characters are accumulated in an organism during its lifetime

Q.19 Assertion : Human body produces highly toxic substances, which if not eliminated may cause death

Reason : Excretory substance removes nitrogenous waste from the body

Q.20 Assertion : A moving magnet can induce electric current.

Reason : Metallic conductors can conduct electricity due to electrons

SECTION-B

Q.no. 21 to 26 are very short answer questions.

Q.21 Identify the type of each of the following reactions. Also write the balanced chemical equation for each reaction.

A reaction in which the reaction mixture becomes warm.

A reaction in which an insoluble substance is formed.

OR

A brown substance 'X' on heating in air forms a substance 'Y'. When hydrogen is passed over heated 'Y', it again changes back into 'X'.

Name the substances 'X' and 'Y'.

(ii) Name the chemical processes occurring during both the changes

Q22. How the timing of secretion and amount of hormone secretion are regulated in human system ?

Explain giving example.

Q23. When we over-eat we feel burning sensation in our stomach. State the reason

Q.24 What happens when the system of blood vessels develops a leak ?

Q.25 Does the incident ray and emergent ray coincide in the process of refraction through glass slab ? Give reason.

OR

Explain why the planets do not twinkle ?

Q.26 List the key functional aspects of ecosystems.

SECTION- C

Q.no. 27 to 33 are short answer questions.

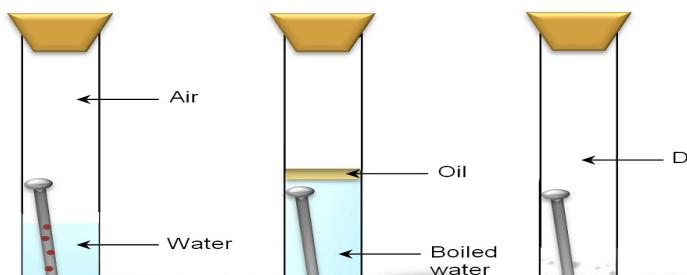
Q.27 Take 3 g of barium hydroxide in a test tube, now add about 2 g of ammonium chloride and mix the contents with the help of a glass rod. Now touch the test tube from outside.

What do you feel on touching the test tube ?

State the inference about the type of reaction occurred.

Write the balanced chemical equation of the reaction involved.

Q.28. What is indicated by the given figure ?



Q.29 In each of the following situations what happens to the rate of photosynthesis ?

Cloudy days

No rainfall in the area

Stomata get blocked due to dust

OR

What will happen if mucus is not secreted by the gastric glands ?

Q.30 A student focuses the image of a candle flame, placed at about 2 m from a convex lens of focal length 10 cm, on a screen. After that he moves gradually the flame towards the lens and each time focuses its image on the screen.

In which direction does he move the lens to focus the flame on the screen ?

What difference is seen in the intensity (brightness) of the image of the flame on the screen ?

Q.31 (a) A security mirror used in a big showroom has radius of curvature 5 m. If a customer is standing at a distance of 20 m from the cash counter , find the position, nature and size of the image formed in the security mirror.

What is seen on the screen when the flame is very close (at about 5 cm) to the lens?

Neha visited a dentist in his clinic. She observed that the dentist was holding an instrument fitted with a mirror . State the nature of this mirror and reason for its use in the instrument used by dentist.

Q.32 Give reasons for the following :

There is either a convergence or a divergence of magnetic field lines near the ends of a current carrying straight solenoid

The current-carrying solenoid when suspended freely rests along a particular direction.

OR

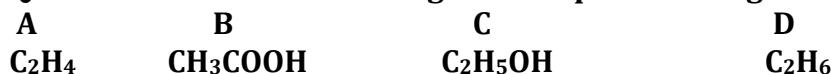
Explain with the help of a diagram the distribution of magnetic field due to a current through a circular loop. Why is it that if a current-carrying coil has n turns the magnetic field produced at any point is n times as large as that produced by a single turn ?

Q.33 In a food chain , state the trophic level at which the concentration of harmful chemicals is maximum. Why is it so ?

SECTION -D

Q.no. 34 to 36 are Long answer questions

Q.34 The formulae of four organic compounds are given below :



Which one of these compounds A, B, C or D is a saturated hydrocarbon ?

Identify the organic acid and give its structural formula .

Which of the above compounds when heated at 443 K in the presence of conc. Sulphuric acid forms ethene as the major product ? What is the role played by conc. Sulphuric acid in this reaction? Also write the chemical equation involved.

Give a chemical equation when B and C react with each other in presence of conc. Sulphuric acid.

Name the major product formed and mention one of its important use.

OR

Write the chemical formula and name of the compound which is the active ingredient of all alcoholic drinks. List its two uses. Write chemical equation and name of the product formed when this compound reacts with Sodium metal. Also state how this alcohol can be converted to an organic acid. Name the reaction.

Q.35 (i) Although Amoeba and Leishmania both show same mode of reproduction but the process of reproduction is carried out in different ways. Identify their mode of reproduction and mention the way it is carried out in the two species.

(ii) What is regeneration? Explain with the help of a diagram how this process is carried out in Planaria.

(iii) Name the part of Rhizopus in which spores are formed.

State the condition under which spores grow into a new individual.

OR

"Use of a condom is beneficial for both the sexes involved in a sexual act ". Justify this statement giving two reasons.

How do oral contraceptive help in avoiding pregnancies ?

Q.36 (i) Draw a labelled circuit diagram of the circuit used to show the variation of potential difference across the ends of a resistor with current flowing through it. If you use this circuit, what relation would you find between voltmeter reading V and the ammeter reading I ?

What is sex selective abortion ? How does it affect a healthy society ? (state any one consequence)

(ii) A wire of a given material having length ' L ' and area of cross section ' A ' has a resistance of 4Ω .

Find the resistance of another wire of the same material having a length $L/2$ and area of cross section $2A$.

SECTION- E

Q.37 A student took four metals P, Q, R and S and carried out different experiments to study the properties of metals. Some of the observations were :

All metals could not be cut with knife except metal R.

Metal P combined with oxygen to form an oxide M_2O_3 which reacted with both acids and bases.

Reaction with water.

P- Did not react either with cold or hot water but reacted with steam.

Q- Reacted with hot water and the metal started floating.

R- Reacted violently with cold water

S- Did not react with water at all

Based on the above observation answer the following :

Out of the given metals , the one which needs to be stored in kerosene is

P (b) R (c) S (d) Q

The metal which forms amphoteric oxide is

P (b) Q (c) R (d) S

Out of the given metals , the metal Q is

Iron (b) Zinc (c) Potassium (d) Magnesium

The increasing order of the reactivity of the four metals is :

P < Q < R < S

S < R < Q < P

S < P < Q < R

P < R < Q < S

OR

(i v) Which metal can be displaced by copper from its salt solution ?

Q. no. 37 to 39 are case-based / data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub parts.

(a)Zinc (b) Silver (c) Iron (d) Lead

In what ways are the sex chromosomes 'X' and 'Y' different in size ? Name the mismatched pair of sex chromosome in humans.

Write the number of pair/pairs of sex chromosomes present in human beings. In which one of the parent (male/female) perfect pair/pairs of sex chromosomes are present ?

OR

Q.38 Sex of an individual is determined by different factors in various species. Some animals rely entirely on the environmental cues, while in some other animals the individuals can change their sex during their life time indicating that sex of some species is not genetically determined. However , in human beings, the sex of an individual is largely determined genetically.

(ii) What is the statistical probability of getting either a male child or a female child ?

Q.39 The ability of a medium to refract light is also expressed in terms of its optical density. Optical density has a definite connotation. It is not the same as mass density. We have been using the terms 'rarer medium' and 'denser medium' quite often in the chapter of light. It actually means 'optically rarer medium' and 'optically denser medium' , respectively. When can we say that a medium is optically denser than the other ? In comparing two media, the one with the larger refractive index is optically denser medium than the other. The other medium of lower refractive index is optically rarer.

Optical density is:

Mass/Volume

Ability to refract light

Ability to reflect light

None of these

An optically rarer medium is one in which :

Speed of light is more.

Speed of light is less.

Speed equals to speed of sound

None of these

An optically denser medium is one in which :

Speed of light is more

Speed equals to speed of sound

Speed of light is less

None of these

When light travels from an optically denser medium to an optically rarer medium :

It bends towards the normal

It bends away from the normal

It passes without deviation

Depends upon the two media in contact

OR

(iv) The refractive index of diamond is 2.42. What do you mean from this ?

Speed of light in diamond is raised by a factor 2.42 relative to that in vacuum

Speed of light in diamond is lower by a factor 2.42 relative to that in vacuum.

Speed of light in air equals to speed of light in diamond

(d) None of these

Science (086)

Class X

Sample Question Paper -4 ,2022-23

Max. Marks: 80

Time Allowed: 3 hours

General Instructions:

- i. This question paper consists of 39 questions in 5 sections.
- ii. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
- iii. Section A consists of 20 objective type questions carrying 1 mark each.
- iv. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
- v. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words
- vi. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
- vii. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

SECTION - A

Select and write one most appropriate option out of the four options given for each of the questions 1 – 20.

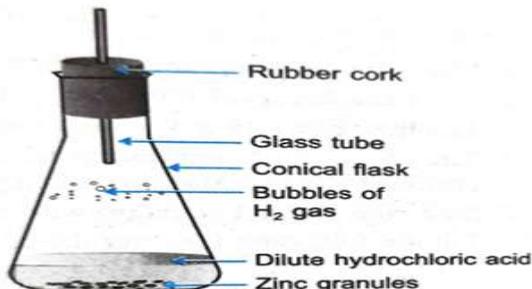
Q 1. Four students were given three colourless liquids A, B, C of water, lemon juice and a mixture of water and lemon juice respectively. After testing these liquids with pH paper, following sequences in colour change of pH paper were reported.

- (i) Blue, red and green
- (ii) Orange, green and green
- (iii) Green, red and red
- (iv) Red, red and green

The correct sequence of colours observed is:

- (a) (i) (b) (ii) (c) (iii) (d) (iv)

Q 2. The reaction between Zinc (Zn) and Dil. Hydrochloric acid (HCl) is



- (i) Displacement reaction
- (ii) Exothermic process
- (iii) Zn is more reactive than hydrogen
- (iv) All of these

Q 3. The reaction between copper oxide and hydrogen is redox reaction. Identify the oxidizing and reducing agent.

- (i) CuO and Cu
- (ii) CuO and H_2
- (iii) CuO and H_2O
- (iv) H_2O and H_2

Q 4. Common salt, besides being used in kitchen, can also be used as the raw material for making

- (i) washing soda (ii) bleaching powder
 - (iii) baking soda (iv) slaked lime
- (a) (i) and (ii)
 - (b) (i), (ii) and (iv)
 - (c) (i) and (iii)
 - (d) (i), (iii) and (iv)

Q 5. What happens when calcium is treated with water?

- (a) It does not react with water
- (b) It reacts violently with water
- (c) It reacts less violently with water
- (d) Bubbles of hydrogen gas formed stick to the surface of calcium

- A. (A) & (D)
- B. (B) & (C)
- C. (A) & (B)
- D. (C) & (D)

Q 6. In terms of acidic strength, which one of the following is in the correct increasing order?

- (a) Water < Acetic acid < Hydrochloric acid
- (b) Water < Hydrochloric acid < Acetic acid
- (c) Acetic acid < Water < Hydrochloric acid

(d) Hydrochloric acid < Water < Acetic acid

Q 7. Identify 'A' in the following reaction:



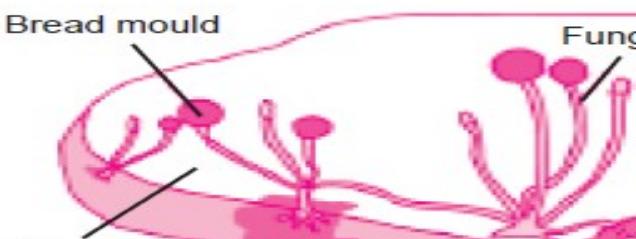
(a) CH_3COONa

(b) $\text{CH}_2(\text{Na})\text{COOH}$

(c) NaOH

(d) NaHCO_3

Q 8. The image shows the bread moulds on a bread.



How these fungi obtain nutrition?

(a) By using nutrients from the bread to prepare their own food.

(b) By allowing other organisms to grow on the bread and then consuming them.

(c) By breaking down the nutrients of bread and then absorbing them.

(d) By eating the bread on which it is growing.

Q 9. Rings of cartilage present in the throat ensure that

(a) air is filtered

(b) air is at room temperature

(c) air passage does not collapse

(d) air is free of microbes

Q 10. If a round, green seeded pea plant (RR yy) is crossed with wrinkled, yellow seeded pea plant (rr YY), the seeds produced in F₁ generation are

(a) round and yellow

(b) round and green

(c) wrinkled and green

(d) wrinkled and yellow

Q 11. Which statement is not true about thyroxin?

(a) Iron is essential for the synthesis of thyroxin

(b) It regulates carbohydrates, protein and fat metabolism in the body

(c) Thyroid gland requires iodine to synthesise thyroxin

(d) Thyroxin is also called thyroid hormone

Q 12. Offspring formed by asexual method of reproduction have greater similarity among themselves because

(i) asexual reproduction involves only one parent

(ii) asexual reproduction does not involve gametes

(iii) asexual reproduction occurs before sexual reproduction

(iv) asexual reproduction occurs after sexual reproduction

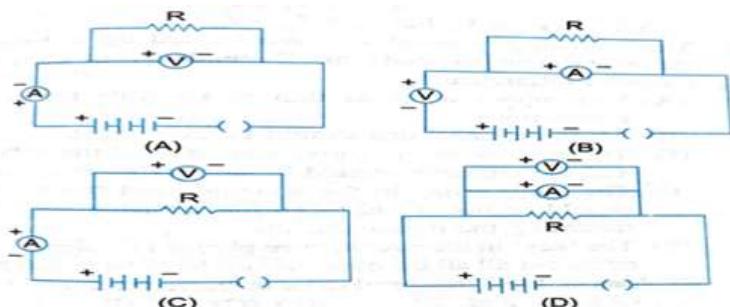
(a) (i) and (ii)

(b) (i) and (iii)

(c) (ii) and (iv)

(d) (iii) and (iv)

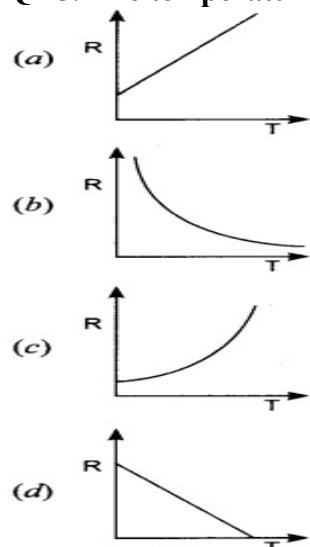
Q 13. The correct set up for studying the dependence of the current on the potential difference across a resistor is:



Q 14. Two identical coaxial circular loops carry a current i each circulating in the same direction. If the loops approach each other, you will observe that

- (a) the current in each increases
- (b) the current in each decreases
- (c) the current in each remains the same,
- (d) the current in one increases whereas that in the other decreases

Q 15. The temperature of a conductor is increased. The graph best showing the variation of its resistance is



Q 16. Which of the following statements is incorrect regarding magnetic field lines?

- (a) The direction of magnetic field at a point is taken to be the direction in which the north pole of a magnetic compass needle points.
- (b) Magnetic field lines are closed curves
- (c) If magnetic field lines are parallel and equidistant, they represent zero field strength
- (d) Relative strength of magnetic field is shown by the degree of closeness of the field lines

Q. no 17 to 20 are Assertion - Reasoning based questions.

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

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true and R is not the correct explanation of A
- (c) A is true but R is false
- (d) A is False but R is true

Q 17. Assertion: Colour of copper sulphate does not change when an iron nail is kept in it.

Reason: Iron is more reactive than copper and it displaces it

Q 18. Assertion: Traits like tallness and dwarfness in pea plant are inherited independently.

Reason: When a homozygous tall pea plant is crossed with dwarf pea plant, medium sized pea plant is obtained in F₁ generation.

Q 19.Assertion: Arteries are thick-walled and elastic in nature.

Reason: Arteries have to transport blood away from the heart.

Q 20.Assertion: Fuse is a safety device which is installed to prevent electrical circuits and possible fires.

Reason: Fuse consist of tin-plated copper wire having low melting point, which melts and breaks the circuit if the current exceeds a safe value.

SECTION – B

Q. no. 21 to 26 are very short answer questions.

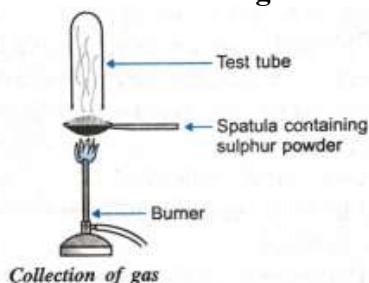
Q 21.Give reason for the following:

(a) Aluminium oxide is considered as an amphoteric oxide.

(b) Ionic compounds conduct electricity in molten state.

OR

Q.Pratyush took Sulphur on a spatula and heated it. He collected the gas evolved by inverting a test tube over it as shown in the figure.



(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.

Q 22(a) Draw a neat diagram of a neuron and label (i) dendrite and (ii) axon.

(b) Which part of the human brain is:

(i) the main thinking part of the brain?

(ii) responsible for maintaining the posture and balance of the body?

Q 23.Two green plants are kept separately in oxygen free containers, one in the dark and the other in continuous light. Which one will live longer? Give reason.

Q 24.a) Give one advantage of having a large number of these highly coiled structures in our kidneys.

(b) Mention any two substances which are selectively reabsorbed as the filtrate flows along the tubular part of this unit.

Q 25.Define the term dispersion of white light. State the colour which bends (i) the least and (ii) the most while passing through a glass prism.

OR

A person uses convex lens spectacles. What vision defect does he have? Draw a diagram

(i) to show the defective eye

(ii) to show the correction with the lens.

Q 26.Study the food chain in a pond in which the pesticide accumulation is found to be maximum at the fourth trophic level. Name and explain the phenomenon responsible for it.



SECTION - C

Q.no. 27 to 33 are short answer questions.

Q 27. Lead nitrate solution is added to a test tube containing potassium iodide solution.

- Write the name and colour of the compound precipitated.
- Write the balanced chemical equation for the reaction involved.
- Name the type of this reaction justifying your answer.

Q 28. A white powder is added while baking cakes to make it soft and spongy. Name its main ingredients.

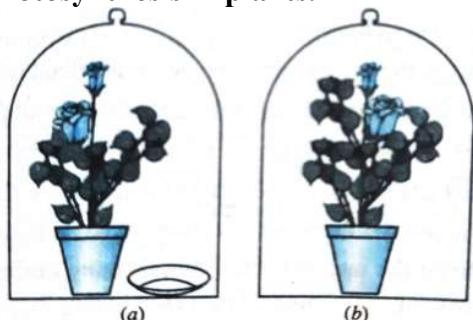
Explain the function of each ingredient. Write the chemical reaction taking place when the powder is heated during baking.

Q 29. Explain the process of breakdown of glucose in a cell,

- In the presence of oxygen,
- In the absence of oxygen

OR.

Given below is the experimental set-up to establish that one of the atmospheric gases is essential for photosynthesis in plants.



(a) Name the atmospheric gas which is essential for photosynthesis.

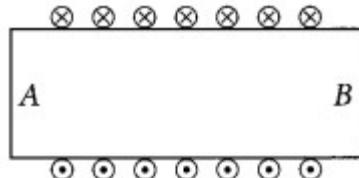
(b) What is kept in watch-glass in figure 'a' and why?

(c) What is the significance of transpiration in plants.

Q 30. Find the position of an object, which when places in front of a concave mirror of focal length 20 cm produces virtual image which is twice the size of the object.

Q 31. Define power of a lens. What is its unit? One student uses a lens of focal length 50 cm and another -50 cm. What is the nature of the lens and its power used by each of them?

Q 32. Diagram shows the lengthwise section of a current carrying solenoid. \otimes indicates current

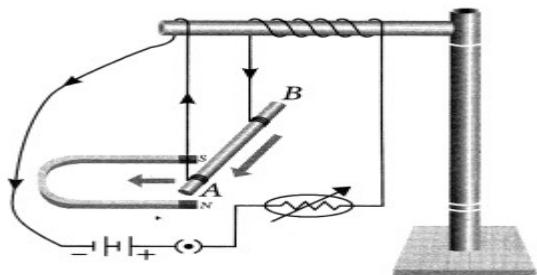


entering into the page, \odot indicates current emerging out of the page.

Decide which end of the solenoid A or B, will behave as north pole. Give reason for your answer. Also draw field lines inside the solenoid.

OR

Q.32 A small aluminium rod suspended horizontally from a stand using two connecting wires. A strong horseshoe magnet is placed in such a way that the rod lies between the two poles with the magnetic field directed upwards. The north pole of the magnet vertically below and south pole is vertically above the aluminium rod.



On passing a current through the aluminium rod from one end to other (B to A).

- What do you observe?
- What happens when the direction of current flowing through the rod is reversed?
- Why does the rod get displaced?
- Name the rule to find the direction of force on a current carrying conductor.

Q 33. What are decomposers? List two important roles they play in the environment.

SECTION - D

Q.no. 34 to 36 are Long answer questions.

Q 34. Few pair of organic compounds are given below:

- A. CH_3OH and $\text{C}_2\text{H}_5\text{OH}$
- B. $\text{C}_2\text{H}_5\text{OH}$ and $\text{C}_3\text{H}_7\text{OH}$
- C. $\text{C}_3\text{H}_7\text{OH}$ and $\text{C}_4\text{H}_9\text{OH}$

Atomic mass: C = 12u, H = 1u, O = 16u.

Instruction: Answer the following questions on the basis of above data.

- Calculate difference in formula and molecular masses in the pairs give above A, B and C.
- What is common in the above result?
- Name the functional group/groups present in the compounds listed above.
- Arrange the above compound in order of increasing number of carbon atoms.
- What is such type of series called?

OR

Two carbon compounds 'A' and 'B' have the molecular formula C_3H_8 and C_3H_6 respectively. Which one of the two is most likely to show addition reactions ? Justify your answer. Explain with the help of a chemical equation, how an addition reaction is useful in vegetable ghee industry

Q 35.(i) A bulb is rated at 200 V, 100 W. Calculate its resistance. Five such bulbs bum for 4 hours daily. Calculate the units of electrical energy consumed per day. What would be the cost of using these bulbs per day at the rate of Rs4.00 per unit?

- Why elements of electrical heating devices are made up of alloys?

Q 36. Distinguish between pollination and fertilisation. Mention the site and product of fertilisation in a

flower. Draw a neat and labelled diagram of a pistil showing pollen tube growth and its entry into the ovule.

OR

Mention the information source of making proteins in the cell. What is the basic event in reproduction ?

In human body what is the role of

- (i) seminal vesicles and
- (ii) prostate gland.

- (c) List two functions performed by testes in human beings.

SECTION - E

Q.no. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

Q 37. Electrolytic Refining. This method is widely used as method of purification of metals like zinc (Zn), copper (Cu), aluminium (Al), chromium (Cr), tin (Sn), lead (Pb), nickel (Ni), gold (Au). In this process, impure metal is used as anode, a strip of pure metal is used as cathode and soluble salt of metal is used as an electrolyte.

During extraction of metals, electrolytic refining is used to obtain pure metals.

A) Which material will be used as anode and cathode for refining of Copper metal by this process ?

B) Suggest a suitable electrolyte and corresponding ions.

C) Draw a labelled diagram of electrolytic refining of copper to illustrate it.

Q 38. A girl was playing with a thin beam of light from her laser torch by directing it from different directions on a convex lens held vertically. She was surprised to see that in a particular direction the beam of light continues to move along the same direction after passing through the lens.

A) State the reason for this observation.

B) In which direction, the ray of light bends as it travels from denser to rarer medium

C) What is the value of $n_2 \times n_1$?

OR

C) How is the refractive index of a medium related to the speed of light?

Q 39. While playing near a sugarcane field, Mohan noticed that the plants are almost similar to one another.

At the same time, he noticed the mango trees in the next plot of land which are not similar to one another.

Mohan's brother told Mohan that sugarcane reproduces asexually, hence there is little variation, Mango reproduces sexually, hence there is larger variation.

A) Why sugarcane cannot reproduce sexually?

B) Can mango reproduce asexually?

C) If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier?

OR

C). A Mendelian experiment consists in breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers, but almost half of them are short. This suggests that the genetic make-up of the tall parent can be depicted as-

- (a) TTww
- (b) TTww
- (c) TtWW
- (d) TtWw

**KENDRIYA VIDYALAYA SANGATHAN, RAIPUR REGION
SAMPLE QUESTION PAPER-5, (22-23)
SCIENCE (086)
CLASS – 10TH**

Maximum Marks- 80

Time – 3hrs

GENERAL INSTRUCTION :

The question paper comprises of five sections A, B, C , Dand E. There are 39 questions in the question paper. All questions are compulsory.

Section A –question 1 to 20 all are of 1 marks each. These questions contain MCQs and assertion and reasoning type question. Answer to these should be given in one word or one sentence.

Section B – question 21 to 26 are very short answer type questions, carrying 2 marks each, answer should be in 30 to 50 words.

Section C – question 27 to 33 are short answer type question , carrying 3 marks each. Answer to these question should be in the range of 50 to 80 words.

Section D – question 34 to 36 are long answer type questions, carrying 5 marks each word limit is 80 to 120 words.

Section E – question 37 to 39 are Case Study Based Questions , carrying 4 marks each.

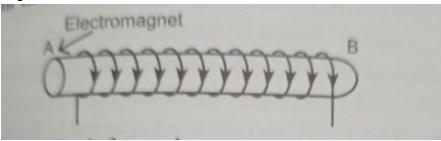
There is no overall choice. However, internal choices have been provided in some question. A student has to attempt only one of the alternatives in such questions.

Wherever necessary, neat and properly labeled diagram should be drawn.

	i)a response ii) a stimulus iii) an impulse iv) an effector	
12	What marks the beginning of reproductive phase in women's life – i)menopause ii)fertilization iii)menarche iv) None of the above	1
13	Human offspring's sex is determine – i)through father's sex chromosomes ii) through mother's sex chromosomes iii) by hormones iv) by enzymes	1
14	The fossil remains of Archaeopteryx is a connecting link between –  i)Reptiles and mammals ii) Reptiles and birds iii) Amphibians and fishes iv) Reptiles and amphibians	1
15	Name of element with which filament of bulb is made – i)silicon ii)lead iii)tungsten iv) copper	1
16	The strength of magnetic field inside a long current carrying straight solenoid is – i)more at the ends than at the centre ii) minimum in middle iii) same at all points iv)increase from one end to another	1
	Direction (Q.17 to 20) : In these question Assertion and Reason has been put forward . Choose the appropriate option for the statements given below- a)Both Assertion and Reason are correct and reason is correct explanation for Assertion. b) Both Assertion and Reason are correct but Reason is not the correct explanation for the assertion. c) Assertion is true but Reason is false . d) The Assertion statement is false but Reason statement is true.	
17	Assertion : Conductors allow the current to flow through themselves. Reason ; They have free electrons to carry charge.	1
18	Assertion : Strength of an electromagnet depends on the magnitude of current flowing through them. Reason: Electromagnets are majorly used to lift heavy weights.	1
19	Assertion : When the direction of the moving charge is perpendicular to the magnetic field , it experience a maximum force. Reason : Force on the moving charge does not depends on the direction of magnetic field in which it moves.	1
20	Assertion : Human being has complex respiratory system . Reason : Human skin is impermeable to gases.	1

SECTION B

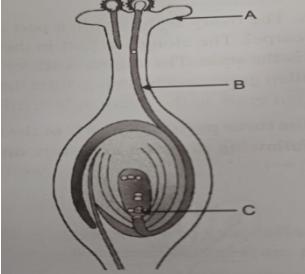
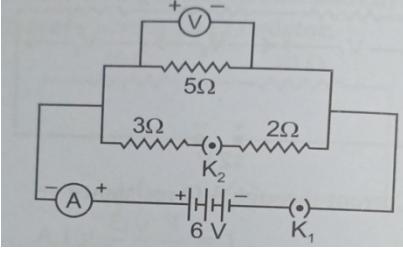
Q.21 to 26 are very short answers type questions of 2 marks each		
21	<p>Two elements A and B have the electronic configuration as 2, 8, 2 and 2, 6 respectively.</p> <p>These form a chemical bond.</p> <p>Name the type of bond formed .</p> <p>Why does the compound so formed has high melting point.</p>	2
22	<p>Complete the various pathways of respiration . The given flow chart contains blank spaces , write most appropriate substances –</p> <pre> graph TD Glucose[Glucose (6-carbon Molecule)] --> Step1[...1.....+ Energy (3-carbon molecule)] Step1 --> Step2[...2.....+ CO2 + (2 C molecules)] Step1 --> Step3[...3.....+ ...4....+ (in cytoplasm)] Step2 --> Yeast[... in Yeast] Step3 --> Yeast </pre> <p>The flowchart illustrates the pathways of respiration. It starts with Glucose (6-carbon Molecule) in the cytoplasm. It can follow two main paths: one leading to energy and a 3-carbon molecule (pyruvate), and another leading to CO_2 and two carbon molecules. The path to energy and a 3-carbon molecule can further branch into two options: one involving yeast where it leads to CO_2 and two carbon molecules, and another involving oxygen where it leads to CO_2 and two carbon molecules.</p>	2
23	<p>Give Reason –</p> <p>a) Plants have low energy needs as compared to animals.</p> <p>b) Herbivores have longer small intestine than carnivores .</p>	2
24	<p>a) Name the longest cell of body .</p> <p>b) Which is the control centre of reflex action and what is the route taken by reflex action called ?</p>	2
25	<p>In which of the following two cases the focal length of the eye lens will be more –</p> <p>a) When ciliary muscles of a normal eye is most relaxed.</p> <p>b) When ciliary muscles of a normal eye is in most contracted state.</p>	2
26	<p>What is biodiversity ? What will happen if biodiversity of an area is not preserved?</p>	2
SECTION C		
Q.No. 27 to 33 are short answer type questions of 3 marks each		
27	<p>A solution of potassium iodide is added to lead nitrate solution –</p> <p>a) State the observation recorded after the reaction.</p> <p>b) Name the type of reaction taking place .</p> <p>c) Write a balanced chemical equation for the above chemical reaction .</p>	3
28	<p>White chemical compound becomes hard on mixing with proper quantity of water . It is used to fix fractured bones in hospitals .</p> <p>a) Name the chemical compound and give its chemical formula .</p> <p>b) What it is commonly called ? Give Its one more use.</p> <p>c) Why it is kept in air tight container explain with equation of reaction taking place.</p>	3
29	<p>a) Explain circulation in human beings with a labeled diagram.</p>	3

	b) Circulation in human beings is called as double circulation. Give reason for your answer.	
30	a) List four specific characteristics of the images of the object formed by convex mirrors. b) The angle between the incident ray and reflected ray is 60^0 . What is the angle of incidence.	3
31	a) A real image, $(1/5)^{th}$ the size of the object is formed at distance of 18cm from a mirror. What is nature of the mirror? b) Calculate its focal length.	3
32	a) The diagram shows a coil of wire wound on a soft iron core forming an electromagnet. A current is passed through the coil in the direction indicated by the arrows. Mark the N and S poles produced in the iron core.  b) State important features of magnetic field obtained inside the solenoid. Write one use of solenoid.	3
33	Gas A, found in the upper layers of the atmosphere, is a deadly poisonous but is essential for all living beings. The amount of this gas started declining sharply in the 1980s. Identify Gas A. How is it formed at higher levels of atmosphere? Why is it essential for all living beings? State the cause for depletion of this gas. OR Suppose you find a heap of domestic waste, in a nearby park, which is decomposing. What would you do to make the people of surrounding area realize that such type of disposal of domestic waste is harmful to environment?	3

SECTION D

Q.No 34 to 36 are long answer type questions, carrying 5 marks each

34	An organic compound 'X' on heating with con. H_2SO_4 forms a compound 'Y' which on addition of one molecule of hydrogen in the presence of nickel forms a compound 'Z'. One molecule of compound 'Z' on combustion forms two molecules of CO_2 and three molecules of H_2O . Identify compounds 'X', 'Y' and 'Z', giving reason. Write the chemical equation for all the reactions involved. OR A carbon compound 'A' having melting point 156K and boiling point 351K, with molecular formula C_2H_6O is soluble in water in all proportions. Identify 'A' and draw its electron structure. What happens when this Compound 'A' is heated with excess Con. H_2SO_4 , write balanced chemical equation of above reaction and name the main product formed.	5 or 2,2,1
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	Give the molecular formulae of any two homologues of 'A' .											
35	<p>a) Identify A, B and C in the given diagram and write one function of each –</p>  <p>b) In human females , what happens when – i) egg is fertilized ii) egg is not fertilized</p>	5										
36	<p>In the given circuit , calculate –</p>  <p>a) net resistance of the circuit. b) voltmeter reading when – i) both the keys are open ii) both the keys are closed c) current through 3 Ω resistor d) State ohms law .</p>	5										
SECTION E Q.No. 37 to 39 are Case Study based questions , carrying 4 marks each.												
37	<p>Case study based : The following table so given shows melting point of some metals . Study the table and the questions related to table and studied data available.</p> <table border="1"> <thead> <tr> <th>Metals</th> <th>Melting Points ($^{\circ}\text{C}$)</th> </tr> </thead> <tbody> <tr> <td>Na</td> <td>98</td> </tr> <tr> <td>Ag</td> <td>961.8</td> </tr> <tr> <td>Cu</td> <td>1085</td> </tr> <tr> <td>Al</td> <td>660.3</td> </tr> </tbody> </table>	Metals	Melting Points ($^{\circ}\text{C}$)	Na	98	Ag	961.8	Cu	1085	Al	660.3	4
Metals	Melting Points ($^{\circ}\text{C}$)											
Na	98											
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	<table border="1"> <tr><td>Zn</td><td>419.5</td></tr> <tr><td>Au</td><td>1064</td></tr> <tr><td>Hg</td><td>--38.63</td></tr> </table>	Zn	419.5	Au	1064	Hg	--38.63	
Zn	419.5							
Au	1064							
Hg	--38.63							
	a) Sodium is refined by -							
	i) distillation ii) electrolytic refinery iii) Liquation iv) oxidative refining							
	b) In electrolytic refining of copper ,cathode and anode are made up of –							
	i) Pure Cu-anode , Impure Cu- cathode iii) Both are impure Cu							
	ii)impure Cu-anode , pure Cu-cathode iv) both are pure Cu							
	c) Which metal is liquid at room temperature -							
	i) Hg ii) Au iii) Zn iv)Cu							
	d) Which metal is best conductor of heat –							
	i) Ag ii) Al iii)Ag iv)Na							

38	<p>Within minutes of baby's birth , people starts remarking about resemblance of baby's looks with mother ,father or someone in family .</p>  <p>But from where does this similarities arise ?</p> <p>Every individual has 46 chromosomes , 23 chromosomes from each parent. Chromosomes are composed of deoxyribonucleic acid . Smaller units of deoxyribonucleic acid are called genes . There are about 20,000 genes in each chromosomes which are responsible for carrying traits to offspring.</p> <p>a) Number of chromosomes a human being has –</p> <p>i) 23 pairs ii) 23 numbers iii) 46 pairs iv) 34 numbers</p> <p>b) Full form of DNA-</p> <p>i) Ribonucleic acid ii) Deoxyribonucleic acid</p> <p>iii) Dinucleic acid iv) Diribonucleic acid</p> <p>c) Which of the following is not correct about variation –</p> <p>i) Variation forms the basis of heredity.</p> <p>ii) Variations enables organisms to adapt in changing environment.</p> <p>iii) Variation is more in case of asexual reproduction.</p> <p>iv) Variation leads to development of new species.</p> <p>d) Segments of DNA which are responsible for traits of an individual are called as –</p> <p>i) RNA ii) Chromosomes iii) Genes iv) germ cell</p>
39	<p>Shyam participated in a group discussion in his interschool competition on the practical application of light and was very happy to won a award for his school. That</p>

	<p>very evening his father gave treat to celebrate Shyam's win. Shyam while sitting saw image of a person sitting at his backside in his curved plate and could see that person's mobile drop in flower bed. Person was not aware until Shyam went and informed him.</p> <p>He thanked Shyam for his clever move.</p> <p>a) From which side of his plate Shyam observed the incident –</p> <p>i) outward curved ii) inward curved iii) plane surface iv) mirror</p> <p>b) Part of plate from which Shyam observed the incident acted like a-</p> <p>i) concave mirror ii) convex mirror iii) plane mirror iv) lens</p> <p>c) The nature of the size of the image formed in above situation is –</p> <p>i) real, inverted and magnified ii) same size, laterally inverted iii) virtual, erect and diminished iv) real, inverted and diminished</p> <p>d) Magnification of the image formed by convex mirror is –</p> <p>i) 0 ii) more than 1 iii) equal to 1 iv) less than 1</p>
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MARKING SCHEME-1
SAMPLE PAPER CLASS X
SECTION “A”

Que no.	Ans						
Q1	(d)	Q6	(b)	Q11	(d)	Q16	(c)
Q2	(a)	Q7	(b)	Q12	(d)	Q17	(b)
Q3	(b)	Q8	(d)	Q13	(d)	Q18	(b)
Q4	(b)	Q9	(a)	Q14	(b)	Q19	(c)
Q5	(c)	Q10	(d)	Q15	(b)	Q20	(d)

SECTION B

Q21	i) Photolysis decomposition reaction , $2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$ (ii) white(AgCl) to greyish white(Ag)	1+1
Q22	A) Dendrite B) Cell body (cyton) C) Axon D) Nerve ending	1+1+1+1
Q23	Salivary gland , liver and pancreas	2
Q24	It depends on amount of excess water and dissolved waste products. Or Glomerular filtration or ultrafiltration, reabsorption , secretion , osmoregulation	2
Q25	The atmosphere is quite thin at very high altitude. there is almost no scattering of sunlight. Or As the planets are much closer to the earth , the amount of light received from them is much greater and the fluctuations caused in the amount of light due to atmospheric refraction is negligible as compared to the amount of light received from them.	2
Q26	Biological magnification refers to the increase in concentration of certain toxicants at each successive trophic level.	2

SECTION C

Q27	For each correct and balanced equation give 1 mark	1+1+1
Q28	$2\text{H}_2\text{O} \rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$ X Y Z	3
Q29	For correct and well labeled diagram give 3 marks Or a) When there is a Vaseline coating on the leaves, the plants will not get sufficient carbon dioxide for photosynthesis, gaseous exchange will not take place, and there will be no transpiration. Thus, the plants will not remain healthy for long. b) 1. Rate of photosynthesis will decrease because sunlight is necessary for photosynthesis. 2. Rate of photosynthesis will decrease because water is need for photosynthesis.	1 + 2
Q30	a.convex lens b. Raju feels pain because all the heat received from sun converge at single point on his arm that is why removed his arm away. c.1. It is used in microscope, magnifying glass, camera lens. spectacles 2. It is used in the correction of hypermetropia.	1+1+1
Q31	For correct diagram give 1.5 marks i. This phenomenon is called dispersion of light occurs due to difference between wave length and speed of different coloured lights passing through glass prism. ii. Rainbow formation iii. white light consist of seven colour. Violet light suffers maximum deviation and red light suffer minimum deviation. OR For correct diagram give 1.5 marks Hypermetropia is corrected by convex lens Here, $v = -1\text{m} = -100\text{ cm}$ $u = -25\text{ cm}$ From lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ $f = \frac{uv}{u-v} = \frac{-25 \times (-100)}{-25+100} = \frac{100}{3}\text{ cm}$ $f = \frac{1}{3}\text{ m}$ Power = $\frac{1}{f} = 3\text{ D}$	1.5+0.5+ 0.5+0.5 1.5+1.5
Q32	i) A common application of joule's heating is the fuse used in electric circuit that protects an electrical circuit. ii) fuse is always connected in series so that when fuse opens our break it will open entire circuit and stop current through the component. iii) metals having appropriate melting point can be used so that when current is overloaded metal used can be melts due to rise of temperature and breaks the circuit.	1+1+1
Q33	a.ozone is a triatomic molecule, i.e. made up of three atoms of oxygen joined together. its molecule formula is O_3 b. Main cause of ozone layer depletion is manufactured chemicals especially CFCs , solvents etc. harmful effect are – depletion of ozone layer expose humans to ultraviolet rays this causes skin diseases , cancer and many more fatal diseases.	1+2

SECTION D

Q34		
Q35	a.For correct and well labeled diagram give 3 marks i.ovaries ii.fallopian tube or oviduct iii. Uterus b. If the egg is not fertilized it lives for about one day in the body. Since the ovary releases one	3+2

	<p>egg every month the uterus also prepares itself every month to receive a fertilized egg. Thus its lining becomes thick and spongy. This would be required for nourishing the embryo if fertilization has taken place. Now however the lining is not needed any longer. So the lining slowly breaks and comes out through the vagina as blood and mucus. This cycle take place roughly every month and is known as menstruation. It usually lasts for about 2-8 days.</p> <p>OR</p> <p>The different methods of contraception are :</p> <p>Barrier method : the products like condoms and diaphragm are physical barrier , which prevents sperms from meeting the eggs.</p> <p>Hormonal method : these contains hormonal preparation in the form of pills which prevents the release of ovum</p> <p>Chemical method : the vaginal pills contain the chemical called spermicides which kill the sperms .</p> <p>Surgical methods: in males, a small portion of sperm duct is cut by surgical method.The cut and is tight properly to prevent the sperms from coming out.In females, a small part of fallopian tube is cut and tied to prevent the egg from entering the oviduct</p>	5
Q36	<p>The proper pf conductor due to which it opposes the flow of current through it is called resistance . numerically equal to ratio od potential difference across its ends to the current flowing through it .</p> $R = V/I$ <p>SI Unit od resistance is ohm Ω</p> <p>Factors affecting resistance of conductor are : nature of its material , temperature , length of conductor wire , area of cross section .</p> <p>Rheostat is the device which is used to change the resistance in an electrical circuit.</p> $R = \rho(L/A) \quad R = 5 \times 10^{-8} \times 50/0.01 \quad R= 5 \times 10^{-8} \times 5 \times 10^3$ $R = 25 \times 10^{-5} \Omega$	1 1 1 2
Q37	<p>atmosphere (b) 8.5gm (c) atmosphere, soil, fresh water (d) painting, corrosion inhibitors</p> <p>OR</p> <p>a.(iv) fire hazard b. true c. temperature , humidity in airetc d. painting , corrosion inhibitors</p>	1+1+1+1 1+1+1+1
Q38	<p>1.YES</p> <p>2. Haploid cell have single set of chromosome , diploid cell have two sets of chromosome.</p> <p>3. heredity – the transfer of character from parents to offspring is known as heredity .</p> <p>4.DNA – Deoxyribonucleic acid</p> <p>OR</p> <p>1.(ii).Cellular DNA 2.(iii) both “a” and “b”</p> <p>3.(i).Plant will be tall 4.Ribonucleic acid</p>	1+1+1+1
Q39	<p>a.Diamond b. Ice c. its speed decreases and it bends toward the normal. d. Ice</p>	1+1+1+1

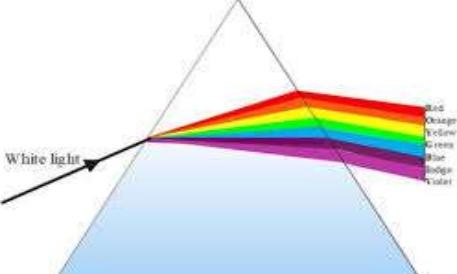
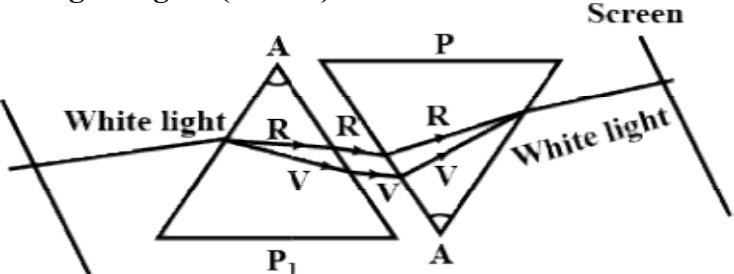
SCIENCE (086) CLASS X
MARKING SCHEME-2 (2022-23)

Q. No	Questions	Marks
SECTION – A		

1.	(c)	1
2.	(c)	1
3.	(d)	1
4.	(b)	1
5.	(b)	1
6.	(b)	1
7.	(a)	1
8.	(b)	1
9.	(d)	1
10.	(d)	1
11.	(c)	1
12.	(iii)	1
13.	(b)	1
14.	(a)	1
15.	(d)	1
16.	(c)	1
17.	(a)	1
18.	(b)	1
19.	(c)	1
20.	(d)	1

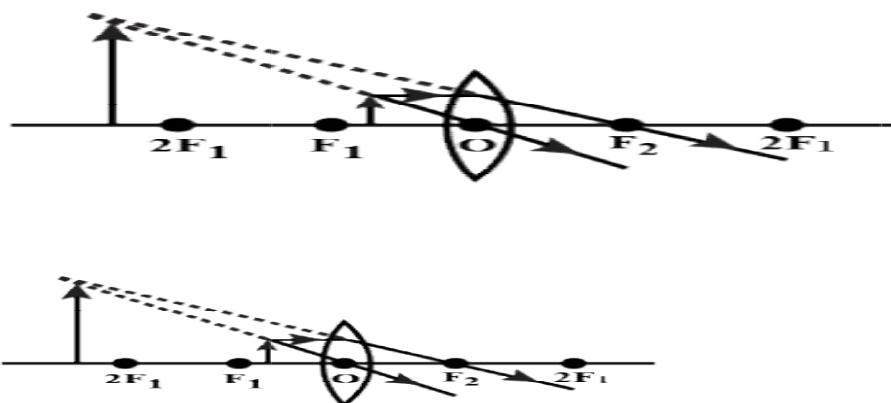
SECTION – B

21.	To test whether a solution is acidic or base To test the strength of concentration of hydronium ions of solution. OR Hydrochloric acid is strong acid because it ionise completely as compared to acetic acid. Strong acid: H_2SO_4 , HNO_3	2
22.	Lactic acid is formed, formation of lactic acid in the muscles causes cramps. During fermentation in yeast, ethanol is formed while in aerobic respiration, carbon Dioxide and water are formed. The energy released in the process of fermentation is also very less as compared to the aerobic respiration.	2

23.	If peristaltic movements do not occur, the food will not be able to move forward. In absence of rings of cartilage, air passage will collapse.	2
24.	Kidney (b) urinary bladder (c) ureter (d) urethra Each carry 1/2 marks.	2
25.	The splitting of white light rays into constituent colour is called dispersion of light.	2
		
	OR Angle of deflections of the two prisms need to be equal and opposite. While the first prism splits the light in the seven colours due to different angles of deflection, the second prism combines the spectrum along a single ray and the colours again combine to give white light as the emergent light. (1mark)	
	 (1mark)	
26.	Cloth bags being biodegradable and broken down by the action of bacteria or other saprophytes, whereas polythene bags are non-biodegradable and they persist in the environment for a long time, causing harm to the ecosystem.	2
SECTION - C		
Q.no. 27 to 33 are short answer questions.		
27.	Exothermic reaction Endothermic reaction Examples: $2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O} + 136 \text{ kcal}$. $\text{C} + \text{H}_2\text{O} \longrightarrow \text{CO} + \text{H}_2 - 31.4 \text{ kcal}$. (Any one of the reaction or other exothermic and endothermic reaction.)	3 0.5 + 0.5 marks

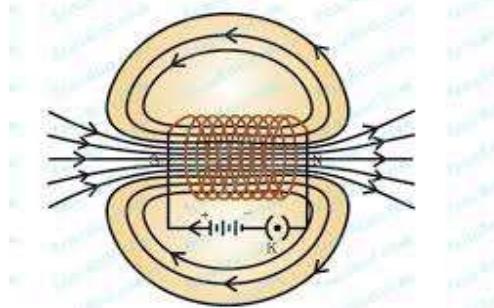
28.	<p>(a)</p> <p></p> <p>Cation is positively charged (Mg^{2+})</p> <p>A solution of ionic compounds contain ions since electricity conduction requires</p> <p>Movement of charged particles they conduct electricity.</p> <p>Soluble in water.</p> <p>Good conductor of electricity in molten state.</p> <p>High melting and boiling point.</p>	3
29.	<p>Xylem is responsible for conduction of water in plants. In xylem, tissue vessels</p> <p>And tracheids of roots, stems and leaves are interconnected to form single</p> <p>Channels to conduct water to all parts of plant. 1 mark.</p> <p>At the roots, cells in contact with the soil actively take up ions. This creates</p> <p>a difference in the concentration of these ions between the root and the soil.</p> <p>Water, therefore, moves into the root from the soil to eliminate this difference.</p> <p>Transpiration of water through the root also help to create suction pull to draw out</p> <p>Water through root from the soil.</p> <p>OR</p> <p>This plant will not remain healthy because</p> <p>It will not get oxygen for respiration.</p> <p>It will not get carbon dioxide for photosynthesis.</p> <p>Upward movement of water and minerals would be hampered due to lack of</p> <p>Transpiration. (1- any one)</p>	3
30.	<p>A convex mirror. If an object is placed between the pole and focus, a highly magnified erect image is formed.</p> <p>Concave mirror: if an object is placed between the pole and the focus a highly magnified erect image is formed.</p> <p>A convex mirror. It produces a diminished erect image.</p> <p>(c) Used as shaving mirror or used by dentists to get enlarged image of teeth (any one use) (1mark)</p>	3

31. Image Virtual, erect, distance of image 40 cm.
Ray diagram using a convex lens.

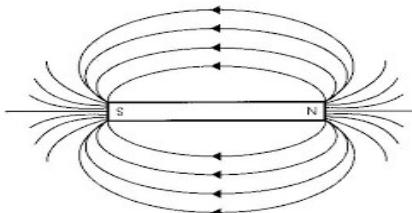


32. A coil of many circular turns of insulated copper wire wrapped closely in the shape of cylinder is called a solenoid.
Magnetic field lines around a current carrying solenoid.

Magnetic Field in a Solenoid



Magnetic field line around bar magnet.



Magnetic field line in a solenoid can be varied its Operation.

Polarisaties of the solenoid can be changed during its Operation.

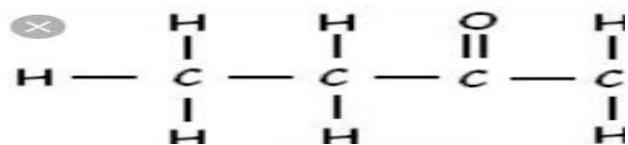
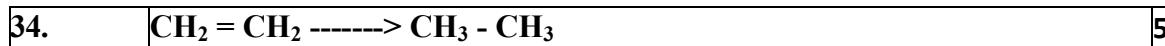
OR

Two magnetic field lines do not intersect each other because if they intersect

Then at the point of intersection there would be two directions of magnetic

	<p>Field. Which is not possible.</p> <p>The magnetic field lines are parallel to the axis of solenoid inside it. Due to</p> <p style="padding-left: 40px;">This the magnetic field is uniform inside the solenoid.</p> <p>Fleming's left-hand rule states that if we stretch the forefinger, middle finger,</p> <p style="padding-left: 40px;">And the thumb of our hand such that all three matually perpendicular to each</p> <p>Other. If the forefinger points in the direction of the magnetic field, the middle</p> <p>Finger points in the direction of electric current. Then the thumb givs the</p> <p>Direction of force acting on the conductor.</p>	
33.	<p>Soil: pesticides are used to protect plants from insects. They consequently get</p> <p style="padding-left: 40px;">Settled into soil particles. When used on plants.</p> <p>Groundwater: through irrigation in the fields, these pesticides present in soil pass</p> <p style="padding-left: 40px;">Into lower layers of soil and reaches groundwater.</p> <p>Water bodies: when the waste water or other agricultural waste is thrown in water</p> <p style="padding-left: 40px;">Bodies like river, canal, ponds etc, the pesticides affect water bodies.</p>	3

SECTION - D



No, because detergent do not react with carbonate/ bicarbonate salts of calcium and magnesium present in hard water and no scum is formed. Therefore, hard water can be checked with soap solution only which forms scum with hard water.

	<p>OR</p> <p>A series of compounds in which the same functional group substitutes for Hydrogen in a carbon chain.</p> <p>Characteristics: (i) all the members have similar chemical properties.</p> <p>There is a gradation in physical properties.</p> <p>Ethene add solid sodium bicarbonate an effervescence occur with the evolution Of carbon dioxide in case of ethanoic while ethanol does not show any action.</p> <p>Ketone.</p>	
35.	<p>Testis: secrete male hormone - testosterone (1/2) marks)</p> <p>Functions: (i) formation of sperm.</p> <p>Development of secondary sexual characters. (1½ marks)</p> <p>(i) fallopian tube/ oviduct. 1 mark.</p> <p>Uterus.</p> <p>Placenta: (i) it is disc like tissue embadded in the mothers uterine wall and connected to the foetus or embryo.</p> <p>It provides large surface area for glucose and oxygen/ nutrients to pass from The mothers blood to the foetus or embryo. 2 marks.</p> <p>OR</p> <p>Testosterone is released in males.</p> <p>Pollen grain falls on the stigma of the flower.</p> <p>Eggs fuses with sperm cell.</p> <p>Planaria is cut into many pieces.</p> <p>Buds are formed on the notches of the bryophyllum leaf. (Each carry 1 mark)</p>	5
36.	<p>An electric fuse is a short length of easily fusible wire put into an electrical</p> <p>Circuit for protection purposes. It is an alloy of lead and tin. It is always connected in series in a circuit.</p> <p>The fused used for domestic purposes are rated as 1A, 2A, 3A, 5A, 10A etc.</p> <p>A fuse is used to protect electrical appliances from being damaged. As soon As the safe limit of current exceeds the fuse “blows” and the electric circuit is Cut off.</p> <p>Given, power = 1kw= 1000W. V = 220V</p> $P = V \times I$ $\text{So, } I = P/V$ $= 1000 / 220$	5

$= 4.454 \text{ A}$
The fuse wire should be able to pass at least 4.545 A current. So, rating should be 5 A.

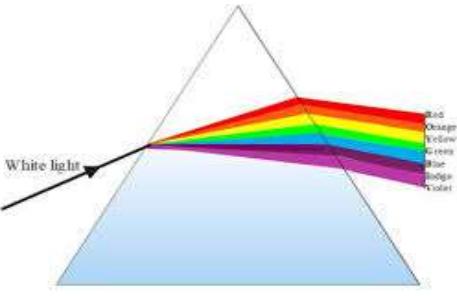
SECTION – E

- | | | |
|-----|---|---|
| 37. | <ul style="list-style-type: none"> (a) aluminum (b) sonorous and ductility (c) tin is least reactive metal while zinc is more reactive. (d) iron. | 4 |
|-----|---|---|

- | | | |
|-----|--|---|
| 39. | <p>Focus.
 Position of the object at C. $i = 0$ hence $r = 0$
 Position of lamp in between F and C.
 Mirror I plane, mirror II concex.</p> <hr style="border-top: 1px dashed black;"/> | 4 |
|-----|--|---|

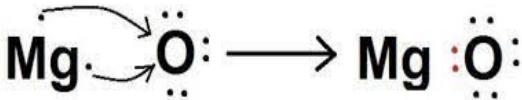
- | | | |
|-----|--|---|
| 38. | <p>Law of independent assortment.
 Round yellow colour
 Round green
 Tall</p> | 4 |
|-----|--|---|

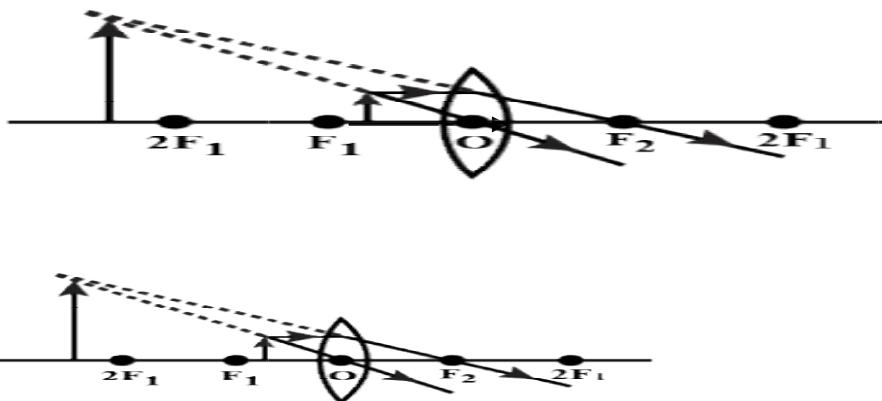
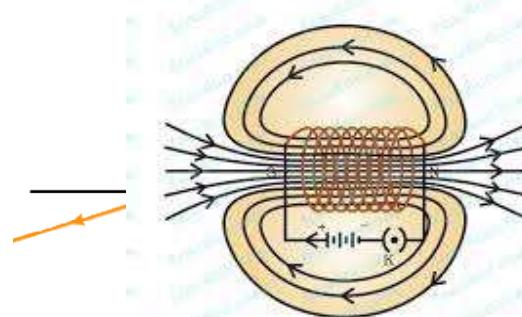
Q. No	Questions	Marks
SECTION – A		
1.	(c)	1
2.	(c)	1
3.	(d)	1
4.	(b)	1
5.	(b)	1
6.	(b)	1
7.	(a)	1
8.	(b)	1
9.	(d)	1
10.	(d)	1
11.	(c)	1
12.	(iii)	1
13.	(b)	1
14.	(a)	1
15.	(d)	1
16.	(c)	1
17.	(a)	1
18.	(b)	1
19.	(c)	1
20.	(d)	1
SECTION – B		
21.	To test whether a solution is acidic or base To test the strength of concentration of hydronium ions of solution. OR Hydrochloric acid is strong acid because it ionise completely as compared to acetic acid. Strong acid: H_2SO_4 , HNO_3	2
22.	Lactic acid is formed, formation of lactic acid in the muscles causes cramps. During fermentation in yeast, ethanol is formed while in aerobic respiration, carbon Dioxide and water are formed. The energy released in the process of fermentation is also very less as compared to the aerobic respiration.	2

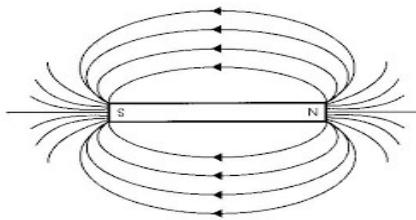
23.	If peristaltic movements do not occur, the food will not be able to move forward. In absence of rings of cartilage, air passage will collapse.	2
24.	Kidney (b) urinary bladder (c) ureter (d) urethra Each carry 1/2 marks.	2
25.	The splitting of white light rays into constituent colour is called dispersion of light.  OR Angle of deflections of the two prisms need to be equal and opposite. While the first prism splits the light in the seven colours due to different angles of deflection, the second prism combines the spectrum along a single ray and the colours again combine to give white light as the emergent light. (1mark)	2
26.	Cloth bags being biodegradable and broken down by the action of bacteria or other Saprophytes, whereas polythene bags are non-biodegradable and they simply Persist in the environment for a long time, causing harm to the ecosystem.	2

SECTION - C

Q.no. 27 to 33 are short answer questions.

27.	<p>Exothermic reaction Endothermic reaction</p> <p>0.5 + 0.5 marks</p> <p>Examples: $2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O} + 136 \text{ kcal}$. $\text{C} + \text{H}_2\text{O} \longrightarrow \text{CO} + \text{H}_2 - 31.4 \text{ kcal}$. 2. <i>(Any one of the reaction or other exothermic and endothermic reaction.)</i></p>	3
28.	<p>(a)</p> <p style="text-align: center;"></p> <p>Cation is positively charged (Mg^{2+})</p> <p>A solution of ionic compounds contain ions since electricity conduction requires</p> <ul style="list-style-type: none"> Movement of charged particles they conduct electricity. Soluble in water. Good conductor of electricity in molten state. High melting and boiling point. 	3
29.	<p>Xylem is responsible for conduction of water in plants. In xylem, tissue vessels</p> <p>And tracheids of roots, stems and leaves are interconnected to form single channels to conduct water to all parts of plant. 1 mark.</p> <p>At the roots, cells in contact with the soil actively take up ions. This creates a difference in the concentration of these ions between the root and the soil.</p> <p>Water, therefore, moves into the root from the soil to eliminate this difference.</p> <p>Transpiration of water through the root also helps to create suction pull to draw out water through root from the soil.</p> <p>OR</p> <p>This plant will not remain healthy because</p> <ul style="list-style-type: none"> It will not get oxygen for respiration. It will not get carbon dioxide for photosynthesis. Upward movement of water and minerals would be hampered due to lack of Transpiration. <p>(1- any one)</p>	3

30.	<p>A convex mirror. If an object is placed between the pole and focus, a highly magnified erect image is formed.</p> <p>Concave mirror: if an object is placed between the pole and the focus a highly magnified erect image is formed.</p> <p>A convex mirror. It produces a diminished erect image.</p> <p>(c) Used as shaving mirror or used by dentists to get enlarged image of teeth (any one use) (1mark)</p>	3
31.	<p>Image Virtual,erect,distance of image 40 cm. Ray diagram using a convex lens.</p> 	
32.	<p>A coil of many circular turns of insulated copper wire wrapped closely in the shape of cylinder is called a solenoid.</p> <p>Magnetic field lines around a current carrying solenoid.</p> <p>Magnetic Field in a Solenoid</p>  <p>Magnetic field line around bar magnet.</p>	3



Magnetic field line in a solenoid can be varied its Operation.

Polarisaties of the solenoid can be changed during its Operation.

OR

Two magnetic field lines do not intersect each other because if they intersect

Then at the point of intersection there would be two directions of magnetic

Field. Which is not possible.

The magnetic field lines are parallel to the axis of solenoid inside it. Due to

This the magnetic field is uniform inside the solenoid.

Fleming's left-hand rule states that if we stretch the forefinger, middle finger,

And the thumb of our hand such that all three matually perpendicular to each

Other. If the forefinger points in the direction of the magnetic field, the middle

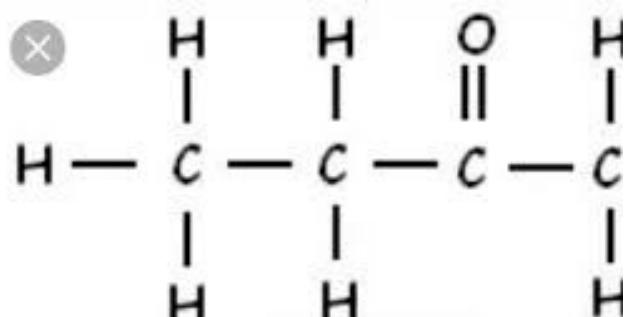
Finger points in the direction of electric current. Then the thumb gives the

Direction of force acting on the conductor.

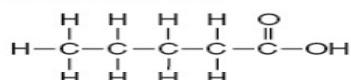
33. Soil: pesticides are used to protect plants from insects. They consequently get
Settled into soil particles. When used on plants.
Groundwater: through irrigation in the fields, these pesticides present in soil pass
Into lower layers of soil and reaches groundwater.
Water bodies: when the waste water or other agricultural waste is thrown in water
Bodies like river, canal, ponds etc, the pesticides affect water bodies.

SECTION - D

34.	$\text{CH}_2 = \text{CH}_2 \longrightarrow \text{CH}_3 - \text{CH}_3$	5
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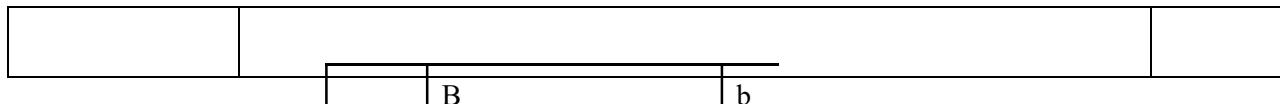
5. Pentanoic acid , $\text{C}_5\text{H}_{10}\text{COOH}$



No, because detergent do not react with carbonate/ bicarbonate salts of calcium and magnesium present in hard water and no scum is formed. Therefore, hard water can be checked with soap solution only which forms scum with hard water.

36.	<p>An electric fuse is a short length of easily fusible wire put into an electrical circuit for protection purposes. It is an alloy of lead and tin. It is always connected in series in a circuit. The fuses used for domestic purposes are rated as 1A, 2A, 3A, 5A, 10A etc. A fuse is used to protect electrical appliances from being damaged. As soon as the safe limit of current exceeds the fuse "blows" and the electric circuit is cut off.</p> <p>Given, power = 1kw = 1000W. V = 220V</p> $P = V \times I$ $So, I = P/V$ $= 1000 / 220$ $= 4.545 \text{ A}$ <p>The fuse wire should be able to pass at least 4.545 A current. So, rating should be 5 A.</p>	5
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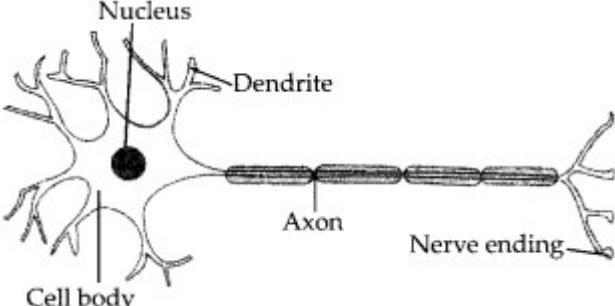
SECTION - E	
37.	<p>(a) aluminum (b) sonorous and ductility (c) tin is least reactive metal while zinc is more reactive. (d) iron.</p>
38.	<p>Law of independent assortment. Round yellow colour Round green Tall</p>



39.	<p>Focus. Position of the object at C. $i = 0$ hence $r = 0$ Position of lamp in between F and C. Mirror I plane, mirror II concex.</p> <hr/>	4
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Science (086)
Class X
MARKING SCHEME -4 2022-23

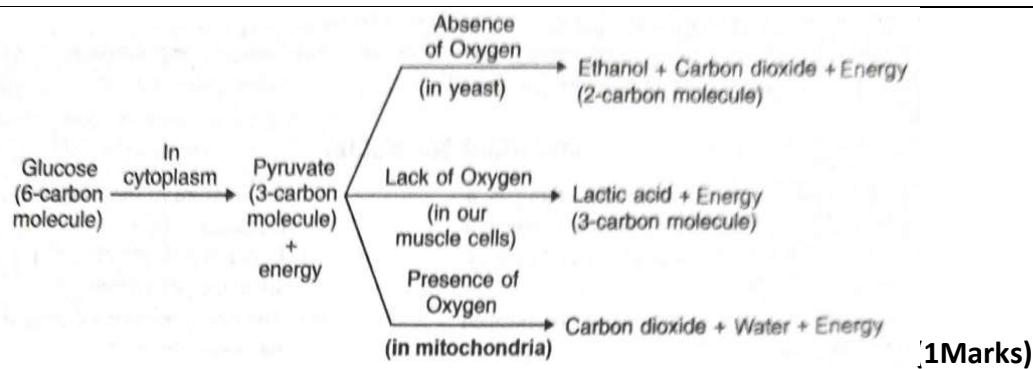
Q. No . .	Value Points	M ar ks
SECTION-A		
1.	(c) (iii)	1
2.	(iv) All of these	1
3.	(ii) CuO and H ₂	1
4.	(c)	1
5.	D. (C) & (D)	1
6.	(a) Water < Acetic acid < Hydrochloric acid	1
7.	(a) CH ₃ COONa	1
8.	(c) By breaking down the nutrients of bread and then absorbing them.	1
9.	(c) air passage does not collapse	1
10.	(a) round and yellow	1
11.	(a) Iron is essential for the synthesis of thyroxin	1
12.	(a) (i) and (ii)	1
13.	(c) C	1
14.	(b)	1
15.	(a)	1
16.	(c)	1
17.	(d) A is False but R is true	1

18	(c) A is true but R is false	1
.		
19	(b) Both A and R are true and R is not the correct explanation of A	1
.		
20	(a) Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.	1
.		
SECTION - B		
21	(a) It is because it is acidic as well as basic. 'Al' is less electropositive metal. So, it forms amphoteric oxide which can react with acid as well as base. (b) Ionic compounds can conduct electricity in molten state because ions become free to move in molten state.. (1x2=2Marks)	2
.	OR	
	(a) (i) There will be no effect of gas on dry litmus paper. (ii) Moist blue litmus paper will turn red.. (.5x2=1Marks)	
	(b) $S + O_2 \longrightarrow SO_2$ $SO_2 + H_2O \longrightarrow H_2SO_3$ (sulphurous acid) Sulphurous acid turn blue litmus red.. (.5x2=1Marks)	
22	(a) Diagrammatic representation of a neuron is as follows:  (1Marks)	2
.		
	(b) (i) Forebrain which includes cerebrum, olfactory lobes and diencephalon, is the main thinking part of the brain. (ii) Cerebellum, part of hindbrain is responsible for maintaining the posture and balance of the body. (.5x2=1Marks)	
23	Plant kept in continuous light will live longer as it will be capable of photosynthesis in which oxygen will be produced for its respiration and energy production for its metabolic function	2
.		
24	(a) Presence of large number (one million in each human kidney) of nephrons helps in increasing the surface area of both filtration of wastes and reabsorption of useful substances. (1Marks) (b) Whole of glucose and amino acids, and large amounts of Sodium (Na) and water are reabsorbed from nephric filtrate into blood capillaries. (1Marks)	2
.		
25	Dispersion: The splitting up of white light into its component colours is called dispersion. The colour which bends, (i) The least – Red (ii) The most – Violet, while passing through a glass prism.	2
.	OR	

	Since the convex lens, a diverging lens is recommended hence the person is suffering from hypermetropia. The power of the convex lens adds up with the power of the eye lens to focus the image at the retina. (1Marks) Correct figure(1Marks)	
26 .	Non-biodegradable substances like pesticide residues cannot be digested or consumed by organisms, so, they are just passed on to organisms of next trophic level along with food. These non-biodegradable residues keep on accumulating. Higher the trophic level an organism occupies in the food chain higher will be the accumulation of non-biodegradable pesticide residues. (1Marks) This phenomenon is called as biomagnification(1Marks)	2
	SECTION – C	
27 .	(a) When lead nitrate is added to potassium iodide then yellow precipitate of lead iodide is formed along with potassium nitrate. (b) Balanced chemical reaction is as follows : $\text{Pb}(\text{NO}_3)_2\text{(aq)} + 2\text{KI}_{\text{(aq)}} \longrightarrow \text{PbI}_{2\text{(s)}} \downarrow + 2\text{KNO}_3\text{(aq)}$ (Yellow ppt.) (c) This type of reaction is called precipitation reaction in which one of the products formed is an insoluble substance or this is also called double displacement reaction (1x3=3Marks)	3
28 .	The white powder added while baking cakes to make it soft and spongy is baking powder. Its main ingredients are sodium hydrogen carbonate and a mild edible acid like tartaric acid or citric acid. NaHCO_3 decomposes to give out CO_2 which causes the cake to rise and makes it soft and spongy. The function of tartaric acid or citric acid is to neutralise sodium carbonate formed during heating which can otherwise make the cake bitter. Reaction taking place when the powder is heated:(2Marks) $2\text{NaHCO}_3 \xrightarrow{\text{Heat}} \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2 \uparrow$ (1Marks)	3
29 .	(a) CO_2 – Carbon dioxide is essential for photosynthesis. (b) KOH is kept in watch glass to absorb CO_2 . It absorbs CO_2 to create an atmosphere which is devoid of CO_2 . (c) Significance of transpiration in plants: The absorbed water is transported from roots to leaves through xylem vessels which is greatly influenced by transpiration pull.. The evaporation of water during transpiration provide cooling effect to the leaves(1x3=3Marks)	3

OR

The process of breakdown of glucose in a cell are as follows:



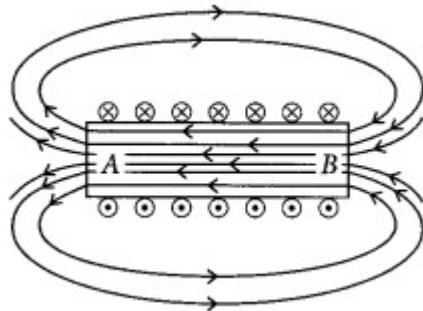
The first step in the breakdown of glucose both in presence of O_2 and in absence of O_2 is same.

In this step, glucose is broken down into pyruvate.(1x2=2Marks)

(i) In presence of O_2 : In presence of O_2 , pyruvate is converted into CO_2 and water. Energy released during aerobic respiration is much greater than that released during an anaerobic respiration.

(ii) In absence of O_2 : In absence of O_2 in yeast, pyruvate is converted into ethanol and CO_2 and the process is called fermentation. In absence of O_2 , in our muscle cells, in our muscle cells, pyruvate is converted into lactic acid. The build up of lactic acid in muscle cells causes cramps.

30 . $u = ?, f = -20 \text{ cm}, m = +2$ For spherical mirrors, $m = -v/u$ therefore, $2 = -v/u$ Therefore, $v = -2u$ (1Marks) According to mirror formula, $1/u + 1/v = 1/f$ (1Marks) Therefore, $1/-2u + 1/u = 1/-20$ $-1+2/2u = 1/-20$ $1/2u = 1/-20$ $U = -10 \text{ cm}$ (1Marks) The object is at a distance of 10 cm from the pole of the concave mirror.	3
31 . Power is the reciprocal of focal length of the lens. The unit of power is dioptre. (1Marks) For focal length 50 cm $f = +50 \text{ cm}$ Therefore, $P = 100/50 = 2D$ (.5Marks) The lens is convex lens(.5Marks) For focal length -50 cm $f = -50 \text{ cm}$ Therefore, $P = 100/-50 = -2D$ (.5Marks) The lens is concave lens(.5Marks)	3
32 .	3



(1Marks)

Using right hand thumb rule we can draw the magnetic field lines around the conductor as shown. From figure, end A of solenoid act as north pole and end B will act as south pole. Inside the solenoid field lines are in the form of parallel straight lines.(2Marks)

OR

- (i) The rod is displaced towards left. (0.5Marks)
- (ii) When the direction of current flowing through the rod is reversed, the displacement of rod will be towards right. (.5Marks)
- (iii) Current carrying conductor when placed in a magnetic field, experiences a force (1Marks)
- (iv) Direction of force on a current carrying conductor is determined by Fleming's left hand rule. (1Marks)

33 Decomposers are microorganisms that break down complex organic substances (dead remains and waste products of organisms) into simpler inorganic substances that go into the soil and are used up once more by the plants.

3

(1Marks)
Roles:(1x2=2Marks)

Decomposers play an important role in the cycling of materials in the biosphere. By decomposing dead bodies of plants and animals they help in cleansing the environment. Example, Bacteria and fungi are examples of decomposers

SECTION – D

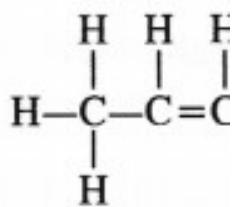
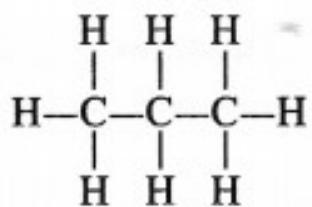
34 .(I) For pair A, $-\text{CH}_2-$; 14u
For pair B, $-\text{CH}_2-$; 14u
For pair C, $-\text{CH}_2-$; 14u
(II) Each successive member differs by $-\text{CH}_2-$ and 14u in terms of molecular mass.
(III) Alcohol (-OH-) group
(iv) CH_3OH , $\text{C}_2\text{H}_5\text{OH}$, $\text{C}_3\text{H}_7\text{OH}$, $\text{C}_4\text{H}_9\text{OH}$
(v) Homologous series

5

(1x5=5Marks)

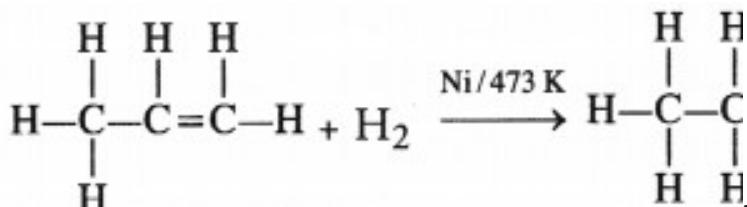
OR

The compound 'A' with formula C_3H_8 (propane) is a saturated hydrocarbon and corresponds to general formula $\text{C}_n\text{H}_{2n+2}$. The compound 'B' with formula C_3H_6 (propene) is an unsaturated hydrocarbon and corresponds to general formula C_nH_{2n} . It has a double bond ($\text{C}=\text{C}$) and is therefore, unsaturated. (1Marks)



(1x2=2Marks)

The compound 'B' will take part in the addition reactions. As a result, double bond will change to single bond. For example,



(1Marks)

The addition reaction is quite useful in the hydrogenation of oils i.e., to convert edible oils like ground nut oil and cotton seed oil which are unsaturated in nature into solid fats which are of saturated nature. (1Marks)

35

$$P = 100 \text{ W}, V = 200 \text{ V}, R = ?$$

$$P = \frac{V^2}{R}$$

\Rightarrow

1

$$\Rightarrow R = \frac{(200)^2}{P}$$

\therefore

1

Given $P = 1001000 \text{ kW}$; Time, $t = 4 \text{ hours}$

Electrical energy consumed, $E = P \times t$

Energy consumed by 1 bulb = $0.1 \times 4 = 0.4 \text{ kWh}$

\therefore Energy consumed by 5 bulbs = $5 \times 0.4 = 2 \text{ kWh} = 2 \text{ units}$

Cost of electrical energy:

Cost of 1 unit of electricity = Rs4

\therefore Cost of 2 units of electricity = $4 \times 2 = \text{Rs8}$

(ii) The heating elements of electrical heating appliances are made up of nichrome alloy because:

Nichrome has very high resistivity due to which it produces a lot of heat on passing current.

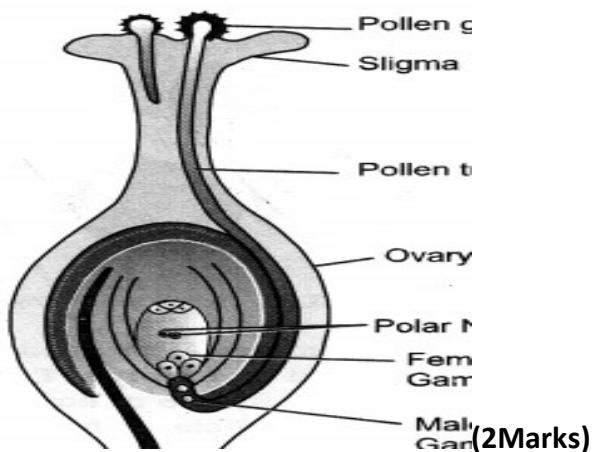
Nichrome does not undergo oxidation easily even at high temperature, it can be kept red hot without burning.

5

36	<p>Pollination</p> <p>1 Definition. It is transfer of pollen grains from anther to the stigma of a flower.</p> <p>2. Step. Pollination precedes fertilization.</p> <p>3. Purpose. It carries the male gamete producing pollen grains to the female sex organ.</p> <p>4. Process. Pollination is a physical process.</p> <p>5. Occurrence. It occurs only in seed plants.</p>	<p>Fertilization</p> <p>1. It is the fusion of male and female gametes.</p> <p>2. Fertilization occurs only after pollination when the pollen grain has germinated and male gametes are carried into ovule.</p> <p>3. It actually brings about fusion of gametes.</p> <p>4. Fertilization is a physico-chemical (biological) process.</p> <p>5. It occurs in both plants and animals of various types.</p>	5
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Any four points .5x4=2

The site of fertilisation is ovule. The product of fertilisation is zygote.
(.5x2=1Marks)



OR

Answer:

(a) Information Source: The information source of making proteins in a cell is its DNA.

Basic Event in Reproduction: The basic event in reproduction is replication of DNA, growth of cellular machinery and cell division.

(i) Seminal Vesicles: They secrete 60-70% of semen plasma that is alkaline and viscous having fructose (for nourishing the sperms), fibrinogen, proteins and prostaglandins. Prostaglandins cause movements in the genital tract of the female. Sperms are also activated by secretion of seminal vesicles.

(ii) Prostate Gland: It produces 20-30% of semen plasma. The secretion is alkaline and viscous. It has clotting enzyme and chemical essential for sperm activity.

(c) Function of Testes,

	Formation of sperms . 2.Secretion of testosterone	
	SECTION – E	
37 .	Pure copper strip --cathode (1Marks) Impure copper strip—anode CuSO₄—electrolyte Ions—Cu²⁺& SO₄²⁻ Labelled diagram (1Marks) (2Marks)	4
38 .	A) Because the ray of light when passes through the Optical Centre of lens it will continue to move in same direction without deviation (2 Marks) B) It bends away from the normal at the point of refraction (1Marks) C) $n_1 n_2 \times 2 = 1$ (1Marks) OR C) $n = c/v$	4
39 .	A) Because they do not bear flowers. (1.5 marks) B) Yes, by grafting and layering. (1.5 marks) C) . If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, trait B is likely to have arisen earlier (1) OR C) Genetic make-up of tall plant can be depicted by TtWW	4

Pollination	Fertilization
<p>1 Definition. It is transfer of pollen grains from anther to the stigma of a flower.</p> <p>2. Step. Pollination precedes fertilization.</p> <p>3. Purpose. It carries the male gamete producing pollen grains to the female sex organ.</p> <p>4. Process. Pollination is a physical process.</p> <p>5. Occurrence. It occurs only in seed plants.</p>	<p>It is the fusion of male and female gametes. Fertilization occurs only after pollination when the pollen grain has germinated and male gametes are carried into ovule.</p> <p>It actually brings about fusion of gametes. Fertilization is a physico-chemical (biological) process.</p> <p>It occurs in both plants and animals of various types.</p>

SCIENCE (086)

CLASS 10TH

Marking Scheme-5 (22-23)

Q.No	Questions	Marks
1	ii) remove oxide layer	1
2	ii) HCl	1
3	i) photochemical decomposition reaction	1
4	iii) NH ₃ and O ₂	1
5	iii) 2>1>4>3 , higher the concentration of H ⁺ ion , lower is pH	1
6	iii)c Impure Cu as anode and Pure Cu as cathode	1
7	i) carbon	1
8	iii) C	1
9	i) 120/80 mm of Hg	1
10	iii) Phototropism	1
11	ii) a stimulus	1
12	iii) menarche	1
13	i) through father's sex chromosomes	1
14	ii) Reptiles and birds	1
15	iii) tungsten	
16	iii) same at all points	1
17	A	1
18	B	1

	<p>iii) size of the image is always smaller than object iv) Magnification is always positive b) Since $\angle I + \angle r = 60^\circ$, but $\angle i = \angle r$ so $\angle i = 30^\circ$</p>	
31	<p>a) Concave mirror as it forms real image. b) Given , $h_i = 1/5 h_0$ and $v = -18 \text{ cm}$ therefore $m = -v/u = -1/5$ $u = -90\text{cm}$ using $1/f = 1/v + 1/u = 1/-18 + 1/-90 = -5/90 - 1/90 = -6/90 = -1/15$ $f = -15 \text{ cm}$</p>	1,2
32	<p>a) Using clock face rule – A is South pole and B is North pole b) The field lines inside the solenoid are parallel and closely spaced showing uniformity of field , same in strength at all points and in the same direction . it is used for making electromagnet.</p>	1,2
33	<p>a) Gas A is ozone, Ozone at higher levels of the atmosphere is a product of UV radiation acting on oxygen (O_2) molecule . The higher energy UV rays split apart some molecular Oxygen into free Oxygen (O) atoms . This oxygen combine with molecular oxygen to form ozone.</p> UV $O_2 \longrightarrow O + O$ $O + O_2 \longrightarrow O_3$ <p>b) Ozone shields the surface of the earth , protects living organisms from ultraviolet (UV) radiations released by sun . Chlorofluorocarbon (CFCs) which are used as refrigerants / in fire extinguishers lead to depletion of ozone layer.</p> <p>OR</p> <p>Any reasons which are appropriate and of one's opinion like – slogan display at places where wastes are disposed, banners ,sign boards , Street plays etc. (with good explanation)</p>	2,1 or 3

Section D

34	$\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[\substack{\text{'X'} \\ \text{HEAT, } 443\text{K}}]{\text{Con. H}_2\text{SO}_4} \text{CH}_2=\text{CH}_2 + \text{H}_2\text{O}$ <p>Ethanol Ethene</p> <p>Ethanol on dehydration with Con.H_2SO_4 gives ethene . Ethene on addition with H_2 in presence of Ni as a catalyst undergoes hydrogenation to form ethane .</p> $\text{CH}_2=\text{CH}_2 + \text{H}_2 \xrightarrow{\text{Ni}} \text{CH}_3-\text{CH}_3$ <p>One molecule of Ethane on combustion gives 2 molecules of H_2O.</p> $\text{C}_2\text{H}_6\text{(g)} + \frac{7}{2}\text{O}_2\text{(g)} \rightarrow 2\text{CO}_2\text{(g)} + 3\text{H}_2\text{O(l)}$ <p>Ethane oxygen carbon dioxide water</p> <p>OR</p> <p>Ethanol : C_2H_5OH</p>	5 or 2,2,1
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	<p>b) $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[\text{HEAT, 443K}]{\text{Con. H}_2\text{SO}_4} \text{CH}_2=\text{CH}_2 + \text{H}_2\text{O}$ 'X' 'Y' Ethanol Ethene Con. H_2SO_4 act as dehydrating agent . c) CH_3OH and $\text{C}_3\text{H}_7\text{OH}$ are homologues of ethanol.</p>	
35	<p>A – stigma , receives pollen grains from anther of stamen during pollination B – Pollen tube , it is path for male germ cell to reach female germ cell C—Female germ cell , it meets with male germ cell to form zygote which divides many times to form an embryo .</p> <p>b)i) If the egg is fertilized , it moves upto uterus and gets implanted on uterus . The uterine wall thickens and gets richly supplied with blood . The uterus wall develops placenta which provides nourishment and oxygen to embryo .</p> <p>ii) If the egg is not fertilized then egg alongwith the thick , nourishing lining of the uterus is shed off from vagina as blood and mucus called as menstruation.</p>	3,1,1
36	<p>Equivalent resistance of the circuit , $1/R = 1/5 + 1/3+2 = 1/5+1/5 = 2/5$ $R = 5/2 = 2.5\Omega$</p> <p>b) Voltmeter reading –</p> <p>i)when both the keys are open , circuit act as open circuit , so no current flows through it . Hence , $V= 0$</p> <p>ii)When both the keys are closed due to parallel combination, voltmeter reading across 5Ω is 6V and voltage across the series combination of 3Ω and 2Ω is also 6V.</p> <p>c)Current through 3Ω , $I = V/R = 6/5 = 1.2 \text{ A}$</p> <p>d) Ohms Law - ‘ The voltage applied across a conductor is directly proportional to the current flowing through the conductors , provided all physical conditions and temperatures remain constant.</p> <p>$V = IR$, V= potential difference I= current R = resistance</p>	1,2,1,1

Section E

37	a)ii) Electrolytic refining b)iii) Impure – anode , Pure – Cathode c)i)mercury Hg d) Silver Ag	1,1,1,1
38	I)23pairs ii)deoxyribonucleic acid iii)variation is more in case of asexual reproduction iii)genes	1,1,1,1
39	i)inwards curved ii)convex mirror iii)virtual , erect and diminished iv)less than 1	1,1,1,1

