



CHEMISTRY

GRADE X
ACADEMIC WINDOW
Year 2023- 2024

NAME -----

A NOTE FROM THE HOD

Chemistry has been called the science of what things are. Its intent is the exploration of the nature of the materials that fabricate our physical environment, why they hold the different properties that depict them, how their atomic structure may be fathomed, how they may be manipulated and changed. Chemistry is the main incentive for the life that we live today; it has provided modern society with facilities that make our day to day lives easier.

Some students seem naturally enthusiastic about learning, but many need or expect their instructors to inspire, challenge, and stimulate them. There is no single magical formula for motivating students. Students learn by doing, making, writing, designing, creating, solving. So, we should ensure opportunities by assigning tasks that are neither too easy nor too difficult.

This academic window is planned as a skill-based questionnaire that emphasizes on thinking skills, experimental skills and application skills and it consists of the following units—Index, Exam wise syllabus, Glossary, Chapter names and sample papers for Formative and summative assessments.

Glossary explains all the short forms and symbols involved in each chapter, it strengthens the students' understanding of the type of questions. Synopsis given in the beginning of each chapter includes summary of the relevant chapter. The explanation of concepts is supported by photographs, diagrams and tables. To strengthen this, HOTS questions, Multi-disciplinary and Value based questions are included in it. The explanation of concepts is supported by photographs, diagrams and tables. Based on the updated Question pattern by CBSE, we have included MCQ and Assertion-Reason questions in each chapter.

I take immense pleasure in bringing out this academic window which can play an instrumental role in developing the skills in chemistry.

Regards,

Ms Anita Roni Thomas

HOD, Department of Chemistry

DPS Sharjah

GLOSSARY

	FACTUAL / SIMPLE	C
	ABOVE AVERAGE	U
	INTERESTING!	A
	HOT	A
	MULTIDISCIPLINARY	C/U

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GRADE X- CHEMISTRY CURRICULUM

Unit I: Chemical Substances – Nature and Behaviour

Chemical reactions:

Chemical equation, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction.

Acids, bases and salts:

Their definitions in terms of furnishing of H⁺ and OH⁻ ions, General properties, examples and uses, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of Sodium Hydroxide, bleaching powder, Baking soda, Washing soda and Plaster of Paris.

Metals and nonmetals:

Properties of metals and non-metals; Reactivity series; Formation and properties of ionic compounds; Basic metallurgical processes; Corrosion and its prevention.

Carbon compounds:

Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series. Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydrocarbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents.

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LIST OF EXPERIMENTS

1. . Finding the pH of the following samples by using pH paper/universal indicator:

- (i) Dilute Hydrochloric Acid
- (ii) Dilute NaOH solution
- (iii) Dilute Ethanoic Acid solution
- (iv) Lemon juice

(v) Water

(vi) Dilute Hydrogen Carbonate solution

2. Studying the properties of acids and bases (HCl & NaOH) on the basis of their reaction with:

a) Litmus solution (Blue/Red)

b) Zinc metal

c) Solid sodium carbonate

3. Performing and observing the following reactions and classifying them into:

A. Combination reaction

B. Decomposition reaction

C. Displacement reaction

D. Double displacement reaction

(i) Action of water on quick lime

(ii) Action of heat on ferrous sulphate crystals

(iii) Iron nails kept in copper sulphate solution

(iv) Reaction between sodium sulphate and barium chloride solutions

4. Observing the action of Zn, Fe, Cu and Al metals on the following salt solutions:

i) $\text{ZnSO}_4 \text{ (aq)}$

ii) $\text{FeSO}_4 \text{ (aq)}$

iii) $\text{CuSO}_4 \text{ (aq)}$

iv) $\text{Al}_2(\text{SO}_4)_3 \text{ (aq)}$

Arranging Zn, Fe, Cu and Al (metals) in the decreasing order of reactivity based on the above

result.

5. Study of the following properties of acetic acid (ethanoic acid):

i) odour

ii) solubility in water

iii) effect on litmus

iv) reaction with Sodium Hydrogen Carbonate

6. Study of the comparative cleaning capacity of a sample of soap in soft and hard water

CHAPTER 1

Chemical reactions and equations

Synopsis:

Chemical Reactions

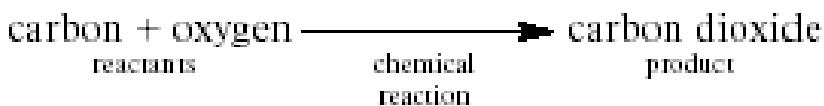
Transformation of a substance into a new substance or many new substances is called a **chemical reaction**. For example, water (which is the compound formed when Hydrogen and Oxygen bind together), the chemical reaction can be written as:



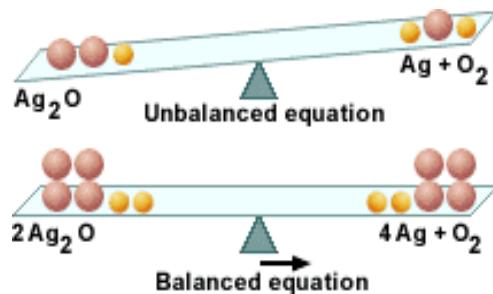
Chemical Equation

It is the method of representing a chemical reaction with the help of symbols and formulae of substances involved.

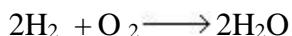
The substances which react are called **reactants** and the new substance which forms is called the **product**. For example,

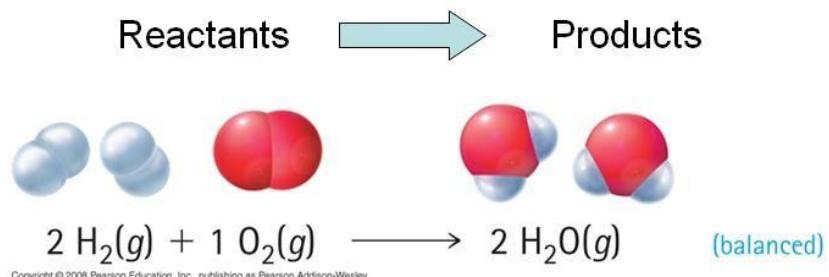


In a chemical equation, the number of atoms on the reactant side should be the same as the number of atoms on the product side. The reaction should be balanced.

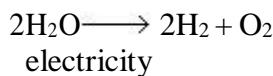


Combination reaction: A **combination reaction** occurs when simpler substances combine to form a single substance.





Decomposition reaction: A **decomposition reaction** occurs when compounds are split into simpler substances.

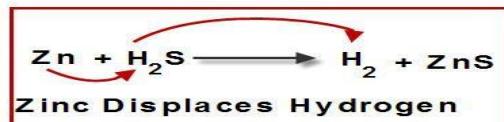


Decomposition is the reverse of combination.

Displacement reactions: A more reactive metal (higher in the reactivity series) will displace a less reactive metal from its salt solution.

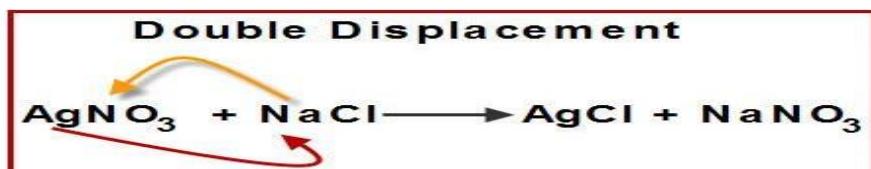


Blue copper sulphate solution reacts with zinc to give colourless zinc sulphate solution and solid copper. Thus Zn displaces Cu in the salt form.



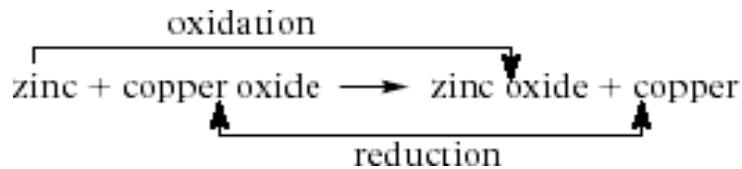
Double displacement reactions: In a double displacement reaction, two substances react by exchanging their radicals.

In a **precipitation reaction**, two compounds in their aqueous state react to form an insoluble residue (precipitate) as one of the reaction product.

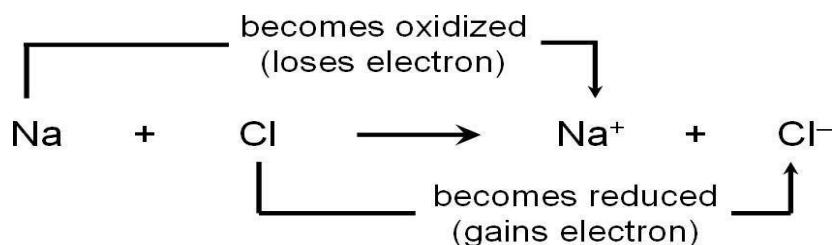
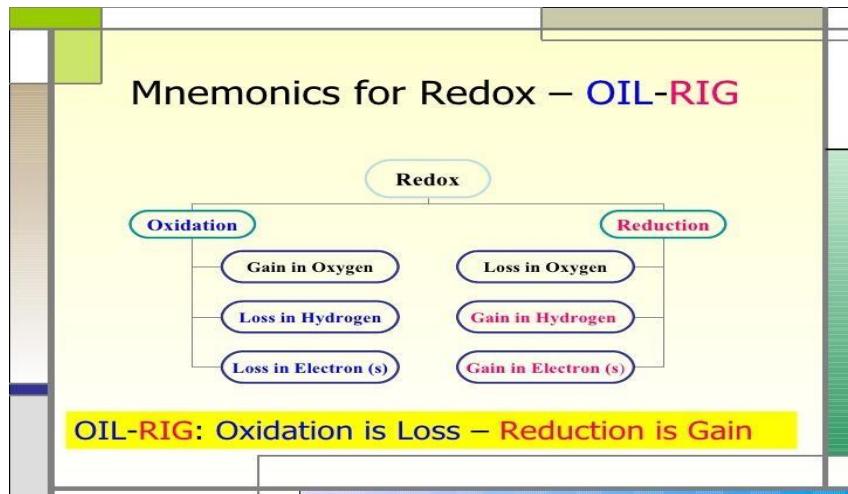


Oxidation and reduction (Redox)

Oxidation is the gain of oxygen/loss of hydrogen. Reduction is the loss of oxygen/gain of hydrogen.



Reduction and oxidation always occur together, and these reactions are often called **redox reactions**.

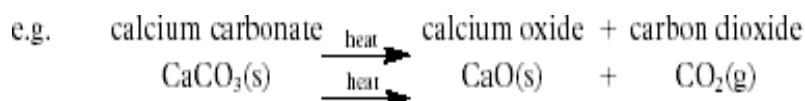


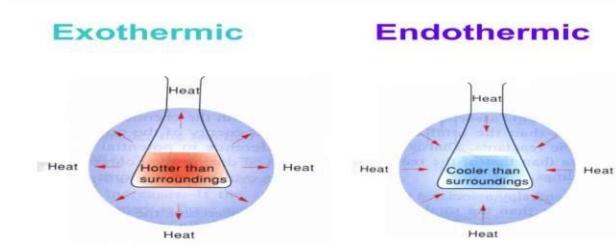
Exothermic and endothermic reaction

Exothermic reactions give out heat.



Endothermic reactions take in heat.



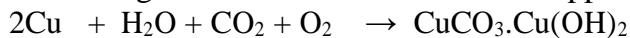


Corrosion: When the surface of a metal is attacked by air, water, or any other substance around it, it is said to corrode and the phenomenon is known as corrosion. Rusting involves the reaction of iron with oxygen and water to form hydrated iron (III) oxide which is rust. Iron becomes brown on corrosion.



Rusting can be prevented by oiling (greasing), painting, Galvanizing (coating with zinc), plating (e.g. with chromium)

Copper becomes green due to formation of basic copper carbonate



Rancidity: Food materials containing oil or fat get oxidized on exposure to air and their smell and the taste changes. This is called rancidity.



Rancidity can be prevented by: storing the food in airtight container, adding an antioxidant or flushing the food item with an inert gas like nitrogen.

Other examples of anti-oxidants: BHA (Butylated hydroxyl anisole), BHT (Butylated hydroxyl toluene)



Prevention

- **Antioxidants** are added to some foods to slow down oxidative deterioration
 - BHA—Butylated Hydroxy-Anisole
 - BHT—Butylated Hydroxy-Toluene
- **Vacuum packaging** to keep oxygen out
- **Adding inert gas** such as nitrogen to the bag to replace the oxygen
- **Refrigeration** will reduce the rate of most reactions that take part in rancidity
- **Packing food protected from light**



ACTIVITY 1.1

Aim: To show burning of magnesium ribbon in air is a combination reaction.

Procedure: Take a clean strip of magnesium ribbon and introduce it in the flame of a burner with the help of tongs.

Observation:

i)

ii)

Reaction involved:

Conclusion:

ACTIVITY 1.2

Aim: To show the reaction between lead nitrate and potassium iodide is a double displacement reaction (precipitation reaction).

Procedure:

- Take lead nitrate solution in a test tube.
- Add potassium iodide solution to it

Observation:

Reaction involved:

Conclusion:

ACTIVITY 1.3

Aim: To show the displacement reaction between zinc granules and dil.HCl

Procedure:

- Take 4-5 zinc granules in a conical flask.
- Add dil.HCl over it.
- Touch the conical flask and observe the change in temperature

Observation:

Reaction involved :

Conclusion:

ACTIVITY 1.4

Aim: To show the combination reaction between calcium oxide and water is an exothermic reaction.

Procedure:

- Take 5 g of Quick lime (calcium oxide) in a beaker.
- Add water to it slowly.
- Touch the beaker and note the change in temperature.

Observation:

Reaction involved:

Conclusion:

ACTIVITY 1.5

Aim: To show decomposition reaction of ferrous sulphate.

Procedure:

- Take 2 g of ferrous sulphate crystals in a dry test tube.
- Heat the crystals over the flame of a burner for some time
- Observe the crystals after heating.

Observation:

i)

ii)

Reaction involved:

Conclusion:

i)

ii)

ACTIVITY 1.6

Aim: demonstrate electrolysis of water.

Procedure:

- Take a plastic mug and drill 2 holes at its base.
- Fit rubber stoppers into the holes and insert 2 carbon electrodes.
- Connect it to a 6V battery.
- Fill the mug with water such that the electrodes are completely immersed.
- Add a few drops of dil. H_2SO_4 to water (to increase its conductivity)
- Invert 2 test tubes filled with water over the electrodes.
- Switch on the current and leave the apparatus undisturbed

Observation:

- i)
- ii)

Reaction involved:

Conclusion:

- i)
- ii)

TEST FOR HYDROGEN:

TEST FOR OXYGEN:

DIAGRAM:

ACTIVITY 1.7

Aim: To show photochemical decomposition of silver chloride.

Procedure:

- Take 2 g of silver chloride in a china dish.
- Place it in sunlight for a few hours.

Observation:

Reaction:

Conclusion:

ACTIVITY 1.8

Aim: To show the oxidation reaction in copper.

Procedure:

- Take 2 g of copper powder in a china dish.
- Place it on a china dish and heat it over a burner.

Observation:

Reaction involved:

Conclusion:

EXERCISE

A MULTIPLE CHOICE QUESTIONS 1 mark each.

- 1 A reaction in which exchange of radicals takes place
 - a) Decomposition reaction
 - b) Single displacement reaction
 - c) Double displacement reaction
 - d) Combination reaction
- 2 What happens when dilute hydrochloric acid is added to iron filings?
 - a) Hydrogen gas and iron chloride are produced
 - b) Chlorine gas and iron hydroxide are produced
 - c) No reaction takes place
 - d) Iron salt and water are produced
- 3 Which of the statement about the reaction below are incorrect?
$$2 \text{PbO} + \text{C} \rightarrow 2\text{Pb} + \text{CO}_2$$

i) Lead is getting reduced
ii) CO_2 is getting oxidized
iii) Carbon is getting oxidized
iv) Lead Oxide is getting reduced

 - a) i and ii
 - b) i and iii
 - c) i, ii and iii
 - d) All of the above
- 4 Which one of the following words best describes the energy change when a substance is burned?
 - a) Endothermic
 - b) Neutralization
 - c) Exothermic
 - d) Reduction
- 5 A student studied the reaction of citric acid with sodium hydrogen carbonate. She put a solution of citric acid in a plastic cup and measured its temperature. Then she added sodium hydrogen carbonate powder and measured the temperature again. The temperature of the reaction mixture decreased. Which one of these statements about this reaction is correct?
 - a) No change in temperature
 - b) The reaction is exothermic
 - c) The reaction is endothermic
 - d) None of these

B ASSERTION & REASON 1 mark each.

In the following questions, the assertion and reason have been put forward. Read the statements

carefully and choose the correct alternative from the following.

- a. Both the assertion and reason are true, and Reason is the correct explanation of assertion.
- b. Both the assertion and reason are true, but Reason is not the correct explanation of assertion.
- c. Assertion is true, but reason is false.
- d. Both assertion and Reason are false

1 **Assertion:** AgBr is used on photographic and x-ray films.

Reason : AgBr is photosensitive and changes to Ag and bromine in the presence of sunlight and undergoes decomposition reaction.

2 **Assertion:** Magnesium ribbon keeps on burning in atmosphere of nitrogen.

Reason : Magnesium reacts with nitrogen to form magnesium nitride and this reaction is combination reaction.

3 **Assertion:** Zinc reacts with sulphuric acid to form zinc sulphate and hydrogen gas and it is a displacement reaction.

Reason : Zinc reacts with oxygen to form zinc oxide.

4 **Assertion:** Lead nitrate on thermal decomposition gives lead oxide, brown coloured nitrogen dioxide and oxygen gas.

Reason : Lead nitrate reacts with KI to form an yellow precipitate of PbI and the reaction is a double displacement reaction.

5 **Assertion:** The colour of ferrous sulphate crystals before heating is green and after heating is reddish brown.

Reason : Ferrous sulphate undergoes thermal decomposition reaction.

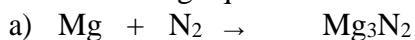
C **VERY SHORT ANSWER TYPE QUESTIONS (VSA) 1 mark each.**

1 Hydrogen being a highly inflammable gas and oxygen being a supporter of combustion, yet water which is a compound made up of oxygen and hydrogen is used to extinguish fire. Why?

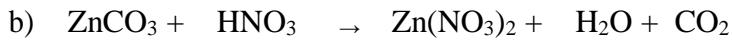
2 State the law that governs balancing of chemical equations.

?

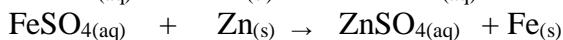
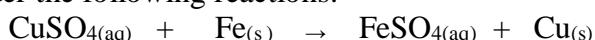
3 Balance the following equations:



!?



4 Consider the following reactions:



Based on the above reactions indicate the most reactive and the least reactive metal out of zinc, copper and iron.

5 What change in color is observed when white silver chloride is left exposed to sunlight ? State the type of chemical reaction in this change.

!?

D **SHORT ANSWER TYPE QUESTIONS (SA) 2 marks each.**

1 Write any two observations in an activity which may suggest that a chemical reaction has taken place.? Give an example to support your answer.

?

2 An aluminium can is used to store ferrous sulphate solution. It is observed that in a few days holes appear in the can. Explain the observation and write chemical equation to support your answer.

?

- 3 A white salt on heating decomposes to give brown fumes and a residue is left behind.
a) Name the salt.
b) Write the equation for the decomposition reaction.
- 4 Identify the oxidized and reduced species in the following reactions
- 5 John was reading the ingredients on a packet of fried crisps which contained an antioxidant. He was wondering what is an antioxidant and what is it used for? Can you help him understand the importance of adding antioxidants?

E. SHORT ANSWER QUESTIONS (SA) 3 marks each.

- 1 Water is added to a small amount of quick lime in a beaker.
a. Write two changes that are observed.
b. Write the chemical equation
c. Name the type of the reaction.
- 2 Write the chemical equation for each of the following reactions and balance them:
a) Phosphorous burns in chlorine gas to form phosphorous pentachloride
b) Aqueous solutions of sulphuric acid and sodium hydroxide react to form aqueous sodium sulphate and water.
c) Calcium carbonate on heating decomposes to form calcium oxide and carbon dioxide
- 3 A student writes the balanced equation for the reaction of magnesium with nitrogen as follows:
 $3\text{Mg} + 2\text{N} \longrightarrow \text{Mg}_3\text{N}_2$
What is wrong in this equation? Write the correct balanced equation.
- 4 A solution of compound 'X' in water was added to the solution of sodium chloride. It formed a white precipitate of the compound 'Y'. It was filtered and kept in a china dish in sunlight for drying but it turned grey. Explain the possible reason for this. Identify the compounds X and Y and write the reactions involved.

5? 2g of ferrous sulphate crystals are heated in a dry boiling tube.

- a) List any two observations

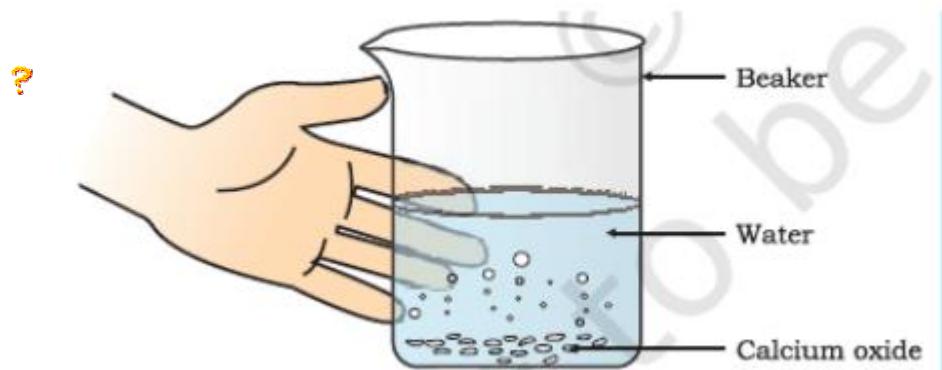
- b) Name the type of chemical reactions taking place.

- c) Write the chemical equation for the reaction.

F. LONG ANSWER QUESTIONS (LA) 5 marks each.

- 1 a) Corrosion is a process observed on most of the metals which causes damage and loss to metallic properties. Explain what is meant by corrosion?
- ! b) What is the name given to the corrosion of iron?
- ? c) What is the colour of coating the corrosive substance formed on silver and copper?
- d) What damage is caused by corrosion?
- e) How can we prevent corrosion?
- 2 A metal nitrate A on heating gives yellowish brown colored metal oxide along with a brown gas B and a colorless gas C. Aqueous solution of A on reaction with potassium iodide forms a yellow precipitate of the compound D. Identify A, B, C ,and D. Also identify the types of both the reactions.

CASE STUDY



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

I. How does the temperature of the beaker affects after the addition of quicklime?

II. Give the chemical name of the quick lime.

III. Identify the type of reaction takes place inside the beaker.

IV. Give two uses of quicklime.

2). Corrosion is the phenomenon of deterioration of surface of metal in presence of air and moisture. It is a natural process and in the presence of a moist atmosphere, chemically active metals get corroded. This is an oxidation reaction. Rusting is the process where iron corrodes due to exposure to the atmosphere. The main circumstance of corrosion occurs with iron because it is a structural material in construction, bridges, buildings, rail transport, ships, etc. Aluminium is also an important structural metal, but even Aluminium undergoes oxidation reactions. However, Aluminium doesn't corrode or oxidize as rapidly as its reactivity suggests. Copper (Cu) corrodes and forms a basic green carbonate.

.i) What is rusting?

(ii) Which two metals do not corrode easily?

iii) Write the chemical name of the compound formed on corrosion of silver.

Iv) Corrosion is a -----reaction

3) . A chemical reaction is a representation of chemical change in terms of symbols and formulae of reactants and products. There are various types of chemical reactions like combination, decomposition, displacement, double displacement, oxidation and reduction reactions. Reactions in which heat is released along with the formation of products are called exothermic chemical reactions. All combustion reactions are exothermic reactions.

1. The chemical reaction in which a single substance is broken down into two or more simpler substances upon heating is known as-----
2. A white salt on heating decomposes to give brown fumes and yellow residue.. The yellow residue left is - -----
- 3.Why do we need to balance a chemical equation?
4. The massive force that pushes the rocket forward through space is generated due to the-----reaction of hydrogen peroxide.

	Achieved 	Working towards	Needs reinforcement
I can recognize chemical changes.			
I can write balanced chemical equations to represent a chemical reaction.			
I can classify chemical reactions and list examples of different types of chemical reactions.			
I can relate my learning to real life when I look at metal articles which corrode and food items which become rancid.			

Teacher's feedback:

Student's feedback:

Next step in Learning:

WORK WELL DONE

WORK ADEQUATELY
ATTEMPTED

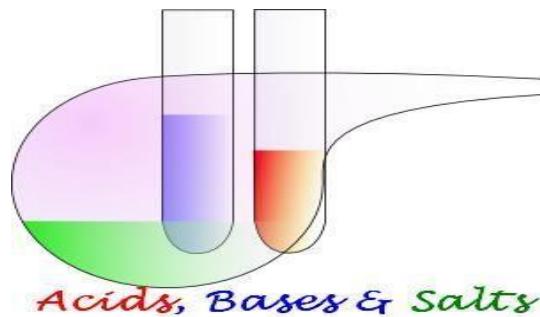
WORK REQUIRES MORE
PRACTICE AND EFFORT

REMARKS :

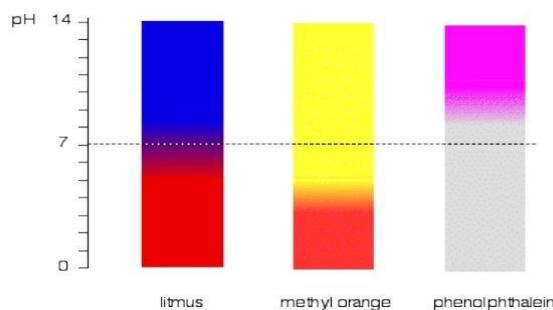
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CHAPTER 2 **Acids, Bases and Salts**



S.NO.	INDICATORS	ACIDS	BASES
1	Red litmus solution	Remains red	Turns blue
2	Blue litmus solution	Turns red	Remains blue
3	Phenolphthalein solution	Colourless	Pink
4	Methyl orange solution	Pink/Red	Yellow



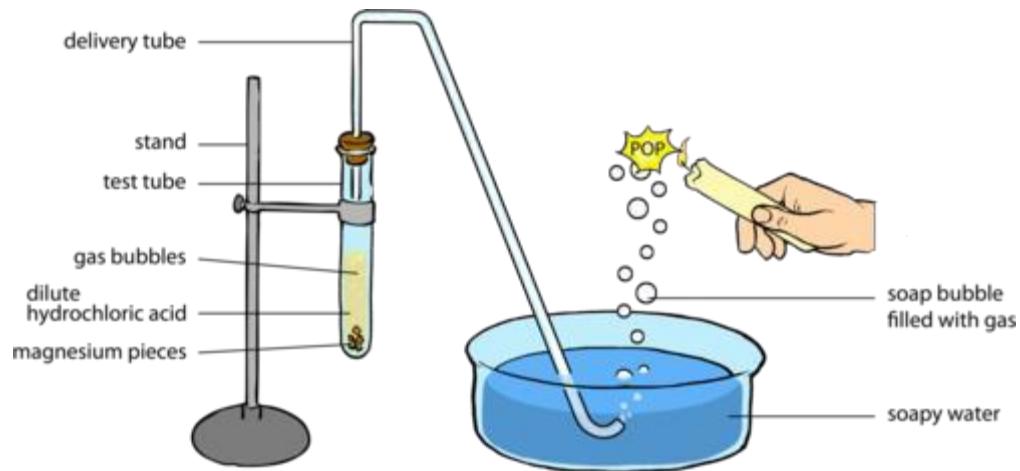
Indicators – There are 2 types of indicators:

Visual Indicator - –Indicates whether a substance is acidic or basic in nature by change in color.
Ex: Turmeric, a natural indicator, turns reddish brown in basic medium but remains yellow in acidic and neutral medium.

Olfactory Indicator - –Odour changes in acidic or basic media. For e.g. –clove oil, vanilla essence.

REACTION WITH METALS

Acid + metal → salt + hydrogen



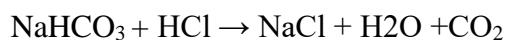
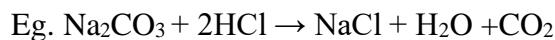
Base + metal → salt + hydrogen

(only for Na, K)-With other metals it does not evolve hydrogen gas.



Reaction with metal carbonate-

Acid + metal carbonate / metal hydrogen carbonate → salt + carbon dioxide + water



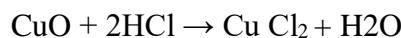
Neutralization reaction –

Acid + base → salt + water

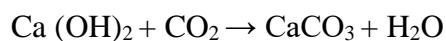


Reaction with metal oxides / nonmetal oxides

Acid + metal oxide → salt + water



Base + nonmetallic oxide  salt and water



Acids and bases in water -

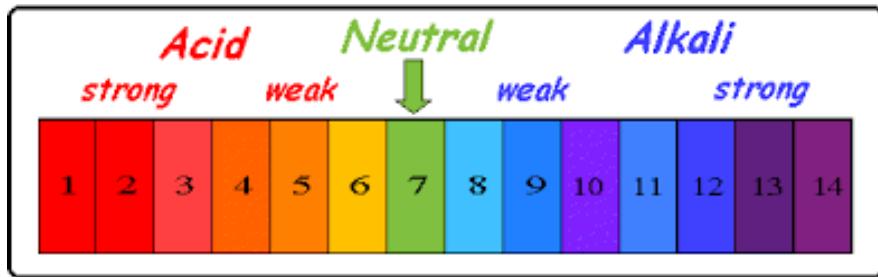
-Acid produces H^+ ions, H^+ ions cannot exist alone. They combine with water molecules to form H_3O^+ .

Acid + water → decrease in H_3O^+ ion concentration per unit volume → dilute acid.

Base + water → decrease in OH^- ion concentration per unit volume → dilute base.

Note – Process of dissolving acid/base in water is highly exothermic. Hence, acid/base must be added dropwise into water with constant stirring so that the heat generated spreads over in water. If water is added to conc acid then the heat generated may cause the mixture to splash out and cause burns.

pH scale – Acids show pH value less than 7. Bases show pH value greater than 7.



Importance of pH-

1. Our body works within pH range of 7.0 to 7.8.
2. Acid rain with pH 5.6, affects animals.
3. Plants need specific range of pH of soil.
4. Acids produced by stomach helps in digestion. If too much acid is formed, we take antacids. Eg.milk of magnesia.
5. Tooth decay starts when pH in mouth is lower than 5.5. Bacteria present in mouth produce acids by degradation of sugar and food particles remaining in the mouth. Rinse your mouth after eating. Use toothpastes, which are basic.
6. Bee-stings acids which causes pain and irritation. Use of baking soda on the sting area gives relief. Stinging hair of nettle leaves inject methanoic acid causing burning pain.

SALTS



Salts belonging to the same positive or negative radicals are said to belong to a family.

Eg.NaCl , Na₂SO₄ - belong to sodium family.

NaCl ,KCl - Belong to chlorine family.

pH of salts –

- a) salts of a strong acid and strong base are neutral with pH =7
- b) salts of a strong acid and weak base are acidic with pH < 7
- c) salts of a strong base and weak acid are neutral with pH > 7

Common salt → NaCl is found in sea. It is an important raw material for making NaOH, baking soda, washing soda, bleaching powder etc.

Sodium hydroxide - – NaOH

Preparation : Chlor – Alkali Process.

Aqueous Solution for Sodium Chloride (Brine) is electrolyzed. Products are chlorine and an alkali .
(Electrolysis)



Beaching Powder : CaOCl₂, Calcium oxy Chloride

Preparation: Action of Cl₂ on dry slaked lime Ca (OH)₂



Uses:

- For bleaching cotton and linen in the textile industry, bleaching wood pulp in paper industry, bleaching washed clothes in laundry.
- As an oxidizing agent in Chemical industries
- For disinfecting drinking water

Baking Soda– NaHCO₃ – Sodium hydrogen Carbonate



Preparation: Raw Materials: NaCl, NH₃, H₂O, CO₂

Equation: NaCl + H₂O + CO₂ + NH₃ → NH₄Cl + NaHCO₃ (less soluble separator out from the solution)

Properties: Non-corrosive base

On heating gives out CO₂ and Na₂CO₃ and Na₂CO₃ is found (bitter in taste)

Heat

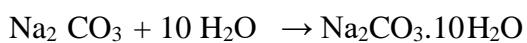
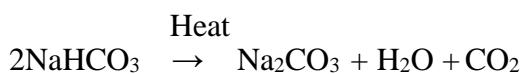


Uses:

- Used as an antacid, being alkaline neutralizes excess acid in the stomach
- Used in Soda-acid fire extinguisher
- For making baking powder (mixture of baking Soda + tartaric acid). When baking powder is mixed with water or heated following reaction takes place
- $\text{NaHCO}_3 + \text{H}^+ \longrightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{Sodium Salt of acid (from acid)}$
- CO₂ produced in the reaction makes the cake fluffy, soft and spongy

Washing Soda (Na₂CO₃.10 H₂O) – Sodium carbonate decahydrate

Preparation: On heating baking soda, we get Sodium Carbonate. It is crystallized on adding water.



(10H₂O is water of crystallization)

Uses:

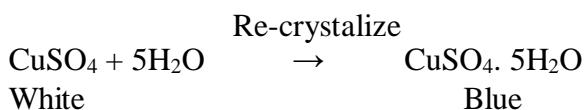
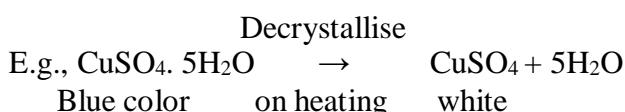
- Used in making glass, soap and paper
- Used in manufacture of Sodium Compounds such as borax
- As Cleansing agent for domestic purposes
- To remove permanent hardness of water

Water of Crystallization: is the fixed number of water molecules present in one formula unit of a salt.

e.g. $\text{CuSO}_4 \cdot 5 \text{H}_2\text{O}$ – Copper Sulphate

$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ – Washing Soda

$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ – Gypsum



Plaster of Paris: $\text{CaSO}_4 \frac{1}{2} \text{H}_2\text{O}$ (Calcium Sulphate Hemihydrate)



Uses: Used in plastering fractured bone



Reason: Plaster of Paris on mixing with water changes to gypsum and sets into hard solid mass.

* $\frac{1}{2} \text{H}_2\text{O}$ - as water of Crystallization is shown.

Explanation: 2 CaSO_4 molecules are attached with one water molecule hence 2 units share one molecule of water or one unit share half a molecule of water.

Used in making toys, decoration materials

ACTIVITY 2.1

Aim: To show that onion is an olfactory & visual indicator.

Procedure:

- Take the juice of crushed onions in 2 watch-glasses.
- Add a few drops of dil.HCl to one of the watch-glasses.
- Add a few drops of dil.NaOH to the other watch glass.
- Note the change in smell/colour in the two watch-glasses.

Observation:

i)

ii)

Conclusion:

ACTIVITY 2.2

Aim: To show that acids react with metals to liberate hydrogen gas.

Procedure:

- Take 2 g of zinc granules in a test-tube and fix a 2-holes rubber cork I its mouth.
- Through one hole pass a thistle funnel and through the other a doubly bent delivery tube.
- Immerse the other end of the delivery tube in a trough containing soap water.
- Add dil.HCl though the thistle funnel.
- Bring a burning candle near the soap bubbles.

Observation:

i)

ii)

iii)

Reaction involved:

Conclusion:

ACTIVITY 2.3

Aim: To show the reaction of acids with metal carbonates/bicarbonates.

Procedure:

- Take 2 test-tubes A and B containing dil.HCl.
- Add sodium carbonate to test tube A and sodium bicarbonate to test tube B.
- Pass the gas evolved through a test tube C containing lime water.

Observation in test tube A and B:

i)

ii)

Reaction involved:

Conclusion:

Observation in test tube C:

i)

ii)

iii)

Reaction involved:

Conclusion:

ACTIVITY 2.4

Aim: To show the neutralization reaction between acid and base.

Procedure:

- Take 2 ml of dilute NaOH in a test tube and add a few drops of phenolphthalein it.
- Now add a few drops of dil.HCl to the above solution .
- Again add a few drops of dilute NaOH to the above solution.

Observation:

i)

ii)

iii)

Reaction involved:

Conclusion:

ACTIVITY 2.5

Aim: To study the neutralization reaction of copper oxide with dil.HCl.

Procedure:

- Take small amount of copper oxide in a conical flask.
- Add dil.HCl to it slowly.
- Observe the change in colour.

Observation:

Reaction involved:

Conclusion:

ACTIVITY 2.6

Aim: To show that solutions of acids/bases conduct electricity.

Procedure:

- Take 2 iron nails and fix them on 2 rubber corks and place them in a beaker.
- Connect the nails to a 6V battery through a switch and a bulb.
- Pour dil.HCl into the beaker and switch on the current.
- Repeat the activity separately for dil.NaOH, alcohol solution and glucose solution.

Observation:

i)

ii)

Conclusion:

ACTIVITY 2.7

Aim: To show that HCl shows acidic property only in aqueous solutions.

Procedure:

- Take 10 g of NaCl in a dry test tube and fix a 2-holed cork in its mouth.
- Through one hole insert a thistle funnel and through the other a delivery tube.
- Add conc. H_2SO_4 slowly through the thistle funnel.
- Test the gas evolved by bringing a dry and moist blue litmus paper near the mouth of the delivery tube.

Observation:

i)

ii)

Reaction involved:

Conclusion:

i)

ii)

ACTIVITY 2.8

Aim: To show that dissolution of an acid/base in water is an exothermic process.

Procedure:

- Take 2 beakers marked A and B , containing 50 ml of water.
- Add a few drops of conc. H_2SO_4 in beaker A and a few NaOH pellets in beaker B.
- Swirl the beakers and touch the bottoms of the beakers.

Observation:

Conclusion:

ACTIVITY 2.9

Aim: To show that crystalline salts contain water of crystallization.

Procedure:

- Take a few crystals of copper sulphate in a dry boiling test tube and observe its colour.
- Heat the crystals by bringing the test tube over the flame.
- Cool the crystals and add a few drops of water to it.

Observation:

i)

ii)

iii)

Reaction involved:

Conclusion:

EXERCISE

A	MULTIPLE CHOICE QUESTIONS (1Mark each)
1	. What happens when an acid reacts with metal oxide? A. Salt and water is formed B. Metal hydride is formed C. Oxyacid will be formed D. Salt and Hydrogen gas is formed
2	. Which of the following is the strongest acid in the world? A. Hydrochloric acid B. Nitric acid C. Sulphuric acid D. Carbonic acid
3	Which statement is correct regarding acids? I. Acid molecule always has Hydrogen in its formula. II. Acid increases the concentration of hydrogen atoms or hydronium atoms in water. III. Acids have a pH value of less than 7. IV. The acid in the stomach helps in the digestion of food. A. Only I B. Both II and IV C. I, III and IV D. All the above
4	Which of the following is a battery acid? A. Sulphuric acid diluted with water. B. Carboxylic acid mixed with water. C. Concentrated hydrochloric acid. D. Concentrated sulphuric acid.
5	What are Olfactory Indicators? A. Substances whose colour changes in acidic or basic media. B. A pH indicator made of a solution of several compounds. C. A man-made chemical substance that can be used as acid-base indicators. D. Substances whose odour changes in acidic or basic media.
B	ASSERTION & REASON (1Mark each)
	In the following questions, the assertion and reason have been put forward. Read the statements carefully and choose the correct alternative from the following. a. Both the assertion and reason are true, and Reason is the correct explanation of assertion.

	b. Both the assertion and reason are true, but Reason is not the correct explanation of assertion. c. Assertion is true, but reason is false. d. Both assertion and Reason are false.
1	Assertion (A): On passing excess of CO ₂ through lime water it turns first milky and then colourless Reason (R): It is due to the formation of insoluble CaCO ₃ and then soluble Ca(HCO ₃) ₂ .
2	Assertion (A): pH solution is also called universal indicator Reason (R): It ranges from 0-14.
3	Assertion (A): Acids react with most metals to liberate hydrogen gas. Reason (R): They liberate hydrogen gas when they are less reactive than hydrogen.
4	Assertion (A): Acetic acid, sulphuric acid and citric acids are strong acids. Reason (R): As all three compounds dissolve in water to give hydronium ions.
5	Assertion (A): A reaction between Hydrochloric acid with caustic soda is a neutralization reaction . Reason (R): As salt and water are the two products formed.
C	VERY SHORT ANSWER TYPE QUESTIONS (1 Mark each)
1.	Dry ammonia gas has no action on litmus paper, but a solution of ammonia in water turns red litmus paper to blue. Why is it so? 

2.	<p>What is the color change observed when:</p> <ol style="list-style-type: none"> Blue litmus is dipped in acetic acid _____ A few drops of phenolphthalein are added to calcium hydroxide _____ Methyl orange is added to sulphuric acid _____ Red litmus is dipped in a solution of KOH _____
3	<p>A substance X when reacted with an acid produced a gas that turned limewater milky. Identify X and the gas evolved</p>
4	<p>How will you test the gas which is liberated when hydrochloric acid react with an active metal?</p>
5	<p>Give the chemical equation for the reaction when zinc metal is added to NaOH</p>
D.	<p>SHORT ANSWER QUESTIONS (SA) 2 marks each.</p>
1	<p>What is meant by water of crystallization? Name three substances having the same.</p>
2	<p>What is plaster of Paris? What use does it find in the medical field?</p>

3. 	15ml of water and 10 ml of sulphuric acid are to be mixed in a beaker. a) State the method that should be followed with reason. b) What is this process called.
4 	The soil in a field is highly acidic. List any two materials which can be added to this soil to reduce its acidity. Give reason for your choice.
5 	A magician has three glasses A, B and C, all containing colourless liquids. On transferring the contents of A to B the solution turns pink. This pink solution when added to C turns colourless again. Identify A, B and C.
6 	The oxide of a metal M was water soluble. When a blue litmus strip was dipped in this solution, it did not show any change in colour. Predict the nature of oxide and explain.
7 	`A` is a soluble acidic oxide and `B` is a soluble base. Compared to pH of pure water. What will be the pH of (a) solution of A (b) solution of B?
E.	LONG ANSWER QUESTIONS (LA) 3 marks each.
1 	Explain the action of dilute hydrochloric acid on the following with chemical equations. a) Magnesium ribbon b) Sodium hydroxide c) Crushed egg shells.
2 	Explain why sulphuric acid conducts electricity whereas alcohol does not.

3	What happens when an acid or base is dissolved in water? Explain why acid must be added to water and not vice versa. 
4	How is bleaching powder manufactured? Give two uses of each of the following and give their chemical names and formulae. 
a.	Bleaching powder
b.	Baking soda
c.	Washing soda
5.	Why is Plaster of Paris written as $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$? How is it possible to have half a water molecule attached to CaSO_4 ? 
6	A compound 'X' on electrolysis in aqueous solution produces a strong base. 'Y' along with two gases 'A' and 'B'. 'B' is used in manufacture of bleaching powder. Identify X, Y, A and B. Write chemical equations. 
7	A yellow powder X gives a pungent smell if left open in air. It is prepared by the reaction of dry compound Y with chlorine gas. It is used for disinfecting drinking water. Identify X and Y. and write the reaction involved. 
8	When CO_2 gas pass through saturated solution of ammonical brine, two compounds 'X' and 'Y' are formed. 'Y' is used as antacid and decomposes to form another solid 'Z'. Identify 'X', 'Y', 'Z' and write chemical equations. 
F.	VERY LONG ANSWER QUESTIONS (VLA) 5 marks each.
1	a) State the chemical properties on which the following uses of baking soda are based.  i) as an antacid ii) as a soda -acid fire extinguisher iii) to make bread and cake spongy

	b) How washing soda is obtained from baking soda? Write balanced chemical equation.																														
2 	What is meant by the Chlor-alkali process? Why is it called so? Give two uses of each of the products formed during this process.																														
3 	Baking soda is used in small amount in making bread and cake. It helps to make these soft and spongy. An aqueous solution of baking soda turns red litmus blue. It is also used in soda acid fire extinguisher. Use this information to answer the following questions: A. How does Baking Soda help to make cakes and bread soft and spongy? B. How does it help in extinguishing fire? C. Is the pH value of baking soda solution lesser than or greater than 7? D. How would you show that blue color copper sulphate crystals contain water of crystallization?																														
4. 	Tabulate the following salts according to the criteria given below:																														
	<table border="1"> <thead> <tr> <th>Salt</th> <th>pH</th> <th>Acid used</th> <th>Base used</th> <th>Family</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>Calcium Chloride</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Potassium Sulphate</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Magnesium Chloride</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Copper nitrate</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Salt	pH	Acid used	Base used	Family	Formula	Calcium Chloride						Potassium Sulphate						Magnesium Chloride						Copper nitrate					
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5 	What happens when: (i) Excess of carbon dioxide is passed through lime water. (ii) Dry chlorine gas is passed over slaked lime. (iii) Electricity is passed through an aqueous solution of sodium chloride. (iv) Gypsum is heated at 373K. (v) A solution of sodium hydrogen carbonate is heated.																														

	CASE STUDY
1.	<p>pH is quite useful to us in a number of ways in daily life. Some of its applications are:</p> <p>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.</p> <p>Self-defense 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.</p>
	<p>a) How can you get relief from bee stings?.</p>
	<p>b) P is an aqueous solution of acid and Q is an aqueous solution of base. When these two are diluted separately, How does the PH value of these solutions change?</p>
	<p>c) Name the acid present in bee sting?</p>
	<p>d) Explain neutralization reaction in terms of PH .</p>
2	<p>On heating gypsum at 373 K, it loses water molecules and becomes calcium sulphate hemihydrate (CaSO₄ .½ H₂O). This is called Plaster of Paris. Plaster of Paris is a white powder and on mixing with water, it changes to gypsum once again giving a hard solid mass. Water of crystallisation is the fixed number of water molecules present in one formula unit of a salt. Five water molecules are present in one formula unit of copper sulphate. Chemical formula for hydrated copper sulphate is Cu SO₄ . 5H₂O. Now you would be able to answer the question whether the molecule of Na₂CO₃ .10H₂O is wet.</p> <ol style="list-style-type: none"> What is the molecular formula of GYPSUM Give the chemical equation for the reaction of POP and water?

iii. Name A compound without water of crystallization

iv) Write 2 uses of Plaster of Paris.

Learning Objective	Achieved	Working towards	Needs reinforcement
I can identify acids and bases by using visual and olfactory indicators.			
I can illustrate reactions of acids with metals, metallic oxides and bases.			
I can express reactions of bases with metals, nonmetallic oxides and acids.			
I can explain the use of pH scale in comparing strength of acids and bases.			

Teacher's feedback:

Student's feedback:

Next step in Learning:

WORK WELL DONE

WORK ADEQUATELY
ATTEMPTED

WORK REQUIRES MORE
PRACTICE AND EFFORT

REMARKS :

Signature: _____

Date: _____

WORKING

CHAPTER-III

Metals and Non-metals

Synopsis:

Elements are divided mainly into two groups on the basis of physical and chemical properties – Metal and Non-metal.

Comparison of physical and chemical properties of metals and non – metals:-

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

Exceptions in Physical Properties

- i. Graphite, a non-metal, is a good conductor of electricity.
- ii. Iodine is a lustrous non-metal.
- iii. Diamond, an allotrope of carbon, which is a non-metal is the hardest substance while sodium and potassium, being metals are soft enough to be cut by knife.
- iv. Mercury, which is a metal, is liquid at room temperature while rest are solids.
- v. Sodium, potassium, mercury, cesium and gallium are metals with low melting and boiling points.
- vi. Diamond is the non-metal with high melting and boiling point.
- vii. Sodium, potassium and lithium are metals with low density.

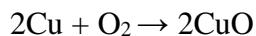
Chemical Properties of Metals

1) Reaction of Metals with Oxygen

Metals on burning in air form Metal Oxides

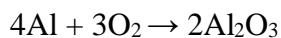
.For e.g.

- a) Copper when heated in air forms Copper (II) oxide, a black oxide.



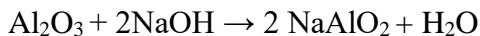
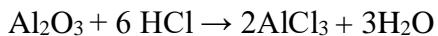
(Copper) (Copper (II) oxide)

- b) Aluminium forms Aluminium Oxide

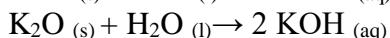
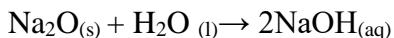


Aluminum oxide, Zinc oxide are amphoteric oxides as they react with both acids as well as bases to form salt and water.

For e.g.



Some metals oxides dissolve in water to form alkalis.



Different metals show different reactivities towards oxygen. Metals such as a K and Na react vigorously with air. To protect them, they are kept immersed in kerosene. At ordinary temp.surface of metals such Mg, Al, Zn, Pb are covered with layer of oxide which prevents metals from further oxidation.

-Fe and Cu do not burn but react with oxygen on heating to form their oxides.

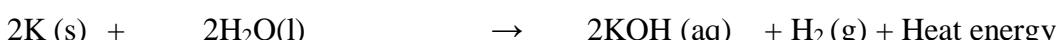
-Gold and Silver do not react with oxygen even at high temp.

2) Reaction of Metals with water

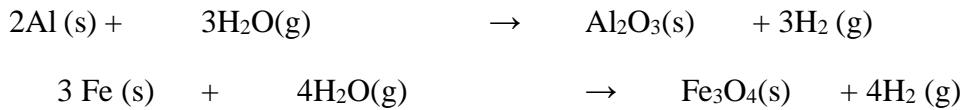


Rate of reaction of different metals is different

- Na , K react violently with cold water



Metals like Al, Fe, Zn do not react with cold water or hot water. They react with steam.



3) Reaction of Metals with Acids

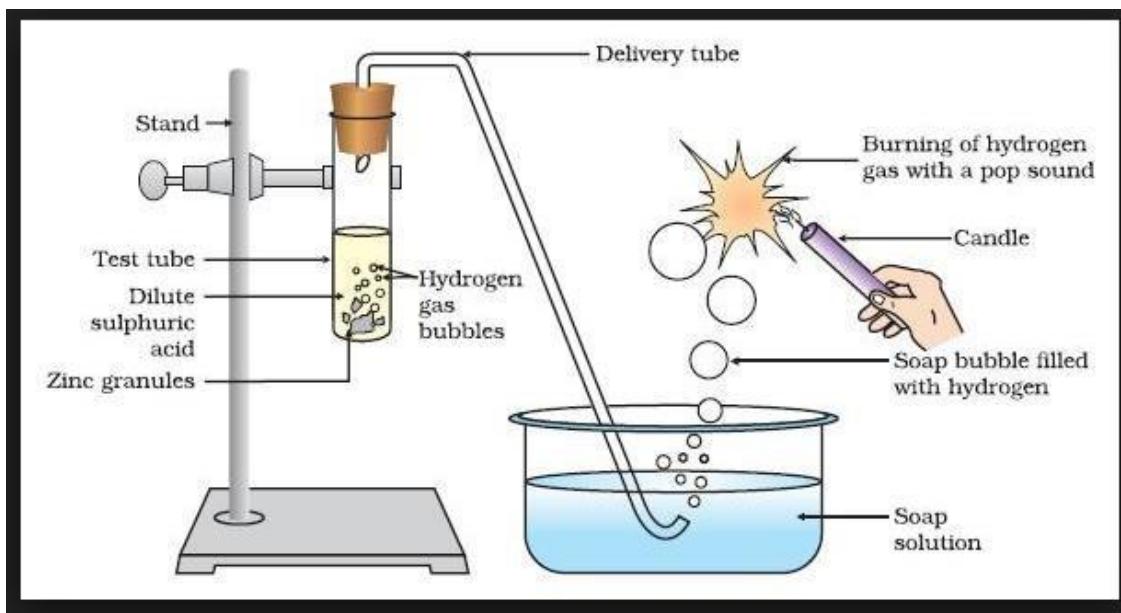
Metal + dilute acid → Salt + Hydrogen

H_2 gas is not evolved when metals react with nitric acid as it is a strong oxidizing agent.

It oxidizes H_2 to produce H_2O , itself gets reduced to oxides of nitrogen (N_2O , NO , NO_2). Mg and Mn react with very dilute HNO_3 to evolve H_2 gas. The reactivity decreases in the order

Mg>Al>>Zn>Fe.

Cu does not react with dilute HCl.



4) Reaction of metals with solutions of other metal salts

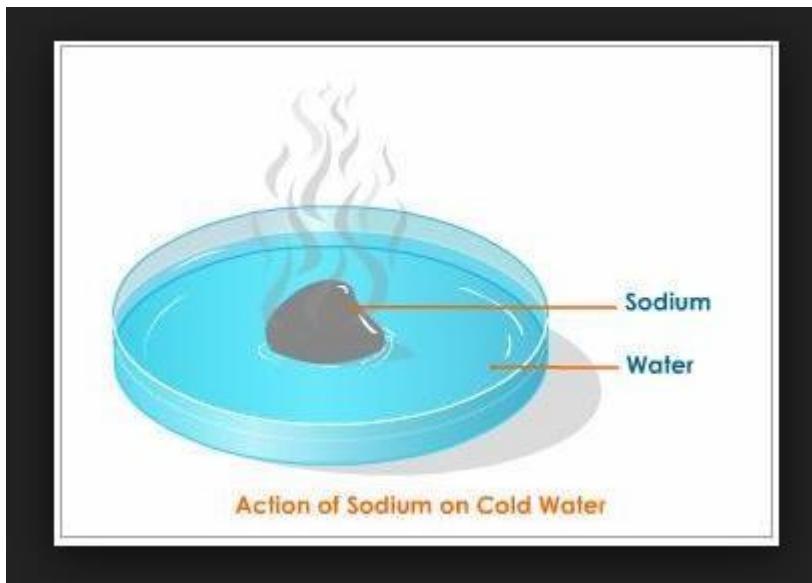
Reactive metals displace less reactive metals from their compounds in solutions or molten form.

When iron nail is kept in an aqueous Copper sulphate, the blue color of $\text{CuSO}_4(\text{aq})$ fades away and changes to green in color as Fe displaces Cu from CuSO_4 solution.



The reactivity of different metals with water is different :-

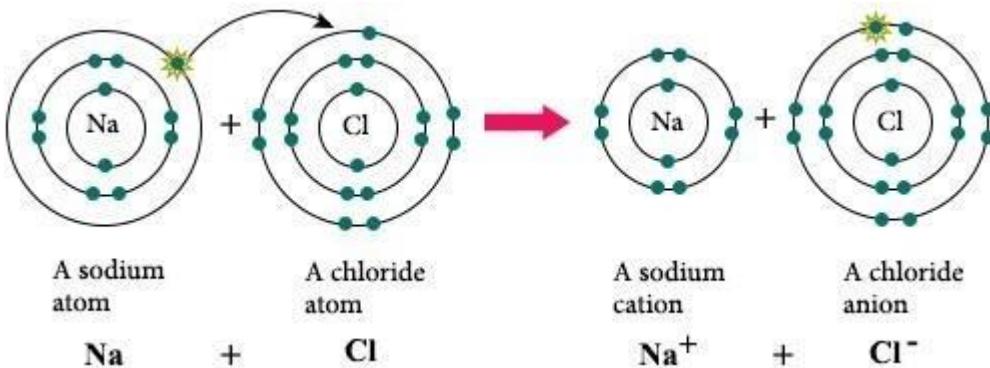
- Sodium and potassium react violently with cold water to form sodium hydroxide and hydrogen and catches fire.
- Calcium reacts less violently with water to form calcium hydroxide and water and does not catch fire.
- Magnesium reacts only with hot water to form magnesium hydroxide and hydrogen.
- Metals like aluminium, iron and zinc react only with steam to form the metal oxides and hydrogen.
- Metals like lead, copper, silver and gold do not react with water.



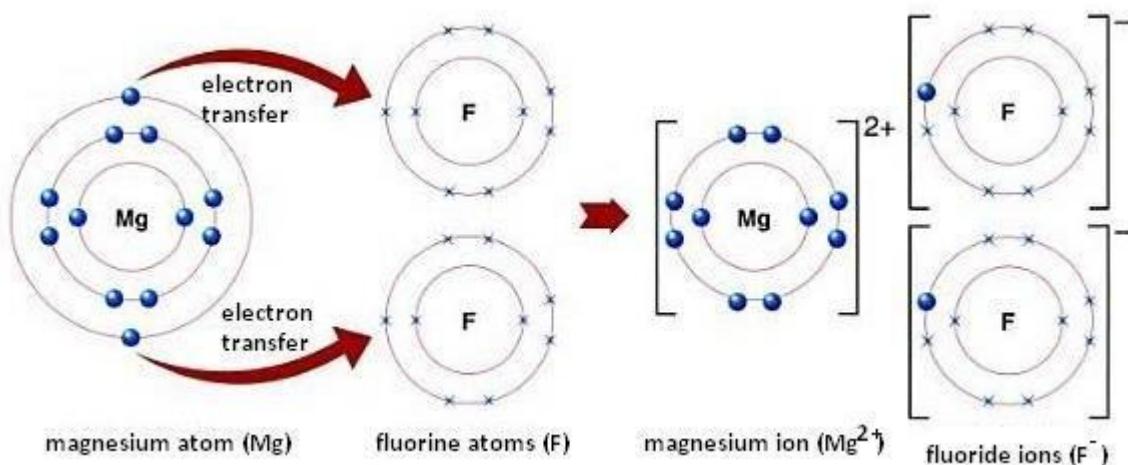
IONIC BOND

A chemical bond formed between two ions with opposite charges. Ionic bonds form when one atom gives up one or more electrons to another atom. These bonds can form between a metal and a non-metal and these type of bond found in salts

Eg: Sodium Chloride



Eg: Magnesium Fluoride



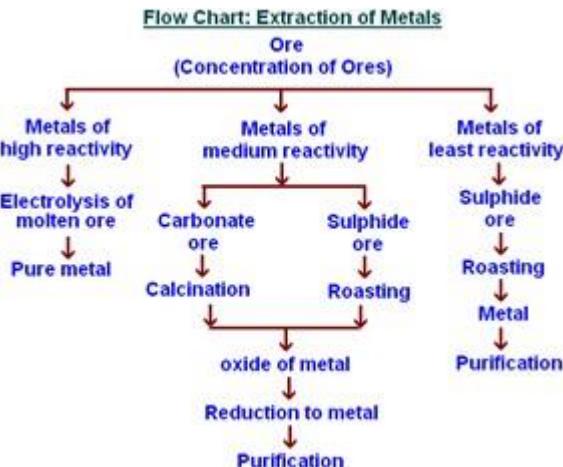
Properties of ionic compounds

1. Physical nature: they are hard, crystalline solids. They are generally brittle.
2. They have high melting and boiling point.
3. Generally soluble in water and insoluble in organic solvents.
4. They conduct electricity in aqueous solution and in molten state

Extraction of Metals

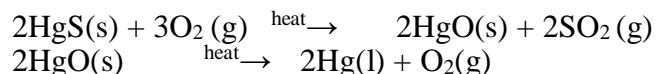
Metals can be categorized into three parts on the basis of their reactivity: most reactive, medium reactive and least reactive

Steps of Extraction of Metals

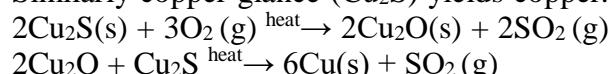


1. Extracting metals low in the reactivity series.

- Ores can be reduced to metal by heating alone.(Roasting)
 - Generally found as sulphides.
- Ex: Cinnabar (HgS) : an ore of mercury
- Conversion of sulphide to oxide
 - Decomposition of oxide to metal



Similarly copper glance (Cu_2S) yields copper.

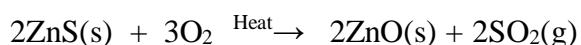


2. Extracting Metals in the middle of the reactivity series

- Fe, Zn, Pb, Moderately active elements.
 - Found as sulphides or carbonates
 - It is easier to extract metals from the oxides than from sulphides or carbonates.
- a. Conversion of the carbonates and sulphides to oxides.

*Sulphide ores and carbonate ores are first converted to oxides.

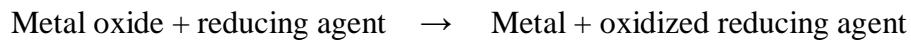
- Roasting: Heating the sulphide ore strongly in the presence of the excess of air.



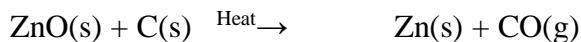
- Calcination: Heating the carbonate ore strongly in the absence or limited supply of air



b. Reduction of metal oxide to metal:



- Reduction using carbon as reducing agent



- Reduction by more active metals as reducing agent

Oxides of manganese (MnO_2) and Chromium (Cr_2O_3) are reduced to metal by heating with aluminium.



3. Extraction of metals of high reactivity:

- Generally found as chlorides or oxides.
- Metal is extracted by electrolytic reduction.
- The metal is obtained by electrolysis of their fused(molten) chlorides.
- The metal is obtained at the cathode whereas the non-metals are obtained at the anode.

Corrosion

- The process of slow wasting away of metal by the action of atmospheric gases and moisture is called corrosion.



Silver objects	:	Black deposit (Silver sulphide)
Copper objects	:	Green deposit (Basic copper carbonate)
Iron objects	:	Brown flaky deposit (Hydrated ferric oxide)

- Conditions necessary for corrosion of iron.

1. Presence of air (oxygen)

2. Presence of water

Prevention of corrosion

1. Painting

2. Oiling

3. Greasing

4. Galvanizing: Coating iron objects with a thin layer of zinc.

5. Chrome plating: Coating iron objects with chromium by electrolysis

6. Anodizing: Making layer of oxide on aluminium

7. Alloying: Making homogeneous mixtures of 2 or more metals or a metal with non-metal.

ALLOYS

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

Why do we make alloys: For altering the properties?

E.g.

1. Increasing hardness: Adding carbon to iron.

2. Making corrosion resistant: Adding Ni and Cr to iron. (stainless steel)

3. Lowering melting point: Mixing tin + lead. (solder)

4. Reducing electrical conductivity: Mixing Cu and Zn to make Brass

5. Reducing reactivity: Adding mercury to sodium.

6. Alloys of metal with mercury are called Amalgams

Xxxxxxxxxxxxxxxxxxxxx

	MULTIPLE CHOICE QUESTIONS (1 mark each)
1	An element A is soft and can be cut with a knife. This is very reactive to air and cannot be kept in open air. It reacts vigorously with water. Identify the element from the following. (a) Mg (b) Na (c) P (d) Ca
2	Alloys are homogeneous mixtures of a metal with a metal or non-metal. Which among the following alloys contain non-metal as one of its constituents.? (a) Brass (b) Bronze (c) Amalgam (d) Steel
3	Although metals form basic oxides, which of the following metals form an amphoteric oxide? (a) Na (b) Al (c) Cu (d) Fe
4	In the electrolytic reefing of copper, the electrolyte used is (a) CuSO ₄ (aq) (b) Cu(OH) ₂ (c) Acidified CuSO ₄ (aq) (d) CuSO ₄ (s)
5	Which one of the following metals do not react with cold as well as hot water? (a) K (b) Ca (c) Mg (d) Fe
	ASSERTION & REASON (1Mark each) <p>In the following questions, the assertion and reason have been put forward. Read the statements carefully and choose the correct alternative from the following.</p> <ol style="list-style-type: none"> Both the assertion and reason are true, and Reason is the correct explanation of assertion. Both the assertion and reason are true, but Reason is not the correct explanation of assertion. Assertion is true, but reason is false. Both assertion and Reason are false.
1	Assertion: Al ₂ O ₃ is an amphoteric oxide. Reason: Al ₂ O ₃ react with acid as well as base to form salt and water.
2	Assertion: Nitrogen is a non-metal. Reason: Nitrogen has 5 valence electrons

3	Assertion: Copper does not react with Sulphuric acid. Reason: Copper is more reactive than hydrogen.
4	Assertion: Highly reactive metals are obtained by electrolytic reduction of their molten ore. Reason: Highly reactive metals can be extracted by chemical reduction.
5	Assertion: Silver becomes black in colour when exposed to atmosphere. Reason: Silver reacts with H ₂ S gas to form Ag ₂ S which is black in colour.
VERY SHORT ANSWER TYPE QUESTIONS (1 mark each)	
1 ?	A nonmetal X exists in two different forms Y and Z. Y is the hardest natural substance, whereas Z is a good conductor of electricity. Identify X, Y and Z.
2 ?	Metals generally occur in solid state. Name and write symbol of a metal that exists in liquid state at room temperature.
3 !?	Why do we use copper and aluminium wire for the transmission of electric current.
4 !	What is aqua regia?
5 !?	A green layer is gradually formed on a copper plate left exposed to air for a week in a bathroom. What could this green substance be?
6 !	Why do gallium and Cesium melt in our palm?

.	Short answer questions (SA) 2 marks each.
1 	What is a thermite reaction? Give one practical application of it.
2 	A solution of copper sulphate was kept in an iron pot. After a few days, the iron pot was found to have many holes in it. Why? Also write the equation involved.
3 	<p>Give reason</p> <p>i) Reactivity of aluminium decreases if it is dipped in nitric acid.</p> <p>ii) Metals like Calcium and magnesium never found in their free state in nature.</p>
4 	When a metal X is treated with cold water, it gives a base Y with molecular formula XOH (Molecular mass=40g) and liberates a gas Z which easily catches fire. Identify X, Y and Z
5 	<p>Name a metal/ non-metal:</p> <p>a) Which makes iron hard and strong?</p> <p>b) Which is alloyed with any other metal to make an amalgam?</p> <p>C) Which is used to galvanize iron articles?</p> <p>d) Whose articles when exposed to air form a green coating?</p>
6 	Why magnesium ribbon starts floating in hot water? Write the chemical equation.
.	Short answer questions (SA) 3 marks each.
1 	<p>Write the electron - dot structure for sodium and chlorine atoms. How do these form a chemical bond?</p> <p>Name the type of bond so formed. Why does a compound so formed have high melting point?</p>
2 	Explain in detail how copper is refined electrolytically.

3	What is cinnabar? How is metal extracted from cinnabar? Explain briefly. 
4	i) Define activity series of metals. Arrange the metals gold, copper, iron and magnesium in the order of their increase in reactivity. ii) What will you observe when: (a) Some zinc pieces are put in copper sulphate solution. (b) Some silver pieces are put into green colored ferrous sulphate solution. 
5	A student was given Mn, Zn, Fe, and Cu metals Identify which of them:  a) will not displace hydrogen from dil.HCl. b) will react only with steam to give hydrogen gas. c) will give hydrogen gas with 5% HNO ₃ Write the chemical reactions involved.
6	A metal M has electronic configuration 2,8,3. and occurs in nature as M ₂ O ₃ . It is more reactive than zinc. Answer the following questions:  (a) Name the metal M. (b) Name the ore from which the metal is extracted. (c) How is the metal oxide converted to metal?
	Long answer questions (LA) 5 marks each.
1 	a) Write the balanced chemical equations for the following reactions: i) Iron metal reacts with steam ii) Zinc sulphide is roasted b) M is an element which is out of Cu, Fe, Al, Na. It shows the following properties: i) One of its ore is rich in M ₂ O ₃ . ii) M ₂ O ₃ is not affected by water. iii) It corrodes easily. iv) It forms 2 chlorides - MCl ₂ and MCl ₃ . Identify M and justify your answer.

2 	<p>Give reasons:</p> <ul style="list-style-type: none"> a) Gold and platinum are used for making jewelry. b) Na, K and Li are stored under oil. c) Ionic compounds have high melting points. d) Metals are good conductors of heat. e) Non-metals cannot displace hydrogen from dilute sulphuric acid. 												
3 	<ul style="list-style-type: none"> a) Write electron dot structures for Potassium, Sulphur, calcium, oxygen, aluminium. b) Show the formation of Na_2S, CaO, and AlCl_3 by the transfer of electrons. c) What are the ions present in these compounds? 												
4 	<p>A metal X combine with a non- metal Y by transfer of electron to form a compound Z.</p> <ul style="list-style-type: none"> a) State the type of bond in compound Z. b) What can you say about the melting and boiling point of compound Z. c) Will compound Z dissolve in kerosene or petrol? d) Will compound Z be a good conductor of electricity? Justify your answer. 												
CASE BASED QUESTIONS(4 marks)													
1	<p>Two students decided to investigate the effect of water and air on iron object under identical experimental conditions. They measured the mass of each object before placing it partially immersed in 10 ml of water. After a few days, the object were removed, dried and their masses were measured. The table shows their results.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">Student</th> <th style="text-align: center; padding: 5px;">Object</th> <th style="text-align: center; padding: 5px;">Mass of Object before Rusting in g</th> <th style="text-align: center; padding: 5px;">Mass of the coated object in g</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 5px;">A</td> <td style="text-align: center; padding: 5px;">Nail</td> <td style="text-align: center; padding: 5px;">3.0</td> <td style="text-align: center; padding: 5px;">3.15</td> </tr> <tr> <td style="text-align: center; padding: 5px;">B</td> <td style="text-align: center; padding: 5px;">Thin plate</td> <td style="text-align: center; padding: 5px;">6.0</td> <td style="text-align: center; padding: 5px;">6.33</td> </tr> </tbody> </table> <p>(a) What might be the reason for the varied observations of the two students?</p> <p>(b) In another set up the students coated iron nails with zinc metal and noted that, iron nails coated with zinc prevents rusting. They also observed that zinc initially acts as a physical barrier, but an extra advantage of using zinc is that it continues to prevent rusting even if the layer of zinc is damaged. Name this process of rust prevention and</p>	Student	Object	Mass of Object before Rusting in g	Mass of the coated object in g	A	Nail	3.0	3.15	B	Thin plate	6.0	6.33
Student	Object	Mass of Object before Rusting in g	Mass of the coated object in g										
A	Nail	3.0	3.15										
B	Thin plate	6.0	6.33										

give any two other methods to prevent rusting.

OR

(b) In which of the following applications of Iron, rusting will occur most? Support your answer with valid reason.

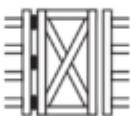
A



B



C



D



A - Iron Bucket electroplated with Zinc

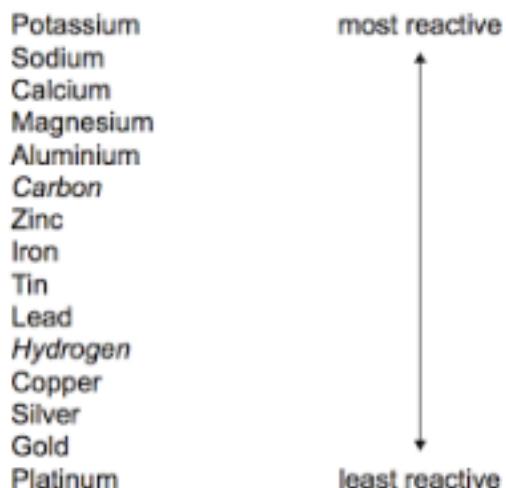
B - Electricity cables having iron wires covered with aluminium

C - Iron hinges on a gate

D - Painted iron fence

2. Activity series

Relative reactivities of metals



- What happens when iron nail is added to copper sulphate solution? What is the colour change?
- Identify the metal which reacts with very dilute nitric acid to evolve hydrogen gas. Name one more metal not given in the above series which reacts in the same way with dilute nitric acid.
- Name one important ore of copper with its chemical formula.
- Which method is used to extract sodium from molten sodium chloride

OR

Which metal is used in the galvanization of iron?

- 3 Anhydrous carnallite is chemically magnesium chloride. This is taken for electrolysis. Electrolytic cell is equipped with steel cathode and graphite anode submerged in molten salt . The temperature is maintained between 680 °C to 750 °C to obtain the metal. Chlorine is the gaseous product evolved at anode and molten metal floats at the top of the salt bath near cathode.

- I. Name the metal extracted in the above extraction process.
- II. Write the chemical formula of the ore used.
- III. After the electrolysis of molten salt name the oxidized and reduced products.
- IV. Show the formation of the chief component of the given ore through electron dot structure .

OR

Show the formation of the oxide of the above metal through electron dot structure

Learning Objective	Achieved 	Working towards	Needs reinforcement
I can understand an element as a metal or a non-metal based on its physical properties.			
I can interpret the chemical properties of metals and non-metals with oxygen, water, dil acids and salt solutions.			
I can describe the ionic bonding by electron dot structure and explain how metals and non-metals react.			
I can describe the extraction of metals from their ores by writing balanced chemical equations.			

Teacher's feedback:

Student's feedback:

Next step in Learning:

WORK WELL DONE

WORK ADEQUATELY
ATTEMPTED

WORK REQUIRES MORE
PRACTICE AND EFFORT

REMARKS :

Signature: _____

Date:

WORKING

WORKING

CHAPTER-4 **CARBON AND ITS COMPOUNDS**

Synopsis:

Carbon: Introduction

Atomic Number: 6

Electronic configuration: 2, 4

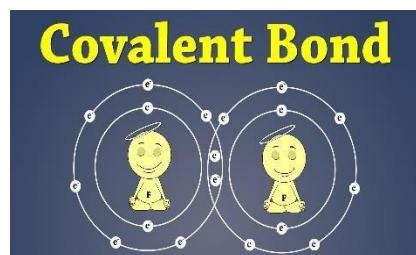
Valence electrons: 4

Property: Non-metal

Abundance: Carbon is the 4th most abundant substance in universe and 15th most abundant substance in the earth's crust. Compounds having carbon atoms among the components are known as carbon compounds. Previously, carbon compounds could only be obtained from a living source; hence they are also known as organic compounds.

Bonding in Carbon: Covalent Bond

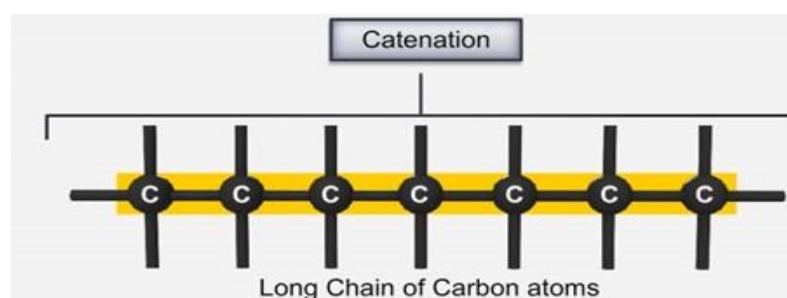
Bond formed by sharing of electrons is called covalent bond. Two or more atoms share electrons to make their configuration stable. In this type of bond, all the atoms have similar rights over shared electrons. Compounds which are formed because of sharing of electrons are called COVALENT COMPOUNDS.



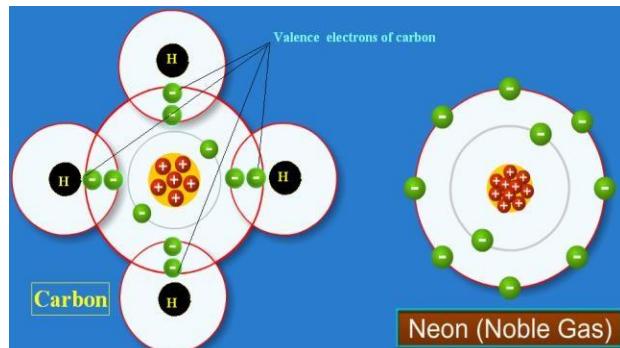
Covalent bonds are of three types: Single, double and triple covalent bond.

Versatile nature of carbon: At present almost five million organic compounds are known to use more than the elements of all the compounds put together!! The unique nature of carbon atom and the arrangement of the bond carbon forms with other atoms enable the existence of such a large number of organic compounds.

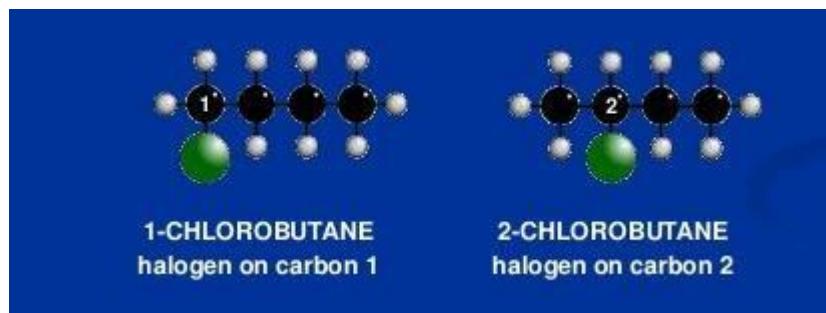
- a) Catenation – the self-linking property of an element due to which a large number of its atoms can be linked with each other by covalent bond is called catenation.



b) Tetravalency- Ability of carbon atom to bond with four other atoms of carbon or atoms of some other mono-valent element.

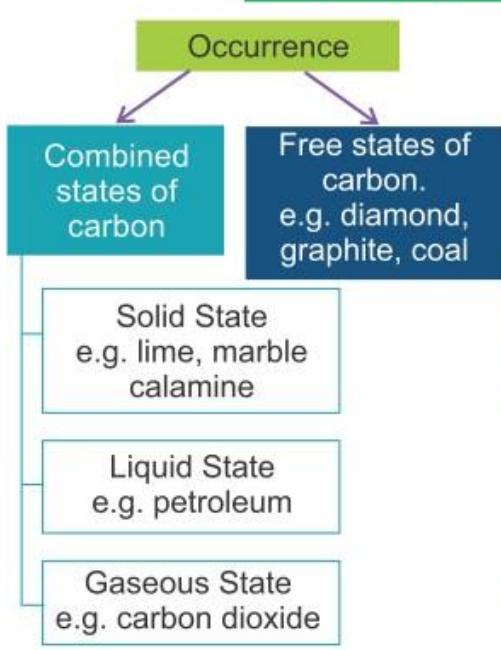


- c) Isomerism – it is the phenomenon due to which two or more compounds have the same molecular formula but different structural formulae.

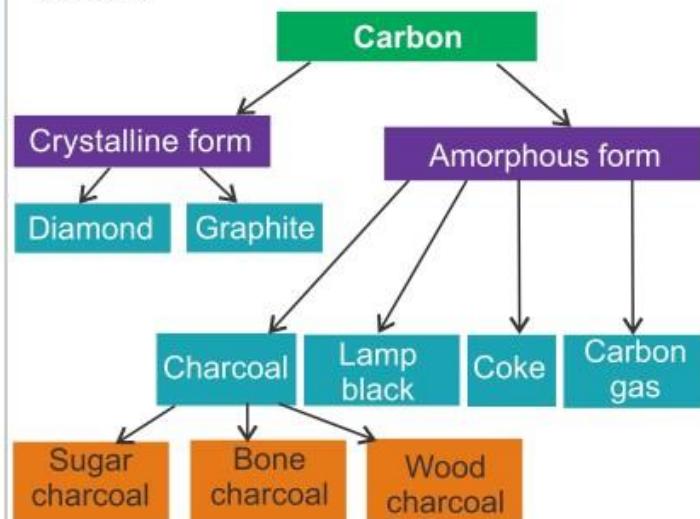


Allotropy: Allotropy may be defined as the property of an element as a result of which it exists in more than one forms, which are physically different and chemically similar.

Chemical Symbol – C ; Atomic Number - 6



Allotropy: The phenomenon due to which an element exhibits different physical forms.
Allotropes are the various physical forms of an element.



DIFFERENCES BETWEEN DIAMOND AND GRAPHITE

Graphite

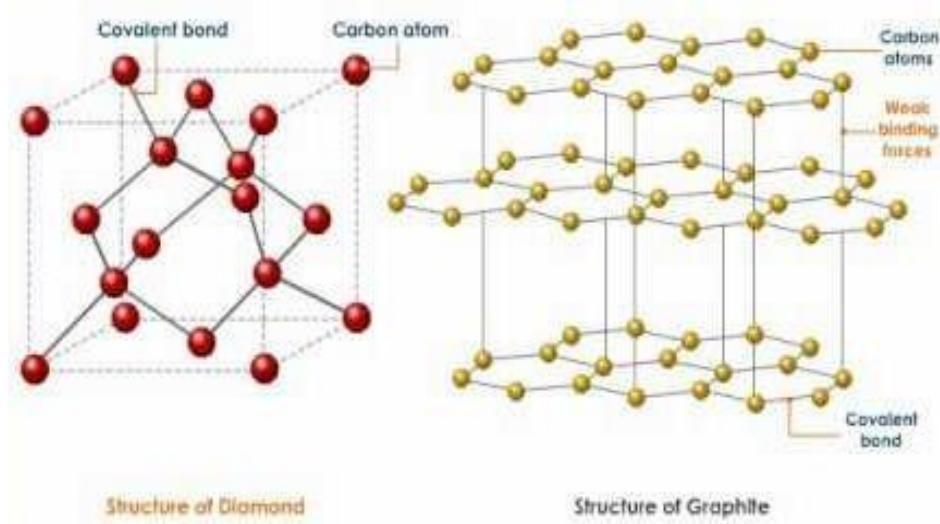
1. Graphite has two dimensional hexagonal planar structure
2. Graphite is soft and greasy.
3. It is a good conductor of heat and electricity.
4. It is grayish black substance.
5. Graphite is used as a lubricant.
6. Density of graphite is comparatively less.



Diamond

1. **Diamond is a three dimensional tetrahedral structure.**
2. **It is the hardest substance known.**
3. **It is the bad conductor of electricity but good conductor of heat.**
4. **It is transparent.**
5. **Diamond is the ultimate abrasive.**
6. **Density of diamond is more**

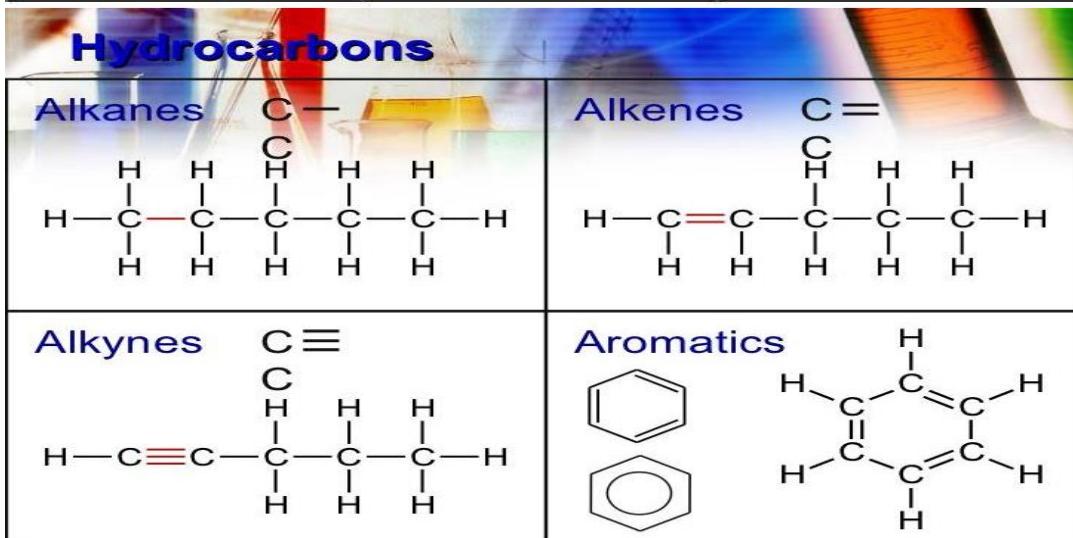




HYDROCARBONS

- The compounds of carbon and hydrogen in which carbon atoms are linked to each other by single covalent bonds (C-C), are known as alkanes. These are very little reactive chemically and are called saturated hydrocarbons.
- The hydrocarbons in which carbon atoms are linked to each other at least by one double bond (C=C) or one triple bond (C ≡ C) are called as unsaturated hydrocarbons. The unsaturated hydrocarbon with a double bond is called an alkene while those having a triple bond are called alkynes.

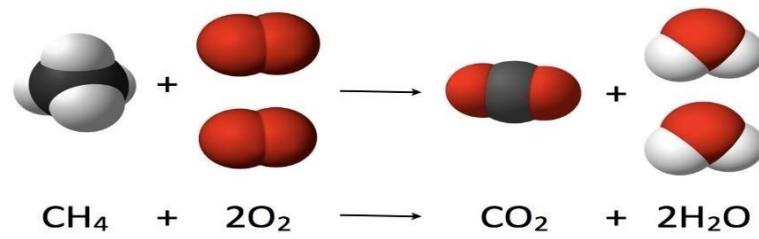
Alkanes	Alkenes	Alkynes
SATURATED means that each carbon is bonded to four other atoms through single covalent bonds. Hydrogen atoms usually occupy all available bonding positions after the carbons have bonded to each other.	UNSATURATED hydrocarbons contain either double or triple bonds. Since the compound is unsaturated with respect to hydrogen atoms, the extra electrons are shared between 2 carbon atoms forming double or triple bonds.	
PARAFFINS which is derived from a Latin word meaning "little activity", and means that the compounds are very unreactive.	Alkenes are also called OLEFINS because they form oily liquids on reaction with chlorine gas.	Alkynes are also generally known as ACETYLENES from the first compound in the series.



- Aromatics are closed chain carbon compounds e.g benzene
- Functional group: An atom or a group of atoms that largely determines the property of a particular family of organic compounds is called a functional group.
- Homologous series is a series of similarly constituted compounds in which the members have the same functional group, same chemical properties and any two successive members in a particular series differ in their molecular formula by $-CH_2$ group.

CHEMICAL REACTIONS OF CARBON COMPOUNDS

- Combustion: Combustion reactions are carried by heating organic compounds with excess of air or oxygen. Complete combustion is indicated by a blue flame while incomplete combustion is represented by yellow flame.



- Oxidation – if the combustion of organic compounds is properly controlled, it may give useful organic compounds.

Oxidation of alcohols

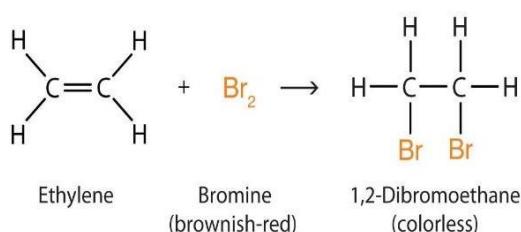
Acidified potassium permanganate (H^+/KMnO_4), and acidified potassium dichromate ($\text{H}^+/\text{K}_2\text{Cr}_2\text{O}_7$) are important oxidising agents.

They will not react unless acid is present.

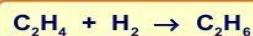
Purple $\text{H}^+/\text{MnO}_4^-$ turns colourless when it has reacted.

Orange $\text{H}^+/\text{Cr}_2\text{O}_7^{2-}$ turns blue/green when it has reacted.

- Addition reactions – in addition reactions, the attacking molecule (e.g Br₂ or H₂) is added to the organic compound containing a double or a triple bond. The addition takes place at the point of unsaturation and changes it to a saturated compound.



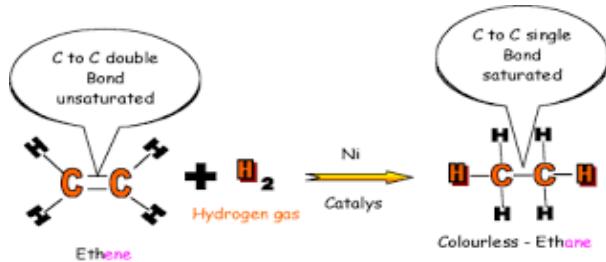
Hydrogen can be added to the carbon–carbon double bond using a nickel catalyst in a process called **hydrogenation**.



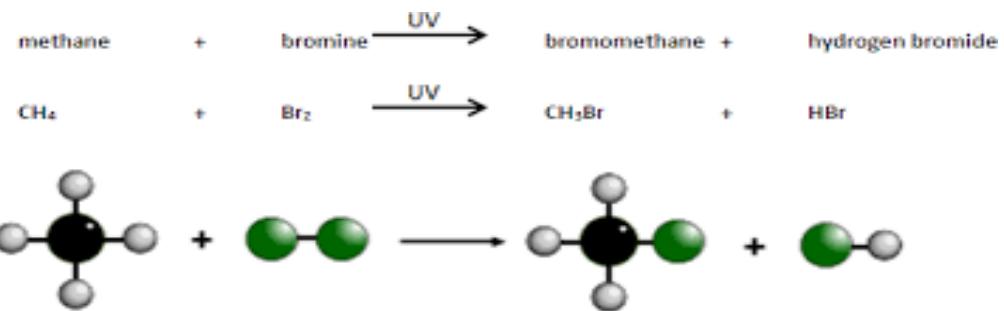
Vegetable oils are unsaturated and may be hydrogenated to make margarine, which has a higher melting point.

As well as a nickel catalyst, this requires a temperature of 200 °C and a pressure of 1000 kPa.





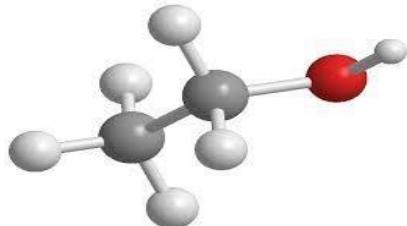
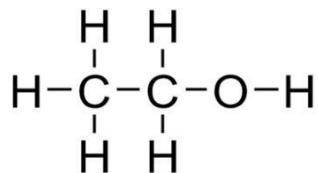
- Substitution reactions: In substitution reactions, one or more atoms or groups of atoms present in a compound are replaced or substituted by different atoms or groups



ALCOHOLS

Organic compounds, which have the hydroxyl group ($-OH$) attached to carbon atoms are known as alcohols. Hydroxyl group is a functional group.

ETHANOL- C₂H₅OH



<ul style="list-style-type: none"> Alcohols are hydroxyl derivative of alkanes. They do not occur naturally, they are synthesized. One or more hydrogen atom of alkane is replaced by OH group to give alcohols. 	<p>Monohydric alcohol</p> <p>Dihydric alcohol</p> <p>Trihydric alcohol</p>	<p>1 OH group</p> <p>2 OH group</p> <p>3 OH group</p>
<p>Uses of Alcohol :</p> <ul style="list-style-type: none"> It's a good solvent for gums and resins. Used in thermometers. Its used in manufacture of chemicals and synthetic products like dyes, perfumes, antiseptics 		<p>Denatured Alcohol : In order to make ethanol undrinkable, pyridine, methanol and copper sulphate is added. This alcohol is called denatured alcohol.</p> <p>Spurious Alcohol : Illicit liquor made by improper distillation, its fatal for human consumption.</p>

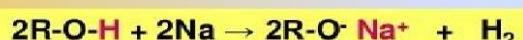
Physical Properties :

Properties	Alcohol	
Physical state	Inflammable volatile liquid which is toxic for humans.	
Boiling Point Melting point	Boiling point increases with increase in molecular weight. $\text{CH}_3\text{OH} = 64.5^\circ\text{C}$, $\text{C}_2\text{H}_5\text{OH} = 78.3^\circ\text{C}$	
Solubility	Soluble in water and organic solvents.	
Density	Ethanol's density is 0.79 gm/c.c.	Note : Ethanol affects that part of our brain which controls the muscular movements and then gives temporary relief from tiredness. It damages liver and kidney.

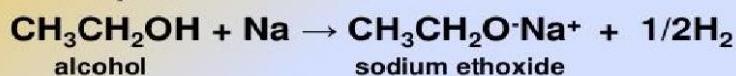
Chemical properties:

a) Reaction with sodium metal:

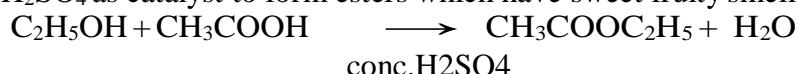
- Alcohols reacts with Na at room temperature to form salts (sodium alkoxides) and hydrogen.

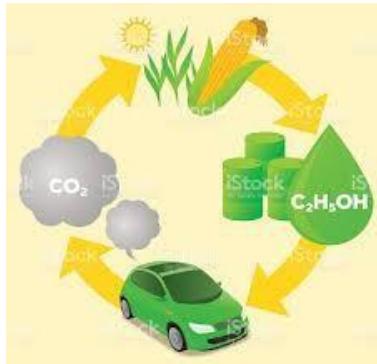


- For example:



b) Reaction with carboxylic acids (esterification): alcohols react with carboxylic acids in presence of conc. H_2SO_4 as catalyst to form esters which have sweet fruity smell.

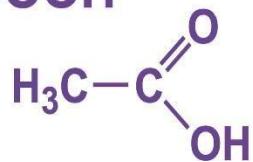




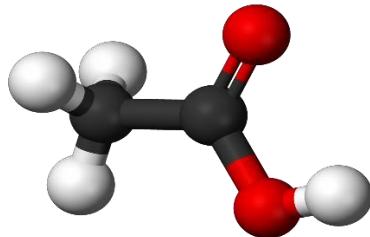
In cold countries ethanol is used as anti-freeze and is an efficient fuel.



CARBOXYLIC ACID

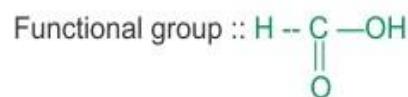


ETHANOIC ACID



- An organic compound containing the carboxyl group (--COOH) is called carboxylic acid.
- These compounds are acidic in nature.

General Formula : $\text{C}_n\text{H}_{2n+1}\text{COOH}$ (or RCOOH)



Ethanoic Acid (Acetic Acid) is the second member of homologous series of Carboxylic Acid.

Properties	Acetic Acid
Physical State	Colorless liquid with characteristic odor.
Boiling Point Melting Point	B.P = 118°C , M.P. = 17°C
Solubility	Soluble in water and organic solvents.
Nature	It is hygroscopic liquid
Combustion	Burns with pale blue flame.
Solvent Nature	It's a good solvent for P_4 , S_8 and many other organic solvents.
Corrosive Nature	Forms blisters in contact with skin.

Test for Acetic Acid:

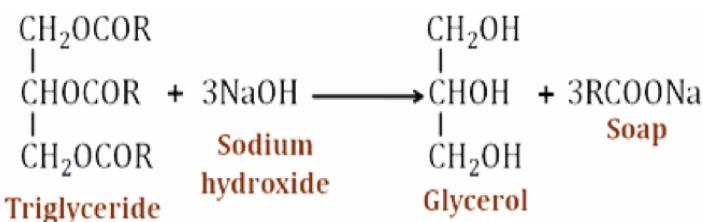
- On adding acetic acid to carbonates and bicarbonates, carbon dioxide is evolved.
- When warmed with ethyl alcohol and conc. Sulphuric acid, a pleasant fruity smell is produced.
- On adding neutral iron (III) chloride, wine color is produced.

➤ Dilute solution (5-8%) of ethanoic acid in water is known as **vinegar**. It is used for preserving food.

Esterification: The compound formed by the reaction of an alcohol with a carboxylic acid in presence of sulphuric acid is known as ester, and the reaction as esterification. Esters have a very sweet fruity smell. Naturally occurring esters are found in fruits. They are used for making perfumes

➤ **Saponification:** The hydrolysis of an ester in presence of an alkali or an acid.

Hydrolysis with an alkali is called saponification.



SAPONIFICATION



SOAPS AND DETERGENTS:

Saponification is the reaction of caustic soda(NaOH) with oil or fat. A soap molecule consists of an anion RCOO^- (R is a long hydrocarbon chain) and cation Na^+ or K^+ .

Long Chain hydrocarbon



Soap Molecule

Detergents

- Prepared from alkyl benzene and oleum, the process is known as sulphonation.
- Detergents have better cleansing action than soaps. They make lather even in hard water.

- Soaps have two main parts – a polar head which is hydrophilic & a non-polar hydrocarbon tail which is hydrophobic.
- Soaps are ineffective in hard water as they react with Ca^{+2} and Mg^{+2} ions in hard water to form insoluble scum.

Detergents can be used in hard water also as the calcium and magnesium salts produced are soluble in water

SOAPs	DETERGENTS
<p>1. Soaps are sodium salts of long chain fatty acids</p> <p>2. They cannot be used in hard water as they produce precipitates with Ca^{+2} and Mg^{+2} ions of hard water.</p> <p>3. They are bio-degradable. Therefore, they do not cause any pollution.</p> 	<p>1. Synthetic detergents are sodium salts of long chain alkyl sulphonates.</p> <p>2. They can be used in hard water as they do not form precipitate with Ca^{+2} and Mg^{+2} ions.</p> <p>3. They are non-biodegradable, hence cause pollution of water sources.</p> 

NOTE:

- While preparing soap a small amount of common salt is added to the reaction mixture of vegetable oil and sodium hydroxide. Common salt lowers the solubility of soap and helps in precipitation. So it is easy to separate soap from the remaining solution.
- If a straight chain hydrocarbon is used in the detergent instead of a branched chain hydrocarbon, then the detergent becomes biodegradable. Thus the major disadvantage of detergents can be overcome by reducing the branching in the carbon chain.

XXXXXXXXXX

EXERCISE

	MULTIPLE CHOICE QUESTIONS (1Mark each)
1	Which of the following substance is added to denature Ethanol? a) methanol b) pyridine c) copper sulphate d) all of them
2	Which of the following represents the correct decreasing order of hydrogen atoms ? a) alkanes, alkenes , alkynes b) alkanes, alkynes, alkenes c) alkenes, alkynes , alkanes d) alkynes , alkanes , alkenes
3	Detergents are sodium or potassium salts of long chain of ;- a) aldehydes b) ketones c) carboxylic acid d) sulphonic acid
4	. Which of the following salt when dissolved in water produce hard water? a) calcium sulphate b) magnesium bicarbonate c) calcium chloride d) any of the above
5	. Which of the following is not an allotropic form of carbon? a) fluorine b) fullerene c) diamond d) graphite
6	Ethane, with the molecular formula C ₂ H ₆ has (a) 6 covalent bonds. (b) 7 covalent bonds. (c) 8 covalent bonds. (d) 9 covalent bonds.
7	Butanone is a four-carbon compound with the functional group (a) carboxylic acid. (b) aldehyde. (c) ketone. (d) alcohol.

8	<p>An unsaturated hydrocarbon having a triple covalent bond has 50 hydrogen atoms in its molecule. The number of carbon atoms in its molecule will be</p> <p>(a) 28 (b) 26 (c) 52 (d) 46</p>
9	<p>The hydrocarbon which has alternate single and double bonds arranged in the form of a ring is</p> <p>(a) cyclobutane (b) benzene (c) butene (d) hexane</p>
10	<p>Which of the following cannot exhibit isomerism?</p> <p>(a) C₄H₁₀ (b) C₅H₁₂ (c) C₃H₈ (d) C₆H₁₄</p>
	<p>ASSERTION & REASON (1 mark each)</p> <p>In the following questions, the assertion and reason have been put forward. Read the statements carefully and choose the correct alternative from the following.</p> <p>a. Both the assertion and reason are true, and Reason is the correct explanation of assertion. b. Both the assertion and reason are true, but Reason is not the correct explanation of assertion. c. Assertion is true, but reason is false. d. Both assertion and Reason are false.</p>
1	<p>Assertion: Chemical bonds in organic compounds are covalent in nature. Reason: Covalent bond is formed by the sharing of electrons in the bonding atoms.</p>
2	<p>. Assertion: Diamond is the hardest crystalline form of carbon. Reason: Carbon atoms in diamond are arranged in tetrahedral nature.</p>
3	<p>Assertion: Due to catenation a large number of carbon compounds are formed. Reason: Carbon compounds show the property of allotropy.</p>
4	<p>. Assertion: Even though it is a non-metal, graphite conducts electricity. Reason: It is due to the presence of free electrons</p>
5	<p>. Assertion: Acetic acid is heated with Na₂CO₃ in a test tube. A colourless and odourless gas (X) is evolved. The gas turns lime water milky. Reason: The gas evolved is hydrogen.</p>
6	<p>Assertion(A) : If the first member of a homologous series is methanal, its third member will be propanal. Reason (R) : All the members of a homologous series show similar chemical properties.</p>

7	Assertion(A) : Diamond and graphite are allotropes of carbon. Reason (R) : Some elements can have several different structural forms while in the same physical state. These forms are called allotropes
8	Assertion(A) : Soaps are not suitable for washing purpose when water is hard. Reason (R) : Soaps have relatively weak cleansing action.
9	Assertion(A) : Carbon compounds can form chain, branched and ring structures. Reason (R) : Carbon exhibits the property of catenation.
10	Assertion(A) : Carbon is the only element that can form large number of compounds. Reason (R) : Carbon is tetravalent and shows the property of catenation.
VERY SHORT ANSWER TYPE QUESTIONS (1 MARK EACH)	
1.	Write the general formula of hydrocarbon alkene .Write the name of simplest alkene.
2.	Why do covalent molecules have low melting and boiling points?
3.	Name the reaction which takes place when ethanoic acid reacts with ethanol. What is the general name of the product obtained in this reaction?
4.	Butanone is a four carbon per molecule compound. Name the functional group present in it and write its structure..
5.	Write the molecular formulae of an alkane and an alkene with 20 carbon atoms.
SHORT ANSWER TYPE QUESTIONS (2 Mark each)	

6.	How can vegetable oils be converted to saturated fat? Give the reaction along with conditions.
7.	Which of the following will have a double bond between two carbon atoms: C_2H_2 , C_4H_8 , C_4H_6 , C_3H_8 .
8.	What would be observed on adding a 5% solution of alkaline potassium permanganate drop by drop to some warm ethanol taken in a test – tube? Write the name of the compound formed and also write a balanced chemical equation for the reaction involved.
9.	Write the structural formula of the following: a) Chloroethane b) Propanol
10.	A compound X has molecular formula C_3H_4 . One mole of X reacts with 2 moles of hydrogen to yield a compound Y. Deduce the structures of X and Y.

The questions given below carry 3 marks each.

11. 	Give reasons why: <ul style="list-style-type: none"> • Carbon compounds are usually poor conductors of electricity? • The use of detergents can cause serious environmental problem. • Mixture of ethyne and oxygen is burnt for welding and not ethyne and air.
12. 	Define esterification and saponification. What is the difference between the two reactions? Give one industrial use of each of the reactions.
13. 	Identify the compound given below and write its IUPAC name. Name the constituents from which this compound is prepared and write a balanced chemical equation for the preparation. $\begin{array}{c} \text{H} & \text{O} \\ & \parallel \\ \text{H} - \text{C} & - \text{C} - \text{O} - \text{C}_2\text{H}_5 \\ \\ \text{H} \end{array}$
14. 	Why do some hydrocarbons burn with a sooty flame? Which of the following ethyne, methane, propene, will give the maximum smoky flame? Give reason for your answer.
15. 	What is isomerism? Write the possible isomers for a hydrocarbon having molecular formula C_5H_{12} and give their names.

The questions given below carry 5 marks each.

16. 	An organic compound ‘A’ is widely used as a preservative in pickles and has a molecular formula $\text{C}_2\text{H}_4\text{O}_2$. This compound reacts with ethanol to form a sweet smelling compound ‘B’. <ol style="list-style-type: none"> Identify the compound ‘A’ Write the chemical equation for its reaction with ethanol to form compound ‘B’. How can we get compound ‘A’ back from ‘B’? Name the process and write corresponding chemical equation. Which gas is produced when compound ‘A’ reacts with washing soda?
17. 	How will you prepare the following? <ol style="list-style-type: none"> ethane from ethanol chloromethane from methane propane from propene ethanoic acid from ethanol Propanol to Propanoic acid.

18. !?	<p>An organic compound A on heating with concentrated H_2SO_4 forms compound B which on addition of one mole of hydrogen in presence of Ni forms compound C. One mole of compound C on combustion forms 2 moles of a gas D which turns lime water milky and 3 moles of water. Identify the compounds A, B, C and D and write the chemical equations of reactions involved</p>
19. !?	<p>A compound X of molecular formula $C_2H_4O_2$ reacts with sodium metal to form compound Y and a gas Z which burns with a pop sound. Compound X on treatment with compound P in presence of an acid gives a sweet-smelling liquid Q. On addition of $NaOH$ to X, it also forms Y and water. Q on treatment with $NaOH$ gives back Y and P. Identify X, Y, Z, P and Q. Write the balanced chemical equation for all the reactions involved.</p>
20. !?	<p>a) Define Functional group. Give examples of four different functional groups with 3 carbon atoms. b) Draw the possible isomers of the compound with molecular formula C_3H_6O and also give their electron dot structures.</p>
1	<p>CASE STUDY :</p> <p>Carbon has the unique ability to form bonds with other atoms of carbon, giving rise to large molecules. This property is called catenation. These compounds may have long chains of carbon, branched chains of carbon or even carbon atoms arranged in rings. In addition, carbon atoms may be linked by single, double or triple bonds.</p> <ol style="list-style-type: none"> What are saturated compounds? What is another versatile property of carbon? Give two examples of unsaturated compounds. What would be the electron dot structure of C_2H_6. Name any one element other than carbon which show catenation property?
2	<p>Carbon, in all its allotropic forms, burns in oxygen to give carbon dioxide along with the release of heat and light. Most carbon compounds also release a large amount of heat and light on burning.</p> <p>Saturated hydrocarbons will generally give a clean flame while unsaturated carbon compounds will give a yellow flame with lots of black smoke.</p> <ol style="list-style-type: none"> Complete the reaction: $CH_3CH_2OH + O_2$ gives What is the reason for incomplete combustion?

iii) Combustion is an oxidation reaction. Explain
iv) Name the allotropic forms of Carbon.

3

Carbon compounds can be easily oxidised on combustion. In addition to this complete oxidation, we have reactions in which alcohols are converted to carboxylic acids.

We see that some substances can add oxygen to others. These substances are known as oxidizing agents.

i) Give two examples of good oxidizing agent.

ii) Complete the reaction: $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{Alk. KMnO}_4 \quad ?$

iii) What are the uses of alcohol?

iv) Why Acidified potassium dichromate is called an oxidizing agent?

v) What are the uses of ethanoic acid?

WORKING

Learning Objective	Achieved	Working towards	Needs reinforcement
I can understand and describe covalent bonding in carbon compounds.			
I can recall the versatile nature of carbon and study about its allotropes.			
I know the difference between saturated and unsaturated hydrocarbons.			
I can explain the nomenclature and chemical properties of carbon compounds.			

Teacher's feedback:

Student's feedback:

Next step in Learning:

WORK WELL DONE

WORK ADEQUATELY
ATTEMPTED

WORK REQUIRES MORE
PRACTICE AND EFFORT

REMARKS :

Signature: _____

Date: _____



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PERIODIC TEST I (2022-23)

Subject: Science

Max. Marks: 35

Grade: X

Time: 1 hr 15 min

Name:

Section:

Roll No:

General Instructions:

- This question paper consists of ? printed pages.
- All answers to be written in the answer sheet provided.

CHEMISTRY (11)

1.	Burning of magnesium ribbon is not a/an	1
	a) Combination reaction	b) Combustion reaction
	c) Oxidation reaction	d) Decomposition reactions
2	Chloride of a metal X which is used to make jewellery turns to grey from white when exposed to sunlight. Name the type of the reaction and give a balanced chemical equation for this change	2
3	Why do walls shine somedays after white washing? Give the equation for the chemical change. Name the substance used for white washing.	2
4	A compound 'X' is used for drinking. Its acidified solution undergoes decomposition in presence of electricity to produce gases 'Y' and 'Z'. The volume of Y is double than Z. Y is highly combustible whereas Z is supporter of combustion. i) Identify Y & Z ii) The volume of Y is double than Z. Give reason iii) Why do we need to acidify the solution?	3
5	A crystalline pale green compound A when heated gives the characteristic odour of burning sulphur and another residue B is obtained which is brown in colour. Identify A and B. Give a balanced equation for the chemical change and also indicate the state of matter in the equation. Name the type of chemical reaction.	3

ANSWER KEY PT1 GRADE 10 (2022-23)

CHEMISTRY

1.	Decomposition reaction	1
2	$2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$	1
	this reaction is photolytic decomposition reaction	1
3	Calcium carbonate is formed after two to three days of white washing and gives a shiny finish to the walls. calcium hydroxide reacts slowly with the carbon dioxide in air to form a thin layer of calcium carbonate on the walls. $\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3$ Ca(OH)₂ or CaO	$\frac{1}{2}$ 1 $\frac{1}{2}$
4	a) $\text{Y}=\text{H}_2, \text{Z}=\text{O}_2$ b) Hydrogen and Oxygen ratio in water is 2:1. Hence the volume of hydrogen gas liberated is double the volume of oxygen gas. c) To increase the conductivity (any suitable ans)	1 1 1
5	A - FeSO_4 ; B- Fe_2O_3 $2\text{FeSO}_4(\text{s}) \rightarrow \text{Fe}_2\text{O}_3(\text{s}) + \text{SO}_2(\text{g}) + \text{SO}_3(\text{g})$ (with state full credit) Thermal decomposition	1 1 1



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PERIODIC TEST II (2022-23)

Subject: Science

Max. Marks:35

Grade: X

Time:1 hr 15 min

Name:

Section:

Roll No:

General Instructions:

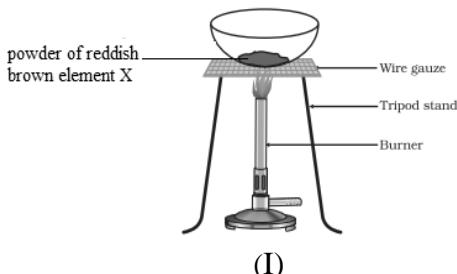
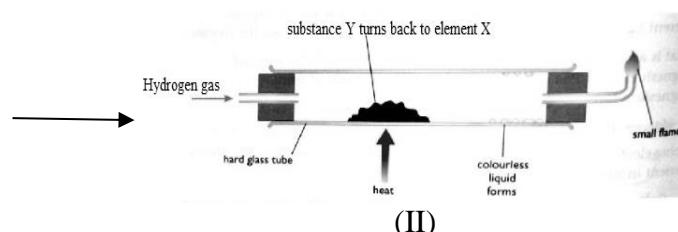
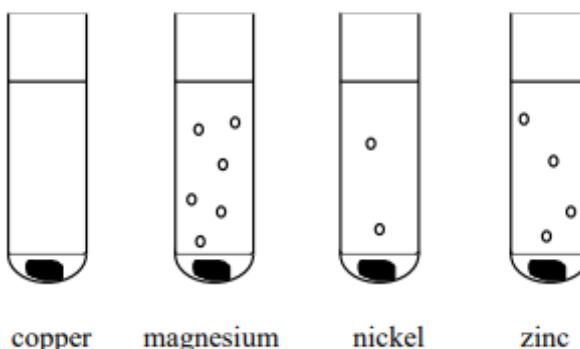
- This question paper consists of 3 printed pages.
- All answers to be written in the answer sheet provided.
- Physics, Chemistry and Biology to be answered on separate answer sheets.
- ALL QUESTIONS ARE COMPULSORY.

PHYSICS (11 Marks)

1.	Which among the following is used in torch to form parallel beam of light? a) Concave lens b) Concave mirror c) Convex mirror d) plane mirror	1
2.	The image of an object formed by a mirror is real, inverted and is of magnification -1. a) If the image is at 40 cm from the mirror, where is the object placed? b) Where would the image be if the object is moved 20 cm towards the mirror?	2
3.	The image formed by a lens is diminished in size and erect for all positions of the object. i. Identify the type of lens. Draw the ray diagram and show the position of the image? ii. Name the point on the lens through which a ray of light passes undeviated?	2
4.	a) The absolute refractive index of water is $4/3$. If the light enters from air to water, find the speed of light in water. The speed of light in vacuum is 3×10^8 m/s. b) Water has refractive index 1.33 and alcohol has refractive index 1.36. Which of the two medium is optically denser? Draw a ray diagram to show the path of a ray of light passing obliquely from water to alcohol.	3
5.	How far an object should be placed from the pole of a concave mirror of focal length 20cm to form a real image whose size is $1/5$ the size of the object.	3

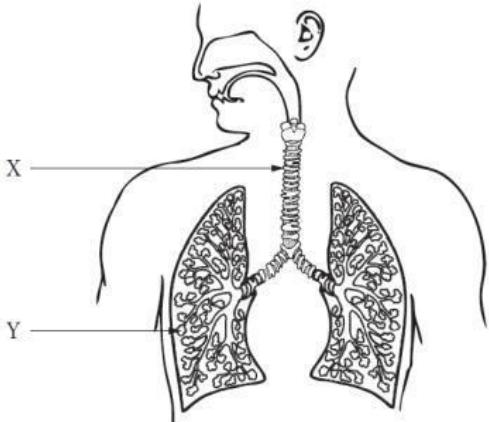
CHEMISTRY (11 Marks)

1	Ca(OH) ₂ + CO ₂ → CaCO ₃ + H ₂ O is an example of i) Neutalization reaction. ii) Displacement reaction	1
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	iii) Double displacement reaction iv) Combination reaction	
	a) i & iv c) iii & iv	b) ii & iv d) i, & iii
2	<p>Arman did not want to share his chips with his brother. So, he hid the chips packet behind his grade X textbooks. After 2 weeks when he remembered he could not enjoy the chips as its taste had spoiled. He thought I could have shared it with my brother on that day.</p> <p>a) Why did the taste of chips change? b) Give two methods he could have used to prevent this process while hiding it.</p>	2
3	<p>a) Corrosion of iron is a serious problem for economy of a country. Justify. b) Magnesium ribbon must be cleaned with sandpaper before burning it. Anushka states' its due to corrosion of magnesium ribbon'. Do you agree with her thought? Yes/no. Justify your choice.</p>	2
4	<p>a) In the given following reaction</p> $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$ <p>Identify the substance i) getting oxidized, ii) Getting reduced b) In the given figures I & II, Write balanced chemical equation for both the processes. Figure I explains element X being heated and forming black coloured compound Y. Figure II explains black compound Y changing back to element X when hydrogen is passed through it.</p>  	3
5	<p>Small pieces of the metals copper, magnesium, nickel, & zinc were placed in test tubes containing small quantities of sulphuric acid. The following results were observed.</p>  <p>copper magnesium nickel zinc</p> <p>a) Identify an element i) more reactive than zinc, ii) Less reactive than nickel b) Why do you think no bubbles are seen in test tube containing copper?</p>	3

- a) Write balanced chemical equation for reaction taking place in test tube containing Zinc.

BIOLOGY (13 MARKS)

1	The internal energy reserve in autotrophs is (a) glycogen (b) protein (c) starch (d) fatty acid	1
2	Name the part of alimentary canal that receives biles from the liver a) Oesophagus b) Stomach c) Small intestine d) Large intestine	1
3	Why are the walls of trachea supported by cartilaginous rings?	1
4	a) If you compare your rate of breathing by feeling your chest movement with the number of times a fish opens and closes its mouth. Which will be higher and why? b) Which type of respiration is more efficient. Give reason	2
5	Explain why a) Carbon dioxide is transported in dissolved form. b) During day oxygen release is the major event in plants .	2
6	Write the different ways in which glucose is oxidised to provide energy in living organism.	3
7	 <p>a) Identify Y in the diagram. What is its function? b) What happens to ribs and diaphragm during inhalation? c) Write any two effects of smoking in human beings.</p>	3



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PT2 -(2022-23)

Subject: SCIENCE

Max. Marks: 35

Grade: 10

Time: 1HR 20 Minutes

1.	b) Concave mirror	1
2.	a) Object is placed at 40cm in front of the mirror. (1mark) b) $u = -20\text{cm}$; $f = -20\text{cm}$ So the image is formed at infinity (1mark) Object is placed at the focus, image if formed at infinity	2
3.	concave lens. Ray diagram 	$\frac{1}{2}$ 1 $\frac{1}{2}$
4.	a) statement b) $n_w = \frac{4}{3}$ $= \frac{c}{v_w} = \frac{3 \times 10^8 \times 3}{4}$ $= 2.25 \times 10^8 \text{m/s}$ c) alcohol 	1 1 $\frac{1}{2}$ $\frac{1}{2}$

5.	$m = \left(-\frac{1}{5} \right) = -\frac{V}{U}$ $\Rightarrow \frac{V}{U} = \frac{1}{5}$ $\Rightarrow V = \frac{U}{5}$ <p>Now by applying the mirror formula</p> $\frac{1}{U} + \frac{1}{V} = \frac{1}{f}$ $\frac{1}{U} + \frac{5}{U} = \frac{-1}{20}$ $\frac{6}{U} = \frac{-1}{20}$ $U = -120 \text{ cm}$	3
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CHEMISTRY		
1	i,& iii	1
2	a. It became rancid, due to rancidity, or oxidation of fats present in chips Airtight container, ziplock, hiding in refrigerator. Vacuum sealing...DO NOT accept antioxidants and flushing with nitrogen	1 $\frac{1}{2} * 2$
3	a. Corrosion causes damage to car bodies, bridges, iron railings, ships and to all objects made of metals, specially those of iron. . Every year an enormous amount of money is spent to replace damaged iron.(any proper logical explanation) b. Yes as corrosion is when a metal is attacked by substances around it such as moisture, acids, etc., (for correct explanation without yes give full credit)	1 $\frac{1}{2} * 2$
4	a. i) HCl, ii) MnO ₂ b. $2\text{Cu} + \text{O}_2 \xrightarrow{\text{Heat}} 2\text{CuO}$ $\text{CuO} + \text{H}_2 \xrightarrow{\text{Heat}} \text{Cu} + \text{H}_2\text{O}$	$\frac{1}{2} * 2$ $1 * 2$
5	c) i) Mg ii) Cu d) , as Cu is less reactive than H ₂ $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$	$\frac{1}{2} * 2$ $1 * 2$
BIOLOGY		
1	(c) starch	1
2	c) Small intestine	1
3	To prevent air passage from collapsing even when there is not much air in it.	1
4	a) As the amount of dissolved oxygen is relatively low (1/2) compare to the amount of oxygen in the air, the number of times a fish opens and closes its mouth will be higher (1/2) b) Aerobic respiration $\frac{1}{2}$. It provides more energy (ATP) to fuel all activities of the cell.	2
5	a) Carbon dioxide is more soluble in water (1mark)	2

	b) During day CO₂ generated during respiration is used up for photosynthesis (1/2) hence no CO₂ release . Instead oxygen release is major event (1/2)	
6	<p style="text-align: center;">1 mark each for three different ways of oxidation of glucose</p>	3
7	<p>i) Y - Alveoli. 1/2 Function – exchange of gases 1/2</p> <p>ii) When we breathe in, ribs move forward / lift(1/2)and diaphragm gets flattened/ contract and move downward(1/2)</p> <p>Any two effects – Lungs cancer / infection /cough 1/2 each</p>	3



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HALF YEARLY PAPER (2022-23)

Subject: SCIENCE

Max. Marks:80

Grade: X

Time:3 Hours

Name:

Section:

Roll No:

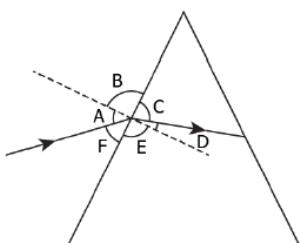
General Instructions:

- i) The question paper comprises five sections A, B, C, D and E. There are 32 questions in the question paper. All questions are compulsory.
- ii) Section-A - question no. 1 to 10 - all questions and parts thereof are of one mark each. These questions contain multiple choice questions (MCQs) and very short answer questions.
- iii) Section-B - question no. 11 to 18 are short answer type questions, carrying 2 marks each.
- iv) Section-C - question no. 19 to 26 are short answer type questions, carrying 3 marks each.
- v) Section-D - question no. - 27 to 29 are long answer type questions carrying 5 marks each.
- vi) Section-E - question no. - 30 to 32 are long case study with MCQs carrying 5 marks each.
- vii) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- viii) Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION A

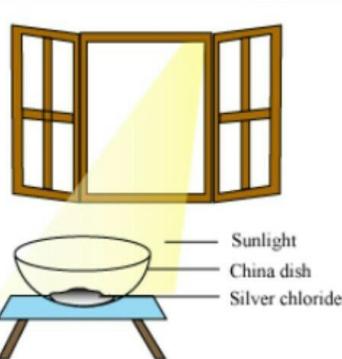
1	The angle between incident ray and reflected ray is 60^0 . The angle of incidence is:	1
a)	30^0	b) 90^0
c)	60^0	d) 0^0

2	The image shows a light ray incident on a glass prism.	1
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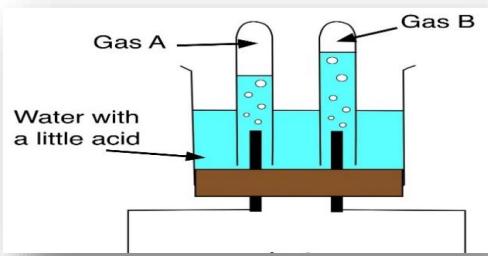


The various angles are labeled in the image. Which angle shows the angle of incidence and angle of refraction, respectively?

- (a) A and D
- (b) B and E
- (c) C and F

	(d) D and F	
3	The magnification produced by plane mirror is:	1
	a)-1	b) +1
	c) +2	d) -2
4	During the preparation of HCl gas on a humid day, the gas is usually passed through a guard tube containing calcium chloride. What is the role of calcium chloride in the guard tube?	1
5	What effect does the concentration of H^+ (aq) have on the acidic nature of the solution?	1
6	A milkman adds a very small amount of baking soda to fresh milk. Why does this milk take a longer time to set as curd?	1
7	2 g of lead nitrate powder is taken in a boiling tube. The boiling tube is heated over a flame. State the color of the fumes evolved and the residue left. Name the residue.	1
8	In which mode of nutrition an organism derives its food from the body of another living organism without killing it?	1
9	Give the term for rhythmic contraction of alimentary canal muscle to propel food.	1
10	What prevents air passage from collapsing in human body?	1
SECTION B		
11	a) What is meant by the power of accommodation of an eye? b) A person with a myopic eye cannot see objects beyond 1.2 m directly. What should be the type of the corrective lens used? What would be its power?	2
12	The image of an object formed by a mirror is real, inverted and is of magnification -1. c) If the image is at 40 cm from the mirror, where is the object placed? d) Where would the image be if the object is moved 20 cm towards the mirror?	2
13	The following diagram displays a chemical reaction. Observe carefully and answer the questions given below  Sunlight China dish Silver chloride	2
	a) Identify the type of chemical reaction that will take place and state one observation you make during the reaction. b) Write the balanced chemical equation.	
14	Dry pellets of a base 'X' when kept in open absorbs moisture and turns sticky. Identify X. a) Write the balanced chemical equation of manufacturing of 'X' by using common salt. b) Name that process.	2

	<p>a) Bluish green solution was obtained with black Copper Oxide.</p> <p>b) Brisk effervescence was observed with baking soda.</p> <p>c) pH paper turned green when dilute sodium hydroxide solution was mixed.</p> <p style="text-align: center;">OR</p> <p>sulphate salt which is white and soft , can be moulded into different shapes by making its dough. When this compound is left in open for some time, it becomes a solid mass and cannot be used for moulding purpose. Identify the sulphate salt and explain why does it show such a behavior? Give the reaction involved.</p>	
24	<p>a) Which mechanism plays an important role in transportation of water in plants i) During day time ii) At night?</p> <p>b) What will happen if platelets were absent in the blood?</p> <p>c) Lymph is another type of fluid involved in human transportation. List out the functions of lymph.</p>	3
25	Draw a flow chart to show the breakdown of glucose by various pathways.	3
26	<p>a) Major amount of water is selectively reabsorbed by the tubular part of nephron in humans. What are the factors on which the amount of water reabsorbed depends?</p> <p>b) What is another term for artificial kidney? How is artificial kidney different from normal kidney?</p>	3
	SECTION D	
27	<p>a) What is meant by power of a lens? Define its S.I. unit</p> <p>b) You have two lenses A and B of focal lengths + 10 and -10 cm respectively. State the nature and power of each lens.</p> <p>Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens? Draw a ray diagram to justify your answer.</p> <p>c) A concave lens of focal length 25 cm and a convex lens of focal length 20 cm are placed in contact with each other. What is the power of this combination? Also, calculate focal length of the combination.</p> <p style="text-align: center;">OR</p> <p>A 2.0 cm tall object is placed perpendicular to the principal axis of a concave lens of focal length 15 cm.</p> <p>a) At what distance from the lens, should the object be placed so that it forms an image 10 cm from the lens?</p> <p>b) Draw a ray diagram to show the formation of this image.</p> <p>c) Also find the nature and the size of image formed.</p>	5
28	Look at the figure and answer the following questions.	5



BATTERY

- Name the gases A and B.
- Name the electrode on which we obtain gas A and the gas B.
- Why is the amount of gas A double the amount of gas B?
- Why do we add a few drops of acid in water?
- Write the balanced chemical equation involved.

29	<ol style="list-style-type: none"> Draw human alimentary canal and its associated glands. Label the following parts <ol style="list-style-type: none"> Finger like projections present Secrete juice that has trypsin Secrete bile Absorbs water from unabsorbed food Mention the names of any two secretions by the gastric glands and state one role played by each in our body. 	5
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SECTION E: Case study

30	<p>The human eye is one of the most valuable and sensitive sense organs. It enables us to see the wonderful world and the colours around us. On closing the eyes, we can identify objects to some extent by their smell, taste, sound they make or by touch. It is, however, impossible to identify colours while closing the eyes. Thus, of all the sense organs, the human eye is the most significant one as it enables us to see the beautiful, colorful world around us. The human eye is like a camera. Its lens system forms an image on a light-sensitive screen called the retina. Light enters the eye through a thin membrane called the cornea. It forms the transparent bulge on the front surface of the eyeball.</p> <p>The ability of the eye lens to adjust its focal length is called accommodation. Sometimes, the eye may gradually lose its power of accommodation. In such conditions, the person cannot see the objects distinctly and comfortably. The vision becomes blurred due to the refractive defects of the eye.</p> <ol style="list-style-type: none"> A person went for a medical check-up and found that the curvature of his eye lens is increasing. Which defects is he likely to suffer from? <ol style="list-style-type: none"> myopia cataract presbyopia hypermetropia A person gets out in the sunlight from a dark room. How does his pupil regulate and control the light entering in the eye? 	5
----	--	---

	<p>(a) the size of pupil will decrease, and less light will enter the eye (b) the size of pupil will decrease, and more light will enter the eye (c) the size of pupil will remain the same, but more light will enter the eye (d) the size of pupil will remain the same, but less light will enter the eye</p> <p>iii) In which part of the human eye is the image of an object formed? (a) iris (b) pupil (c) retina (d) cornea</p> <p>iv) A person is seeing an object closer to his eyes. What changes will take place in his eyes? (a) the pupil size will expand (b) the ciliary muscles will contract (c) the focal length of the eye lens will increase (d) the light entering in the eye will be more</p> <p>v) When light rays enter the eye, most of the refraction occurs at the (a) crystalline lens (b) outer surface of the cornea (c) iris (d) pupil</p>	
31	<p>FOAMING IN THE RIVER YAMUNA-</p> <p>The primary reason behind the formation of the toxic foam in Yamuna River is the high phosphate content in the waste water because of detergents used in dyeing industries, dhobi Ghats and households. Yamuna's pollution level is so bad that parts of it have been labeled 'dead' as there is no oxygen in it for aquatic life to survive.</p>  <p>Predict the pH value of the water of river Yamuna if the reason for froth is high</p>	5

content of detergents dissolved in it.

- a) 10-11
- b) 5-7
- c) 2-5
- d) 7

Which of the following statements is correct for the water with detergents dissolved in it?

- a) low concentration of hydroxide ion (OH^-) and high concentration of hydronium ion (H_3O^+)
- b) high concentration of hydroxide ion (OH^-) and low concentration of hydronium ion (H_3O^+)
- c) high concentration of hydroxide ion (OH^-) as well as hydronium ion (H_3O^+)
- d) equal concentration of both hydroxide ion (OH^-) and hydronium ion (H_3O^+).

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

Solution	pH value
P	2
Q	9
R	5
S	11

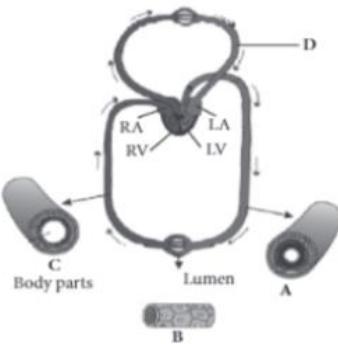
Which of the following correctly represents the solutions in increasing order of their hydronium ion concentration?

- e) P>Q>R>S
- f) P>S>Q>R
- g) S<Q<R<P
- h) S<P<Q<R

j). High content of phosphate ion in river Yamuna may lead to:

- a) decreased level of dissolved oxygen and increased growth of algae
- b) decreased level of dissolved oxygen and no effect of growth of algae
- c) increased level of dissolved oxygen and increased growth of algae
- d) decreased level of dissolved oxygen and decreased growth of algae

. If a sample of water containing detergents is provided to you, which of the following methods will you adopt to neutralize it?

	<p>a) Treating the water with baking soda b) Treating the water with vinegar c) Treating the water with caustic soda d) Treating the water with washing soda</p>							
32	<p>Double circulation is a type of circulatory system in which blood passes through the heart twice before completing a full circuit of the body. Blood is pumped from the heart to the lungs and returns to the heart before being distributed to other organs and tissues of the body.</p>	5						
								
	<p>i) The figure shows blood circulation in humans with labels A to D. Select the option which gives correct identification of label and functions of the part</p> <p>a) B – Capillary- Thin without muscle layer and the wall two cell layers thick b) C – Vein – Thick walled and blood flows continuously. c) D – Pulmonary Vein- Takes oxygenated blood to the heart d) A – Artery – Thin and elastic walls</p>							
	<p>ii) Which of the following animals shows double circulatory pathway?</p> <p>(a) Snake (b) Frog (c) Eel (d) Whale a)</p>							
	<p>iii) The table shows the characteristics of blood in one blood vessel of the body</p> <table border="1" data-bbox="176 1389 1320 1514"> <thead> <tr> <th>Oxygen Concentration</th> <th>CO₂ Concentration</th> <th>Pressure</th> </tr> </thead> <tbody> <tr> <td>High</td> <td>Low</td> <td>High</td> </tr> </tbody> </table> <p>Which blood vessel contains blood with these characteristics?</p> <p>a) Aorta b) Pulmonary Vein c) Pulmonary Artery d) Vena cava</p>	Oxygen Concentration	CO ₂ Concentration	Pressure	High	Low	High	
Oxygen Concentration	CO ₂ Concentration	Pressure						
High	Low	High						
	<p>iv) Select the option which properly represents pulmonary circulation in humans.</p> <p>(a) Left auricle Deoxygenated blood → Lungs Oxygenated blood Right ventricle</p>							

- | | | |
|--|---|--|
| | <p>(b) Left auricle Oxygenated blood → Lungs Deoxygenated blood → Right ventricle</p> <p>(c) Right ventricle <u>Deoxygenated blood</u> → Lungs <u>Oxygenated blood</u> → Left auricle</p> <p>(d) Right ventricle Oxygenated blood → Lungs Deoxygenated blood ≫ Left auricle</p> | |
| | v) Superior and inferior vena cava respectively carries blood from
a. Upper and lower parts of body
b. Lower and upper parts of body
c. Upper and lateral parts of the body
d. Lateral and lower parts of the body | |



**HALF YEARLY PAPER (2022-23)
ANSWER KEY**

Subject: SCIENCE		Max. Marks:80
Grade: X		Time:3 HOURS
Name:	Section:	Roll No:
1 a		1
2 a		1
3 b		1
4 Calcium chloride is used as a drying agent in the guard tube while hydrogen chloride is being formed on a humid day because it can absorb the moisture present in the air. 1 mark		1
5 The concentration of H^+ (aq) ions determines the acidic nature of solution . Hence, acidic nature of a solution increases with increase in concentration of H^+ (aq) ions and vice versa.		1
6 As baking soda is added, it turned into a base. But curd needs acidic condition to set . Hence this milk takes a long time to set as a curd.		1
7 Lead nitrate before heating: White Color of RESIDUE: Yellow due to Lead oxide Color of fumes: Reddish-brown due to nitrogen dioxide Color – $\frac{1}{2} + \frac{1}{2}$ Name of residue- 1 mark		1
8 Parasite mode	(1)	1
9 Peristalsis	(1)	1
10 Rings of Cartilage	(1)	1
11 (a) The ability of an eye to focus the distant objects as well as the nearby objects on the retina by changing the focal length or converging power of its lens is called power of accommodation. (b) Myopic eye $v = 1.2\text{ m} = -120\text{ cm};$		1

$u = (\text{infinity})$;
 P of the corrective lens = ?

By Lens formula,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\Rightarrow \frac{-1}{120} - 0 = \frac{1}{f} \quad \left(\frac{1}{\infty} = 0 \right) \Rightarrow \frac{-1}{120} = \frac{1}{f}$$

$$\therefore f = -120 \text{ cm}$$

Thus the corrective lens for the above defect is concave lens (as focal length has -ve sign) of focal length of 120 cm.

$$P = \frac{1}{f \text{ (in metres)}} = \frac{1 \times 100}{-120} = -0.83 \text{ D}$$

Magnification, $m = -1$

Image is real and inverted.

So, mirror is concave.

Image distance, $v = 40 \text{ cm}$

Object distance, u

magnification, $m = -v/u$

Mirror Formula

$$1/f = 1/v + 1/u$$

From magnification

$$m = -v/u$$

$$-1 = -(-40)/u$$

$$u = -40 \text{ cm}$$

Hence the object is placed at 40 cm from the mirror.

At infinity

12

2

(a) The ability of an eye to focus the distant objects as well as the nearby objects on the retina by changing the focal length or converging power of its lens is called power of accommodation.

(b) Myopic eye

$$v = 1.2 \text{ m} = -120 \text{ cm};$$

$u = (\text{infinity})$;

P of the corrective lens = ?

By Lens formula,

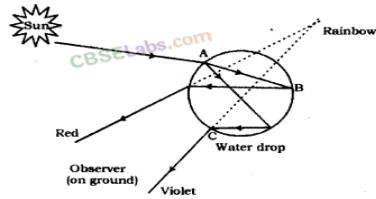
$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\Rightarrow \frac{-1}{120} - 0 = \frac{1}{f} \quad \left(\frac{1}{\infty} = 0 \right) \Rightarrow \frac{-1}{120} = \frac{1}{f}$$

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Thus the corrective lens for the above defect is concave lens (as focal length has -ve sign) of focal length of 120 cm.

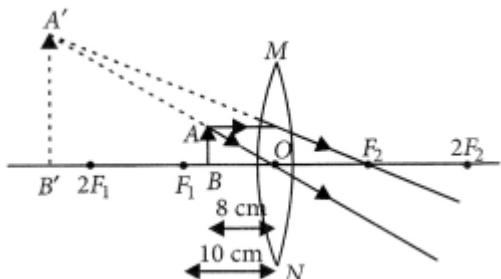
	$P = \frac{1}{f \text{ (in metres)}} = \frac{1 \times 100}{-120} = -0.83 \text{ D}$ <p>Magnification, $m=-1$ Image is real and inverted. So, mirror is concave. Image distance, $v=40\text{cm}$ Object distance, u magnification, $m=-v/u$ Mirror Formula $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ From magnification $m = -v/u$ $-1 = -(-40)/u$ $u = -40\text{cm}$ Hence the object is placed at 40 cm from the mirror. At infinity</p>	
13	The reaction of Photolytic decomposition is as follows (1/2) 2AgCl in presence of light = $2\text{Ag} + \text{Cl}_2$. (1) White silver chloride turns grey after the reaction. (1/2)	2
14	X is sodium hydroxide (NaOH) $\frac{1}{2}$ When sodium chloride solution (brine solution) is electrolyzed, sodium hydroxide solution is formed H_2 and Cl_2 gases are liberated. This is chlor-alkali process. (1/2) $2\text{NaCl} + 2\text{H}_2\text{O} \longrightarrow 2\text{NaOH} + \text{H}_2 + \text{Cl}_2$ (1 mark)	2
15	The brown coloured metal is copper. Hence 'X' is copper and the black coloured compound formed is Copper oxide . (1 mark) Heated copper metal reacts with oxygen to form the black copper oxide. $2\text{Cu} + \text{O}_2 \longrightarrow 2\text{CuO}$ (1 mark)	2
16	Herbivores eating grass need a longer small intestine to allow the cellulose to be digested (1) Meat is easier to digest, hence carnivores like tigers have a shorter small intestine (1) Or a) KOH $\frac{1}{2}$ reason – To absorb CO_2 $\frac{1}{2}$ b) Pot a will turn yellow because no photosynthesis occurs as KOH is present . $\frac{1}{2}$ c) Pot b will be healthy as photosynthesis takes place. $\frac{1}{2}$	2
17	a) Balloon like structure called alveoli are present that provide maximum surface area for the exchange of gases.(1) b) Alveoli have thin walls ,contain extensive network of blood vessels to facilitate the exchange of gases (1)	2
18	Any two methods (1mark each)	2
19	Water droplets acts as tiny prism in the sky. The sunlight when enters these tiny droplets undergo internal reflection and also refract these rays which are dispersed causing a band of seven colours called rainbow. diagram	1



2

20	<p>Absolute refractive index is the ratio of speed of light in vacuum to that of the medium. Refractive index is the ratio of speed of light in 1st medium to that of the second medium. R-15⁰</p> <p>Less angle of refraction, more bending, speed is minimum Speed of light in medium (v) = 0.6 x c Refractive index (n) = c / v Refractive index (n) = c / 0.6 x c = 1 / 0.6 Refractive index (n) = 1.66666..... = 1.67</p>	$\frac{1}{2}$ $\frac{1}{2}$ 1 1 1
21	<p>Given: u=-20 cm</p> <p>$f=R/2=15 \text{ cm}$</p> <p>Size of image, h=5 cm</p> <p>Let size of image be h'</p> <p>From mirror formula, $u/l+v/l=f/l$</p> $-20/l + v/l = 15/l$ $v = 760 = 8.57 \text{ cm}$ <p>The image is formed 8.57cm behind the mirror. It is virtual and erect.</p> <p>Magnification, $m=-v/u=8.57/20=0.428$</p> <p>Also, $m=h'/h=h'/5$</p> <p>From above, $h'/5=0.428$</p> $h' = 2.14 \text{ cm}$	1 1 1 1 1
22	<p>M- CaCO₃ Calcium carbonate (1/2) N- CO₂ (1/2 mark) CO₂ is acidic in nature (1/2) O- Ca(HCO₃)₂ Calcium bicarbonate (1/2)</p> $\text{CaCO}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{Ca}(\text{HCO}_3)_2 \quad (\text{1 mark})$	3
23	<p>A. CuO + 2 HCl → CuCl₂ + H₂O B. NaHCO₃ + HCl → NaCl + CO₂ + H₂O. C. NaOH + HCl → NaCl + H₂O</p>	3

	<p>(1 mark for each balanced equation)</p> <p>OR</p> <p>Plaster of Paris – Calcium sulphate hemihydrate</p> <p>Plaster of Paris is a salt of calcium metal which is also called as calcium sulfate hemihydrate. It absorbs moisture if left in open for sometime and become a hard mass called Gypsum.</p> $CaSO_4 \cdot \frac{1}{2} H_2O + 1 \frac{1}{2} H_2O \rightarrow CaSO_4 \cdot 2H_2O$ <p style="text-align: center;">(PlasterOfParis) (Gypsum)</p>	
24	<p>a) During day time- Transpiration pull (1/2) ii) At night- Root Pressure (1/2)</p> <p>b) Clotting at the site of injury will not take place/ Blood will continue to flow which would be fatal . (1)</p> <p>c) Carries digested and absorbed fat from intestine (1/2)</p> <p>Drains excess fluid from the extracellular spaces back into the blood . (1/2)</p>	3
25		3
26	<p>a) How much excess water is present in the body(1/2) Amount of dissolved waste to be excreted (1/2)</p> <p>b) Haemodialysis (1)</p> <p>Reabsorption does not occur in artificial kidney (1)</p>	3
27	<p>Focal length of lens A, $f_A = +10 \text{ cm}$</p> <p>Focal length of lens B, $f_B = -10 \text{ cm}$</p> <p>Lens A is convex lens . Lens B is concave lens,</p> <p>Power of lens A = 100 D ($\frac{1}{f} = \frac{1}{10} \text{ m}^{-1}$) = $100 \times 10 = +10 \text{ D}$</p> <p>Power of lens B = 100 D ($\frac{1}{f} = \frac{1}{-10} \text{ m}^{-1}$) = $100 - 10 = -10 \text{ D}$</p> <p>Lens A will form a virtual and magnified image.</p>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1



The net focal length of the combination is

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$= \frac{1}{+25} + \frac{1}{-20}$$

$$= -\frac{1}{100}$$

$$\Rightarrow f = -100 \text{ cm}$$

$$\text{Power of combination } P = P_1 + P_2 = \frac{1}{f_1} + \frac{1}{f_2}$$

$$P = \frac{1}{0.25} + \frac{1}{-0.20} = \frac{100}{25} - \frac{100}{20} = \frac{400 - 500}{100} = -\frac{100}{100} = -1$$

$$\Rightarrow P = -1 \text{ D}$$

1/2

1/2

1

a) OR

$$h_o = 2.0 \text{ cm}, f = -15 \text{ cm}$$

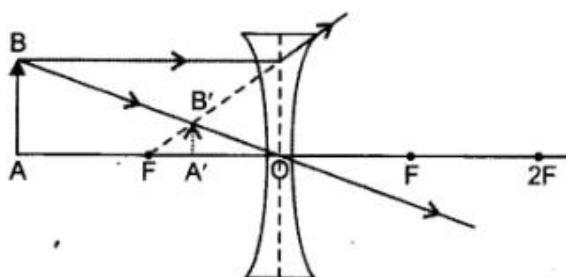
$v = -10 \text{ cm}$ as concave lens always forms virtual image. **1/2 marks**

$$\text{Using, } \frac{1}{f} = \frac{1}{v} - \frac{1}{u}, \text{ we get} \quad \textbf{1/2 marks}$$

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{-10} - \frac{1}{-15} = \frac{-15 + 10}{150}$$

$$\Rightarrow u = -\frac{150}{5} = -30 \text{ cm} \quad \textbf{1/2 marks}$$

b) Diagram 2 marks



	c) <p>Using, $m = \frac{h_l}{h_o} = \frac{v}{u}$, we get</p> $m = \frac{-10}{-30} = \frac{1}{3} < 1, \text{ we get } \mathbf{1/2 \text{ marks}}$ $h_l = 2 \times \frac{1}{3} = \frac{2}{3}. \quad \mathbf{1/2 \text{ marks}}$ <p>So, image is virtual, erect and diminished. 1/2 marks</p>	
28	f) A is H ₂ gas and B is O ₂ gas g) We obtain gas A at cathode and the gas B at anode. h) Hydrogen and oxygen are in the ration 2:1 in a molecule of water. i) To make it a good conductor of electricity. j) 2H ₂ O ----- 2H ₂ + O ₂	5
29	Diagram – 1 mark Labelling ½ mark each i) Finger like projections present- Small intestine ii) Secrete juice that has trypsin- Pancreas iii) Secrete bile- Liver iv) Absorbs water from unabsorbed food- Large intestine (2) b . HCl/ Mucus /Pepsin any two secretions ½ mark each Role – ½ mark each (2)	5
30	i) (a) myopia ii) (a) the size of pupil will decrease, and less light will enter the eye iii) (c) retina iv) (b) the ciliary muscles will contract v) (b) outer surface of the cornea	5
31	(i) a (ii) b (iii) c (iv) a (v) b	5

32	i)c) D – Pulmonary Vein- Takes oxygenated blood to the heart	(1)	5
	ii) d) Whale	(1)	
	iii) Aorta	(1)	
	iv) (c) Right ventricle Deoxygenated blood → Lungs Oxygenated blood → Left auricle	(1)	
	v) a. Upper and lower parts of body	(1)	



مَدْرَسَةِ دَلْهِيِّ الْخَاصَّةِ ذ.م.م.

DELHI PRIVATE SCHOOL L.L.C.

Affiliated to C.B.S.E., DELHI

(Approved & Recognized By Ministry of Education - United Arab Emirates)

PERIODIC TEST 3 (2022-23)

Subject: Science

Max. Marks: 35

Grade: X

Time: 1 hr 15 min

Name:

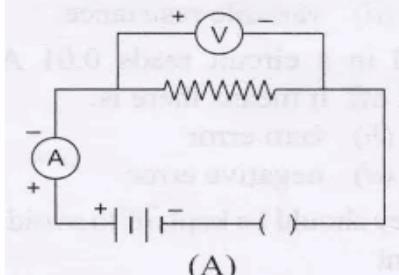
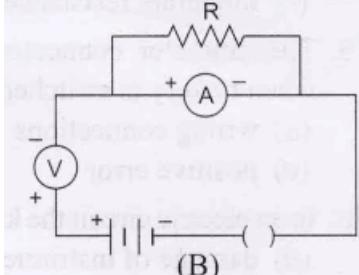
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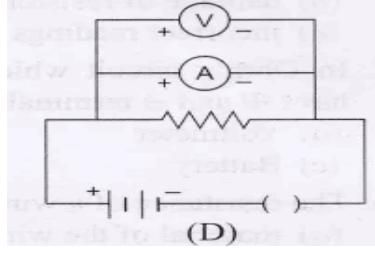
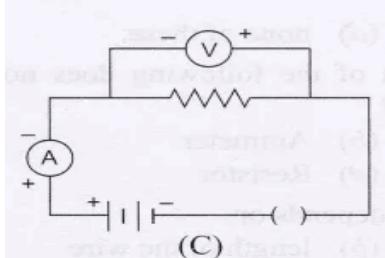
Roll No:

General Instructions:

- This question paper consists of ___ printed pages.
- All answers to be written in the answer sheet provided.
- Physics, Chemistry and Biology to be answered on separate answer sheets.
- ALL QUESTIONS ARE COMPULSORY.

PHYSICS (11 Marks)

1.	A charge of 6 C flows through the copper wire for 2 s connected across cell of potential difference 25 V, the work done is	1
	a) 100 J	b) 150 J
	c) 200 J	d) 250 J
2.	Keeping the potential difference constant, the resistance of a circuit is doubled. The current will become:	1
	a) Doubled	b) halved
	c) one-fourth	d) four times
3.	The correct set-up for studying the dependence of the current on the potential difference across a resistor is	1
	a) 	b) 
	c)	d)

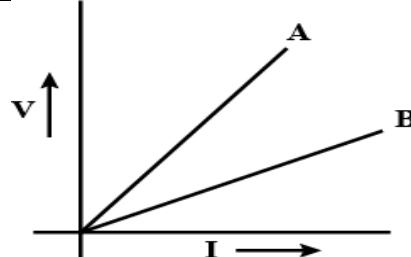


4. Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
 A. Both assertion and reason are true and reason is the correct explanation of assertion
 B. Both assertion and reason are true but reason is not the correct explanation of assertion
 C. Assertion is correct but reason is incorrect
 D. Both assertion and reason are incorrect
- Assertion (A) :** Longer wires have greater resistance and the smaller wires have lesser resistance.
- Reason (R) :** Resistance is inversely proportional to the length of the wire

5. The potential difference between the terminals of an electric heater is 60 V when it draws a current of 4 A from the source. What current will the heater draw if the potential difference is increased to 120 V?

6. a) Define resistivity? Write its SI unit?
 b) How will the following vary when the area of cross-section of a given material of wire is doubled
 (i) resistance (ii) resistivity

7. a) State Ohm's law?
 b) The graph shows the variation of potential difference V with current I across the conductor A and conductor B of same length L and same area of cross section. A. Which conductor A or B have greater resistance? Give reason?



CHEMISTRY (11MARKS)

- 1 The constituents of solder alloy are: 1
 c) Lead and Zinc d) Zinc and Tin
 c) Lead and Tin d) Zinc and Mercury
- 2 When a sample of copper containing iron as impurity is purified by electrolysis, the appropriate electrodes are: 1
 Cathode Anode
 a) Pure iron Pure Copper b) Impure Sample Pure Copper

	Cathode c) Impure iron	Anode Impure sample	Cathode d) Pure copper	Anode Impure sample	
3	Which of the following oxide(s) of iron would be obtained on prolonged reaction of iron with steam?				1
	(a) FeO		(b) Fe ₂ O ₃		
	(c) Fe ₃ O ₄		(d) Fe ₂ O ₃ and Fe ₃ O ₄		
4	In the following question a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices. Assertion: The ores of many metals are oxides. Reason: Oxygen is a very reactive element and is very abundant on the earth. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion. (b) Assertion and reason both are correct statements but reason is not correct explanation for assertion. (c) Assertion is correct statement but reason is wrong statement. (d) Assertion is wrong statement but reason is correct statement.				1
5	How is Sodium Oxide formed by the transfer of electrons? Does the solution of Sodium oxide conduct electricity? Explain				2
6	Two ores 'A' and 'B' were taken. On heating ore 'A' gives CO ₂ and 'B' gives SO ₂ . What steps you'll take to convert them into their metals?				2
7	Write the balanced chemical equations for the following: a) Zinc oxide is treated with carbon. b) Manganese dioxide is heated with aluminium powder. c) Steam is passed over hot aluminium.				3

	CHEMISTRY (11)		
1	The constituents of solder alloy are: c) Lead and Tin	1	
2	Cathode d) Pure copper	Anode Impure sample	1
3	Fe ₃ O ₄	1	
4		1	

5	<p>Summary:</p> <p>sodium atoms 2.8.1 oxygen atom 2.6</p> <p>Configuration: 2.8 Configuration: 2.6</p> <p>Configuration: 2.8 Configuration: 2.8</p> <p>After Bonding</p> <p>2 []⁺ []²⁻</p> <p>Each sodium atom lost an electron to form sodium ions Na^+</p> <p>An oxygen atom gained 2 electrons to form an oxide ion O^{2-}</p> <p>Sodium oxide is Na_2O</p>	1x2
6	<p>Ore 'A' is a carbonate ore and carbonate ores are subjected to calcination to get metal oxide followed by the reduction of the oxide to a metal, Ore 'B' is a sulphide ore, which is roasted to give metal oxide which is subjected to roasting followed by the reduction of the oxide to a metal.</p>	1x2
7	<p>d) $\text{ZnO(s)} + \text{C(s)} \rightarrow \text{Zn(s)} + \text{CO(g)}$</p> <p>e) $3\text{MnO}_2\text{(s)} + 4\text{Al(s)} \rightarrow 3\text{Mn(l)} + 2\text{Al}_2\text{O}_3\text{(s)} + \text{Heat}$</p> <p>f) $2\text{Al(s)} + 3\text{H}_2\text{O(g)} \rightarrow \text{Al}_2\text{O}_3\text{(s)} + 3\text{H}_2\text{(g)}$</p>	1x3

DELHI PRIVATE SCHOOL, SHARJAH

CLASS - X
 Science (086)
 PRE-BOARD
 (2022-23)
 SET – 1

Maximum Marks: 80

Time: 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.

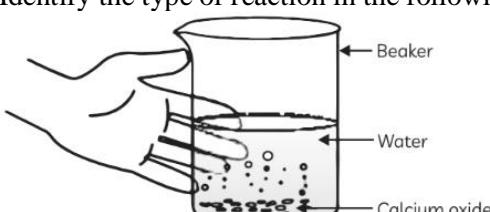
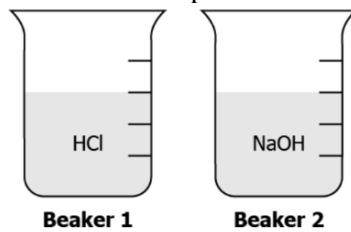
Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words

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

1	<p>Baking soda is a mixture of</p> <ul style="list-style-type: none"> (a) Sodium carbonate and acetic acid (b) Sodium carbonate and tartaric acid (c) Sodium hydrogen carbonate and tartaric acid (d) Sodium hydrogen carbonate and acetic acid 	1															
2	<p>Identify the type of reaction in the following experiment:</p>  <ul style="list-style-type: none"> (I) Combination Reaction (II) Decomposition Reaction (III) Exothermic Reaction (IV) Endothermic Reaction <ul style="list-style-type: none"> (a) Only (I) (b) Only (II) (c) Both (I) and (III) (d) Both (II) and (IV) 	1															
3	<p>In the reaction of iron with copper sulphate solution:</p> $\text{CuSO}_4 + \text{Fe} \rightarrow \text{Cu} + \text{FeSO}_4$ <p>Which option in the given table correctly represents the substance oxidised and the reducing agent?</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>Substance Oxidized</th> <th>Reducing Agent</th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>Fe</td> <td>Fe</td> </tr> <tr> <td>(b)</td> <td>Fe</td> <td>FeSO_4</td> </tr> <tr> <td>(c)</td> <td>Cu</td> <td>Fe</td> </tr> <tr> <td>(d)</td> <td>CuSO_4</td> <td>Fe</td> </tr> </tbody> </table>		Substance Oxidized	Reducing Agent	(a)	Fe	Fe	(b)	Fe	FeSO_4	(c)	Cu	Fe	(d)	CuSO_4	Fe	1
	Substance Oxidized	Reducing Agent															
(a)	Fe	Fe															
(b)	Fe	FeSO_4															
(c)	Cu	Fe															
(d)	CuSO_4	Fe															
4	<p>A student placed 10 mL HCl and NaOH in two separate beakers as shown.</p>  <p>In beaker 1, 4 mL of NaOH is added whereas in beaker 2, 4 mL of HCl is added. The student notes the possible change in pH in both solutions.</p>	1															

	<table border="1"> <thead> <tr> <th></th><th>Change in pH (Beaker 1)</th><th>Change in pH (Beaker 2)</th></tr> </thead> <tbody> <tr> <td>A</td><td>increase</td><td>increase</td></tr> <tr> <td>B</td><td>reduce</td><td>increase</td></tr> <tr> <td>C</td><td>increase</td><td>reduce</td></tr> <tr> <td>D</td><td>reduce</td><td>reduce</td></tr> </tbody> </table> <p>Which change in pH is correct?</p> <ul style="list-style-type: none"> (a) A (b) B (c) C (d) D 		Change in pH (Beaker 1)	Change in pH (Beaker 2)	A	increase	increase	B	reduce	increase	C	increase	reduce	D	reduce	reduce	
	Change in pH (Beaker 1)	Change in pH (Beaker 2)															
A	increase	increase															
B	reduce	increase															
C	increase	reduce															
D	reduce	reduce															
5	<p>Which one of the following four metals would be displaced from the solution of its salts by other three metals?</p> <ul style="list-style-type: none"> (a) Mg (b) Ag (c) Zn (d) Cu 	1															
6	<p>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 solution ‘A’ and ‘B’.</p> <ul style="list-style-type: none"> (a) A is strongly basic and B is a weak base. (b) A is strongly acidic and B is a weak acid. (c) 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. 	1															
7	<p>Write the name of the following compound</p> <p>(a) hexane (b) hexyne (c) hexene (d) hexanal</p>	1															
8	<p>Which part of nephron allows the selective reabsorption of useful substances like glucose, amino acids, salts and water into the blood capillaries?</p> <ul style="list-style-type: none"> (a) Tubule (b) Glomerulus (c) Bowman’s capsule (d) Ureter 	1															
9	<p>A student sets up an experiment to study the role of enzymes in digestion of food.</p>	1															

	<p>In which test tube, the digestion of protein will occur?</p> <ul style="list-style-type: none"> (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 	
10	<p>The diagram shows an asexual mode of reproduction in bread mould. What is the blob like structure involved in reproduction?</p> <ul style="list-style-type: none"> (a) Hyphae (b) Sporangia (c) Cyst (d) Callus 	1
11	<p>Identify which of the following statements about thyroxin is incorrect?</p> <ul style="list-style-type: none"> (a) Thyroid gland requires iodine to synthesize thyroxin (b) Thyroxin is also called thyroid hormone (c) It regulates protein, carbohydrates and fat metabolism in the body. (d) Iron is essential for the synthesis of thyroxin. 	1
12	<p>Which of the following disease is transmitted sexually?</p> <ul style="list-style-type: none"> (a) Kala azar (b) Jaundice (c) Elephantiasis <p>Syphilis</p>	1
13	<p>A complete circuit is left on for several minutes, causing the connecting copper wire to become hot. As the temperature of the wire increases, the electrical resistance of the wire</p> <ul style="list-style-type: none"> a) decreases b) remains the same c) increases d) increases for some time and then decreases. 	1
14	<p>Which of the following can make a parallel beam of light when light from a point source is incident on it?.</p>	1

	a) Concave mirror as well as convex lens b) Convex mirror as well as concave lens c) Two plane mirrors placed at 90° to each other's d) Concave mirror as well as concave lens.	
15	If charge passes through a wire is 0.5C then current of 50 mA will flow in a) 12 seconds b) 15 seconds c) 10 seconds d) 20 seconds	1
16	If the power of a lens is - 4.0 D, then it means that the lens is a a) concave lens of focal length -50 m b) convex lens of focal length +50 cm c) concave lens of focal length -25 cm d) convex lens of focal length -25 m	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:

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

17	Assertion (A) : The reaction $4 \text{ HCl}_{(\text{aq})} + \text{MnO}_{2(\text{s})} \rightarrow \text{MnCl}_{2(\text{aq})} + 2 \text{ H}_2\text{O}_{(\text{l})} + \text{Cl}_{2(\text{g})}$ is an example of redox reaction. Reason (R) : In this reaction HCl is reduced to Cl ₂ and MnO ₂ is oxidized to MnCl ₂	1
18	Assertion: Pollen grains from the carpel stick to the stigma of stamen. Reason: The fertilized egg cells grow inside the ovules and becomes seeds.	1
19	Assertion: In human beings, the respiratory pigment is haemoglobin Reason: It is a type of protein which has high-affinity for carbon dioxide.	1
20	Assertion : Sunlight reaches us without dispersion in the form of white light and not as its components. Reason : Dispersion takes place due to variation of refractive index for different wavelength but in vacuum the speed of light is independent of wavelength and hence vacuum is a non-dispersive medium.	1

SECTION – B

Q. no. 21 to 26 are very short answer questions.

21	Write the balanced chemical equation for the reactions and identify the type of reactions taking place in each of the following cases (i) Zinc reacts with silver nitrate to produce zinc nitrate and silver. (ii) Potassium iodide reacts with lead nitrate to produce potassium nitrate and lead iodide. OR 2 g of ferrous sulphate crystals are heated in a dry boiling tube. (i) Write any two observations. (ii) Write the chemical equation for the reaction.	
22	Electrical impulses are an excellent means for coordination with its own limitations. Explain this statement	

23	Why is it necessary to separate oxygenated & deoxygenated blood in mammals & birds?	
24	Why leakage of blood from vessels reduces the efficiency of pumping system? How is leakage prevented?	
25	Imagine for a moment that the earth has no atmosphere. What would be the colour of sky in such case? Give reason for your answer Red lights are used as warning signals at road crossing. Why? OR “Stars seem higher than they actually are” – explain why?	2
26	a) Name the hormone which is secreted when growing plants detect light. Mention its site of secretion in a plant. (b) Explain why plants appear to bend towards light?	

SECTION - C
Q.no. 27 to 33 are short answer questions.

27	Why are decomposition reactions called the opposite of combination reactions ? Write equations for these reactions.	
28	Write the chemical name of Plaster of Paris. Write a chemical equation to show the reaction between Plaster of Paris and water. Name the compound produced in this reaction.	
29	Write any three methods used by plants to get rid of excretory products. OR Which mechanism act as a driving force in the movement of water in the xylem during day time? Explain how is it caused and its importance?	
30	Draw a schematic diagram of an electric circuit consisting of a battery of five 2 V cells, a $20\ \Omega$ resistor, a $30\ \Omega$ resistor, a plug key, all connected in series. Calculate the value of current flowing through the $20\ \Omega$ resistor and the power consumed by the $30\ \Omega$ resistor.	
31	A student finds the writing on the blackboard as blurred and unclear when sitting on the last desk of the class room. He however sees clearly when sitting on the front desk of an approximate distance 2 m from the blackboard. i. Draw the ray diagram to illustrate the formation of image of the blackboard writing by his eye lens when he sits at the last desk . ii. Name the defect of vision the student is suffering from. iii. Name the kind of lens that would enable him to see clearly when he is seated at the last desk. Draw the ray diagram to illustrate how this lens helps him to see clearly	3
32	A convex lens forms a real image 4 times magnified at a distance of 60 cm from the lens. Calculate the focal length and the power of the lens. OR Define power of a lens and write its S.I unit. ii. A convex lens of power 4 D is placed at a distance of 40 cm from a wall. At what distance from the lens should a candle be placed so that its image is formed on the wall?	3

SECTION - D
Q.no. 34 to 36 are Long answer questions.

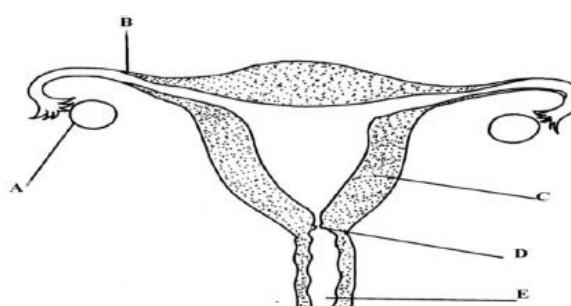
33	Name the hormones secreted by the following endocrine glands and specify one function of each (i)Adrenal (ii) Pituitary (iii) Pancreas	
34	What are covalent compounds? Why are they different from ionic compounds? List three characteristics properties of covalent compounds	5

	OR State the meaning of functional group in an organic compound. Write the formula of the functional group present in alcohols, aldehydes, ketones and Carboxylic acid.	
35	<p>(a) The chromosomal number of the sexually producing parents and their offspring is the same". Justify this statement</p> <p>(b) Explain any three advantages of vegetative propagation</p> <p style="text-align: center;">OR</p> <p>(a) Draw the diagram showing germination of pollen on stigma and label the following parts (i) Ovary (ii) male germ cell (iii) female germ cell (iv) pollen tube.</p> <p>(b) Why are testes located outside the abdominal cavity? List two functions of testes in male reproductive system.</p>	
36	<p>The diagram shows a circuit with three identical lamps. The ammeter, A1, shows a reading of 1.5 A.</p> <p>a) Indicate on the diagram where you would insert a switch so that it will switch on or off lamps L2 and L3, but will not affect lamp L1. b) What name is given to this arrangement of connecting lamps? c) What will be the reading on ammeter A2? d) What will be the reading on the voltmeter?</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.		
37	<p>All metals do not react in the same rate. The reactivity series of metals, also known as the activity series, refers to the arrangement of metals in the descending order of their reactivities. The data provided by the reactivity series can be used to predict whether a metal can displace another in a single displacement reaction. It can also be used to obtain information on the reactivity of metals towards water and acids.</p> <p>(a) Why is Sodium kept immersed in Kerosene oil? (b) Sample of five metals 'A', 'B', 'C', 'D' and 'E' was taken and added to the following solution one by one. The results obtained have been tabulated as follows</p>	4

	Metal	FeSO_4	ZnSO_4	AgNO_3	$\text{Al}_2(\text{SO}_4)_3$	MgSO_4	CuSO_4	
A	No reaction	No reaction	Displacement	No reaction	No reaction	No reaction	Displacement	
B	Displacement	No reaction	Displacement	No reaction	No reaction	No reaction	Displacement	
C	No reaction	No reaction	Displacement	No reaction	No reaction	No reaction	No reaction	
D	No reaction	No reaction	No reaction	No reaction	No reaction	No reaction	No reaction	
E	Displacement	Displacement	Displacement	No reaction	No reaction	No reaction	Displacement	

(i) Which of them is most reactive and why?
(ii) Arrange 'A', 'B', 'C', 'D' and 'E' in the increasing order of reactivity
OR
Container of which metal can store zinc sulphate and silver nitrate solution?

38 (a) A couple wants to space the birth of their second child. Suggest one preventive method which could be adopted by (i) Husband (ii) By the wife for the same.
(b) Mention two viral diseases that are transmitted sexually.
(c) Identify the part labelled as C in the female reproductive system. Explain in brief how embryo gets nutrition inside the mother's body?



The diagram illustrates the female reproductive system. It shows the uterus at the bottom, with two ovaries attached to its upper corners. Two fallopian tubes extend from the ovaries to the uterus. Labels indicate: A points to the left fallopian tube; B points to the right ovary; C points to the central uterus; D points to the left uterine tube; and E points to the cervix.

OR (for part c)
(d) What happens to the egg if it's not fertilized? Explain.

39

Refractive index, also called index of refraction, measure of the bending of a ray of light when passing from one medium into another. If i is the angle of incidence of a ray in vacuum (angle between the incoming ray and the perpendicular to the surface of a medium, called the normal) and r is the angle of refraction (angle between the ray in the medium and the normal), the refractive index n is defined as the ratio of the sine of the angle of incidence to the sine of the angle of refraction; i.e., $n = \sin i / \sin r$. Refractive index is also equal to the velocity of light c of a given wavelength in empty space divided by its velocity v in a substance, or $n = c/v$.

- The refractive index of glass is 1.5. What is the meaning of this statement in relation to speed of light?
- Is the absolute refractive index of a medium always greater than or less than 1? Justify your answer.
- The refractive index of water with respect to vacuum is $4/3$ respectively. If the speed of light in vacuum is 3×10^8 m/s. Find the speed of light in water.

OR

Water has refractive index 1.33 and alcohol has refractive index 1.36.

Which of the two medium is optically denser? Draw a ray diagram to show the path of a ray of light passing obliquely from water to alcohol?

SCIENCE (086)

CLASS X

MARKING SCHEME (2022-23)

Q. No	Question S	Mark S
SECTION – A		
1.	(c) Sodium hydrogen carbonate and tartaric acid	1
2.	(c) Both (I) and (III)	1
3.	(a) Substance oxidized -Fe, Reducing agent -Fe	1

4.	(c)C	1
5.	(b) Ag	1
6.	(c) A has pH greater than 7 and B has pH less than 7.	1
7.	(b) hexyne	1
8.	(a)Tubule	1
9.	(d). Test tube B as HCL will activate pepsin for breakdown of proteins into simple molecules	1
10.	(b) Sporangia	1
11.	(d) Iron is essential for the synthesis of thyroxin.	1
12.	(d) syphilis	1
13.	(c) increases	1
14.	a) Concave mirror as well as convex lens	1
15.	c) 10 seconds	1
16.	(c) A is true but R is false	1
17.	(c) A is true but R is false	1
18.	(d) Assertion is false Reason is true.	1
19.	Assertion is true but Reason is false	1
20.	(a) Both A and R are true and R is the correct explanation of A	1

SECTION – B

21.	(i) displacement reaction. (1/2 mark) $Zn(s) + 2Ag(NO_3)_3(aq) \rightarrow Zn(NO_3)_2(aq.) + 2Ag(s)$ (1/2 mark) (ii) double displacement reaction. (1/2 mark) $2KI(aq) + Pb(NO_3)_2(aq) \rightarrow 2KNO_3(aq) + PbI_2(s)$ (1/2 mark)	2
	OR (i)- Green colour of $FeSO_4$ disappears which means change in state and colour occurs. -The reddish brown solid is formed with the formation of gas. (1/2 mark each) $2FeSO_4(s) + \text{heat} \rightarrow Fe_2O_3 + SO_2 + SO_3$ (1 mark)	

PRACTICALS

EXPERIMENT NO.1

Experiment 1A

AIM: To perform and observe the following reactions and classify them into:

- i) Combination Reaction
- ii) Decomposition Reaction
- iii) Displacement Reaction
- iv) Double Displacement Reaction

1. Action of water on quick lime.
2. Action of heat on Ferrous Sulphate crystals
3. Iron Nails kept in copper sulphate solution
4. Reaction between Sodium sulphate and Barium chloride solutions

MATERIALS REQUIRED: Quick lime (calcium oxide),water,

beaker

THEORY:
Combination Reaction: A reaction in which two or more substances combine to form a new substance is called **combination** reaction. Calcium oxide reacts vigorously with water to form calcium hydroxide (slaked lime) with the evolution of heat.



Such reactions in which heat is evolved are called **exothermic** reactions.

OBSERVATION TABLE:

EXPERIMENT	OBSERVATION	INFERENCE
Take 5g of Calcium oxide in a beaker and add water to it slowly.	A vigorous reaction takes place to form slaked lime and the beaker in which the reaction is carried out becomes hot.	Since Calcium oxide and water react to form a single product i.e slaked lime,it is a combination reaction.Also it is an exothermic process since heat is evolved.

RESULT: The reaction of calcium oxide with water is a combination reaction

Experiment 1B

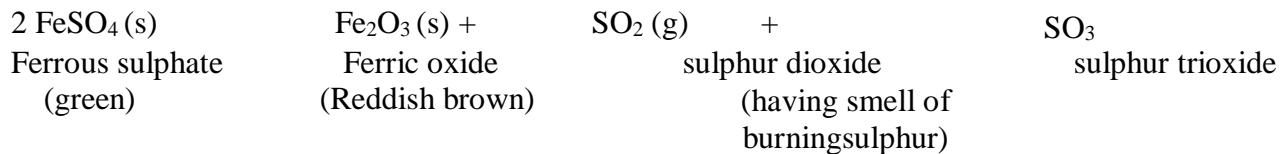
MATERIALS REQUIRED: Ferrous sulphate crystals, dry test tube, burner

THEORY:

Decomposition reaction: A reaction in which a single compound breaks down to produce two or more simpler substances is called decomposition reaction. When green coloured ferrous sulphate crystals($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) are heated, they first lose water and the colour changes to form anhydrous FeSO_4



This on further heating gives out a characteristic smell of burning sulphur leaving behind a reddish brown residue of ferric oxide.



OBSERVATION TABLE:

EXPERIMENT	OBSERVATION	INFERENCE
Take a small amount of ferrous sulphate crystals in a dry test tube and heat it strongly over a flame.	The green colour of ferrous sulphate crystals changes to reddish brown and smell of burning sulphur is obtained.	Ferrous sulphate decomposes into simpler compounds Fe_2O_3 , SO_2 and SO_3 on heating.

RESULT: Heating of ferrous sulphate is a thermal decomposition reaction.

Experiment 1C

Materials Required: Iron nail, copper sulphate, distilled water.

Theory:

- Iron is more reactive than copper as it is above copper in the reactivity series.
- **Displacement reaction:** It is a reaction in which a more reactive metal displaces a less reactive metal from its salt solution.

Reaction:



(blue)	(green)
--------	---------

S.No	Experiment	Observation	Inference
1	Clean an iron nail and put it a test tube. Add about 10 ml of copper sulphate solution to it and leave it for some time.	After 15 minutes the colour of the solution changes from blue to light green and a brown coating is observed on the surface of the nail.	The Brown coating on the nail shows that copper from the copper sulphate solution has been displaced by iron and green coloured Ferrous sulphate has been formed. Iron is more reactive than copper

RESULT: The reaction of Iron with copper sulphate is a displacement reaction.

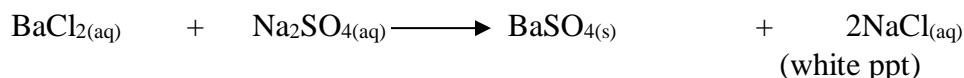
Experiment 1D

Aim: Sodium sulphate with Barium chloride in the form of their solutions in water.

Materials Required: Sodium sulphate solution, barium chloride solution, conical flask and glass rod.

Theory:

Double displacement reaction: A reaction in which exchange of two metal atoms in the given solutions takes place simultaneously, e.g.



OBSERVATION TABLE:

S.No.	Experiment	Observation	Inference
1	Take 10 ml each of sodium sulphate and barium chloride solutions in different test tubes. Mix the two solutions.	A white precipitate is formed	A double displacement reaction takes place. A white precipitate of barium sulphate is formed and sodium chloride remains in solution

RESULT: The reaction of sodium sulphate with barium chloride is a double displacement reaction

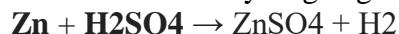
PRACTICAL BASED QUESTIONS:

- What happens when an iron nail is dipped in copper sulphate solution. Write two observations and a balanced chemical equation.

Ans. As iron is more reactive than copper it displaces copper and color of the solution fades. Blue solutions changes to pale green and reddish brown copper metal deposits at the bottom.
 $\text{CuSO}_4 + \text{Fe} \longrightarrow \text{FeSO}_4 + \text{Cu}$

- What happens when zinc reacts with dil sulphuric acid? Write the equation and name the reaction.

Ans. Bubbles of hydrogen gas will be evolved.



This is a single displacement reaction.

- Name the white ash formed on burning Mg ribbon. Is it acidic or basic? Write the chemical equations to justify your answer.

Ans. Magnesium oxide

This is basic in nature as red litmus turns blue on mixing with water.



- What happens when barium chloride and sodium sulphate are mixed together. Name the type of chemical reaction.

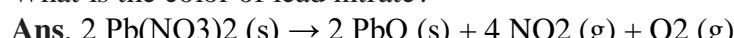
Ans. White ppt of Barium sulphate is formed.

The reaction is double displacement reaction.

- Heating of lead nitrate gives brown fumes.

Write a balanced chemical equation. Name the substance with brown fumes.

What is the color of lead nitrate?

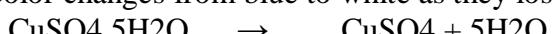


NO₂ is a brown gas.

Lead nitrate is white in color.

- What is the color change when blue copper sulphate is heated strongly? Write the chemical reaction involved.

Ans. Color changes from blue to white as they lose water molecules.



- What happens when Silver chloride is exposed to sunlight? Write the color change? Define the type of the reaction.

Ans. Silver chloride when exposed to sunlight decomposes to form grey Silver and chlorine gas, color changes from white to grey.

Decomposition reaction is when a single reactant breaks into two or more products by means of heat, light and electricity.

8. Name two metals which can displace hydrogen from acids. Name two metals which cannot displace hydrogen from acids.

Ans. Na and K

Cu and Hg

9. Why do we add a few drops of sulphuric acid during electrolysis of water?

Name the gases evolved at cathode and anode.

Ans. Sulphuric acid increases the conductivity of the water as distilled water is a bad conductor of electricity.

O₂ gas is evolved at anode and H₂ gas at cathode.

10. Write the chemical equation when barium chloride is mixed with sodium sulphate? Define the type of this reaction.

Ans. BaCl₂ + Na₂SO₄ → 2NaCl + Ba SO₄

A double displacement reaction takes place when exchange of radicals takes place.

EXPERIMENT NO. 2A

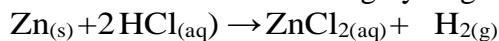
Objective: To carry out the reactions of an acid (HCl) with (i) litmus solution (blue or red), (ii) zinc metal, (iii) sodium carbonate

Materials required: Boiling test tube, test tube holder, Hydrochloric acid, litmus solutions (blue and red), zinc metal, sodium carbonate and distilled water.

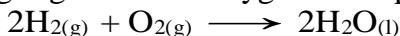
Theory:

HCl turns blue litmus solution red and it does not affect a red litmus solution.

HCl reacts with zinc metal liberating hydrogen gas.



Hydrogen gas burns in oxygen with a pop sound.



HCl reacts with sodium carbonate liberating carbon dioxide gas.



Carbon dioxide gas turns lime water milky due to the formation of calcium carbonate.



Procedure and observation table:

S.No.	Experiment	Observation	Inference
1	Litmus solution: a) Take HCl in a test tube and add few drops of blue litmus solution. b) Take HCl in a test tube and add few drops of red litmus solution.	Blue litmus turns red. No change in the colour of the red litmus solution.	HCl is acidic in nature. Acids do not affect red litmus solution and this shows that HCl is an acid.
2	Zinc metal: Add zinc metal into a test tube containing HCl.	Gas is evolved.	Zinc reacts vigorously with HCl forming hydrogen gas.

3	Sodium carbonate: a) Take sodium carbonate in a dry test tube and add slowly few drops of HCl. b) Pass the gas through limewater.	Brisk effervescence is evolved. Limewater turns milky.	When sodium carbonate reacts with HCl it produces CO ₂ . CO ₂ reacts with limewater to form calcium carbonate.
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Precaution:

- i) HCl should be handled with care.
- ii) Small quantities of Zn and HCl should be used for the reaction, otherwise large amount of hydrogen gas will be produced which may cause explosion.

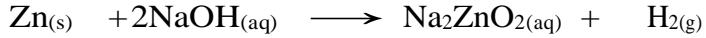
EXPERIMENT NO.2B

Objective: To carry out the reactions of a base (NaOH) with (i) litmus solution (blue or red), (ii) Zinc metal, (iii) Sodium carbonate.

Materials required: Boiling test tube, test tube holder, sodium hydroxide solution, litmus solutions (blue and red), zinc granules, sodium carbonate and distilled water.

Theory:

- NaOH turns red litmus solution blue and it does not affect a blue litmus solution.
- NaOH reacts with zinc metal liberating hydrogen gas.



Procedure and observation table:

S.No.	Experiment	Observation	Inference
1	Litmus solution: a)TakeNaOH in a test tube and add few drops of blue litmus solution. b)TakeNaOH in a test tube and add few drops of red litmus solution.	No change in the colour of the blue litmus solution. Red litmus turns blue.	NaOH is a base and does not affect blue litmus solution. NaOH is alkaline in nature.
2	Zincmetal: Add zinc metal into a test tube containing NaOH and heat it.	Gas is evolved.	NaOH reacts with zinc forming hydrogen gas.
3	Sodium carbonate: a) Take sodium carbonate in a dry test tube and add slowly few drops of NaOH .	No reaction	Sodium hydroxide is an alkali. It does not react with sodium Carbonatebecause both will mix to give basic solutions.

Precautions: i) Small quantity of chemicals should be used.
ii) Handle NaOH carefully because it can burn skin and clothes.

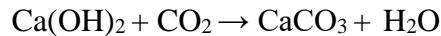
PRACTICAL BASED QUESTIONS:

1. A student dropped few pieces of marble in dilute hydrochloric acid contained in a test tube. The evolved gas was then passed through lime water. What change would be observed in lime water? Write balanced chemical equation for both the change observed?

Ans. When dilute HCl is added to marble which is calcium carbonate, it forms calcium chloride, water and carbon dioxide. The chemical equation for the reaction is as follows:



Carbon dioxide gas turns limewater milky due to the formation of calcium carbonate. The chemical equation showing reaction between lime water and carbon dioxide is as follows:



2. What happens when a small amount of copper oxide is mixed with dilute hydrochloric acid? Indicate the color change.
3. Two solutions of A and B have pH values of 5 and 8. Which solution will be basic in nature? Which solution neutralize a base?

Ans. Solution B is basic in nature. Solution A is acidic so it will neutralize a base.

4. How will you test for a gas, which is liberated when HCl reacts with an active metal? Hydrogen gas is liberated.

Ans. Bring a burning matchstick near the gas. The flame extinguishes with a pop sound.

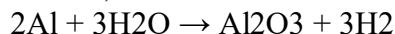
5. What would be the color of litmus in a solution of sodium carbonate? Give reason for your answer.

Ans. Blue.

Sodium carbonate is a basic salt as it is made up of strong base and a **weak acid**.

6. Name three metals which do not react either with cold or hot water but they react with steam to form hydrogen gas. Write the chemical equation with any one of these metals.

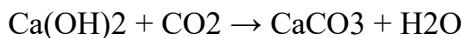
Ans. Al, Fe and Zn



7. Why the lime water turns milky after passing CO₂ gas through it. Why the milky lime water turns colorless when excess of CO₂ is passed through it?

Write the chemical equations involved.

Ans. When CO₂ gas passes through lime water it turns milky due to the formation of insoluble Calcium carbonate. After passing excess of CO₂ gas, It forms Calcium bicarbonate which is soluble and forms a colorless solution.



8. Why does the bulb glow when we pass electric current through a salt solution? Why the bulb does not glow when we pass current through a sugar solution?

Ans. Salt solution form ions thus able to conduct electricity but sugar solution doesn't form ions , so no current flows and the bulb doesn't glow.

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

Ans. Acid should be added to water slowly dropwise with constant stirring because it is a highly exothermic reaction . It evolves a lot of heat which may splash out and burn us if water is added to acid.

10. Why HCl gas doesn't show change in the dry blue litmus paper but show color change in the moist blue litmus paper?

Ans. HCl gas doesn't ionize in presence of dry litmus paper. So due to the absence of H⁺ ions it doesn't behave like an acid and thus shows no color change with blue litmus paper.

On the other hand, HCl gas ionizes in contact with water present on the moist blue litmus paper. Thus due to the presence of H⁺ ions it behaves as an acid and turns moist blue litmus paper into red.

EXPERIMENT NO.3

Objective: To find the pH of the given samples of solids/liquids/ juices using pH paper/universal indicator.

Materials Required: Lemon juice, dil. Sodium hydroxide (NaOH), dil. hydrochloric acid (HCl), dil. solution of sodium bicarbonate (NaHCO₃), distilled water, dil. ethanoic acid solution (CH₃COOH), pH papers and standard colour chart to compare pH value, white tile and fine droppers.

Theory:

- pH is a measure of the hydrogen ion [H⁺] concentration solution of a solution.
- The pH of a solution tells us how acidic or alkaline it is. The pH scale runs from 0 to 14.
- A pH 7 shows that the solution is neutral-neither acidic nor alkaline.
- A pH of less than 7 indicates acidity, and the lower the value the greater the acidity.
- A pH of more than 7 indicates alkalinity, and the higher the value higher the alkalinity.

Procedure: i) Take 6 strips of pH paper and place them on a tile. This strip of pH paper is called test strip.
ii) Place a drop of the test solution on the strip of the pH paper with the help of a fine dropper.
iii) Observe the colour produced and match it with the different colour shades of the standard colour pH chart.
iv) Note down the pH from the colour chart, of that colour which matches the most with colour produced on the pH paper.
v) Find out the pH values of all the samples given to you.

Observation table and inference:

S.No.	Sample solution	Colour produced on pH paper	Approximate pH(from chart)	Inference
1	Lemon juice			Acidic
2	DilHCl			Acidic
3	DilNaOH			Basic
4	Baking soda solution			Basic
5	Water			Neutral
6	Ethanoic acid			Acidic

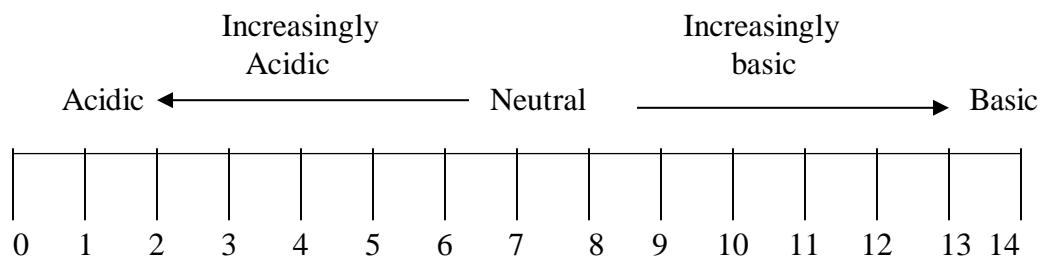
Result: In the given samples we have observed that:

- The pH values of lemon juice, dil. hydrochloric acid (HCl) and dil. ethanoic acid solution (CH₃COOH) is less than 7. Therefore these have acidic character.
- The pH values of dil. sodium hydroxide (NaOH) and dil. solution of sodium bicarbonate (NaHCO₃) is more than 7. Therefore these have basic character.
- The pH value of distilled water is 7. Therefore, it has neutral character.

Note: The pH of water depends on its source. For example:

- i) The pH of distilled water is 7 and it is neutral.
- ii) The pH of chlorinated water is less than 7 and it is acidic.
- iii) The pH of hard water is more than 7. Therefore, it is basic

Precautions: i) Use separate strips for testing different samples.
ii) Keep the pH strips away from chemical fumes.



PRACTICAL BASED QUESTIONS:

1. A solution 'X' gives orange colour when a drop of universal indicator is added to it. On the other hand, another solution 'Y' gives bluish-green colour with universal indicator. What type of solutions are 'X' and 'Y' and are their pH values?
2. On adding a few drops of universal indicator to three unknown colourless solutions P, Q, and R taken separately in three test tubes, a student observed the changes in colour as green in P, red in Q and violet in R.
 - (a) Write the decreasing order of their pH
 - (b) In which test tube solution is acidic in nature?
3. A student has 3 samples A, B, and C containing dil HCl, dil NaOH and distilled water respectively. What colours will be observed when these samples are tested with pH paper and what are their approximate pH values?
4. A student dips pH papers in solutions A and B and observes that the pH paper turns blue and orange respectively. What could be his inference?
5. Two students were given 3 colourless liquids each of A (water), B (lemon juice) and C (soap solution). After testing these liquids with pH paper, the following sequence of colour change on pH paper was reported.
Student 1 – Green, Red, Blue
Student 2 – Blue, Green, Red

Which student reported the correct sequence. Explain.

6. Five solutions P, Q, R, S and T when tested with universal indicator showed Ph of 13, 8, 1, 5 respectively.
 - A) Which solution is strongly alkaline and which is weakly acidic?
 - B) Arrange the pH in increasing order of H⁺ ion concentration.
7. A student was given 4 unknown colourless samples labelled A, B, C and D and was asked to test the pH. He observed the pH turned light green in A, dark red in B, light orange in C, and dark blue in D. What is the correct sequence of increasing order of the pH value of the samples?
8. Bottle A contains oxalic acid, bottle B contains sodium carbonate solution. When pH paper is dipped, what colour is observed in bottle A and B?
9. On putting few drops of unknown solution on pH strip, the colour changes to violet. What is the nature of the liquid likely to be?
10. The pH of NaOH solution is 10.6. On addition of water to this solution, what will happen to its pH. Explain.

Answers:

1. X is a weak acid and Y is a weak base.
2. (a) Q < P < R
(b) Solution in test tube Q is acidic in nature.
3. A with dil HCl gives Red colour, B with dil NaOH gives blue and distilled water gives green colour.
4. Solution A is a Base and solution B is an acid.
5. Student 1 reported correct. Water is neutral and give green colour, lemon juice is acidic give red colour and soap solution is basic which gives blue colour on pH paper.
6. a) Solution P is strongly alkaline and Soution T is weakly acidic.
b) P<Q<S<T<R
7. B<C<A<D
8. Orange and blue
9. Strong base like NaOH
10. PH of solution decreases on dilution as the no. of H⁺ ions decrease per unit volume.

EXPERIMENT NO.4

Objective: To study the interaction of metals (Zn, Fe, Cu and Al) with their salt solutions and arrange them according to their decreasing reactivity.

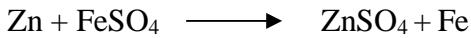
Materials required: Zinc granules, iron filings, aluminium foil, zinc sulphate solution, ferrous sulphate solution, copper sulphate solution, aluminium sulphate solution and test tubes.

Theory:

- More reactive metal can displace the less reactive metal from their salt solution. These reactions are called displacement reactions.
- Al is more reactive than Zn, Fe and Cu; therefore, it can displace these metals from their salt solutions.



- Zn is more reactive than Fe and Cu; therefore, it can displace these metals from their salt solutions.



- Fe is more reactive than Cu; therefore, it can displace the metal from its salt solution.



Name of the substance	Formula	Original colour
zinc sulphate	ZnSO_4	Colourless
ferrous sulphate	FeSO_4	Light green
copper sulphate	CuSO_4	Blue
aluminiumsulphate	$\text{Al}_2(\text{SO}_4)_3$	Colourless

Procedure and observation table:

S.No	Experiment	Observation	Inference
1	Take 4 test tubes and add Al foil a) To ZnSO_4 solution. b) To FeSO_4 solution.	Colourless solution, Zn metal gets deposited on aluminium. Pale green solution changes to colourless solution and grey	Al is more reactive than Zn. Al is more reactive than Fe.

	c) To CuSO ₄ solution. d) To aluminiumsulphate solution	coloured iron metal get deposited. Blue solution changes to colourless solution and reddish brown copper metal gets deposited. There is no change	Al is more reactive than Cu. There is equilibrium between Al ³⁺ and Al.
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S.No	Experiment	Observation	Inference
2	Take 4 test tubes and add Zn granules a) To FeSO ₄ solution. b) To CuSO ₄ solution. c) To Al ₂ (SO ₄) ₃ solution. d) To ZnSO ₄ solution.	Pale green solution changes to colourless solution and iron metal gets deposited. Blue solution changes to colourless solution and reddish brown copper metal gets deposited on zinc. There is no change There is no change	Zn is more reactive than Fe. Zn is more reactive than Cu. Zn is less reactive than Al. There is equilibrium between Zn ²⁺ and Zn.
3	Take 4 test tubes and add iron filings a) To CuSO ₄ solution. b) To Al ₂ (SO ₄) ₃ solution. c) To ZnSO ₄ solution. d) To FeSO ₄ solution.	Blue solution changes to green solution and reddish brown copper metal gets deposited. There is no change There is no change There is no change	Fe is more reactive than Cu. Fe is less reactive than Al. Fe is less reactive than Zn. There is equilibrium between Fe ²⁺ and Fe.

4	Take 4 test tubes and add copper turnings a) To ZnSO_4 solution. b) To FeSO_4 solution. c) To $\text{Al}_2(\text{SO}_4)_3$ solution. d) To CuSO_4 solution.	There is no change There is no change There is no change There is no change	Cu is less reactive than Zn. Cu is less reactive than Fe Cu is less reactive than Al There is equilibrium between Cu^{2+} and Cu.
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Result: The reactivity order of the metals is

Al > Zn > Fe > Cu

PRACTICAL BASED QUESTIONS:

- Which of the following pairs will undergo displacement reaction? Give reason.
 - FeSO_4 and Cu
 - FeSO_4 and Al
- Why does Zn react with Sulphuric acid to give hydrogen gas, but Cu does not? Give reason.
- When a strip of Zn metal is put in Copper sulphate solution, the blue colour of copper sulphate fades gradually. Why?
- In an experiment each of the metals Al, Zn, Cu and Fe are reacted with ZnSO_4 , CuSO_4 , $\text{Al}_2(\text{SO}_4)_3$ and FeSO_4 solutions. The results are tabulated as follows where ‘√’ means that the reaction occurs and ‘x’ means no reaction occurs. Based on the result, what would be the order of reactivity of the metals? Explain.

Metal	ZnSO_4	CuSO_4	$\text{Al}_2(\text{SO}_4)_3$	FeSO_4
Zn	X	√	X	√
Cu	X	X	X	X
Al	√	√	X	√
Fe	X	√	X	X

- Iron fillings are added to different test tubes each containing aqueous solution of
 - ZnSO_4
 - CuSO_4
 - FeSO_4
 - and
 - $\text{Al}_2(\text{SO}_4)_3$.

In which test tube reaction will not occur and why?

- Two beakers A and B contain iron sulphate solution. In beaker A, small pieces of copper is added. In beaker B, small pieces of zinc is added. It was found that grey deposit is formed on zinc in beaker B but no change on copper in beaker A. What is the conclusion you can derive from these observations?
- A student took 4 test tubes A, B, C and D containing aluminium sulphate, copper sulphate, ferrous sulphate and zinc sulphate solutions respectively. He placed an iron strip in each of them. What will be the observation in the test tubes?
- A piece of granulated zinc was dropped into copper sulphate solution. After sometime the colour of the solution the colour of the solution changed. Explain the observation.

9. Based on the sequence of the reactions, identify the most and reactive elements



10. On placing a piece of aluminium metal in the solution of mercuric chloride, it acquires a shining silvery surface but when it is placed in a solution of magnesium sulphate, no change is observed. Why?

Answers:

1. Al is more reactive than Fe hence displacement reaction takes place.
2. Zn is more reactive and placed above hydrogen in the reactivity series hence H₂ gas is released. Cu is less reactive and hence cannot displace H₂.
3. Zn displaces Cu from CuSO₄ and forms ZnSO₄ which is colourless.
4. Al, Zn, Fe, Cu
5. Iron filings will not react with ZnSO₄, FeSO₄ and Al₂(SO₄)₃
6. Zn is most reactive metal followed by iron and then copper.
7. In test tube B copper is deposited on iron strip and in all other test tubes, no reaction is observed.
8. Blue colour copper sulphate becomes colourless as zinc replaces copper from copper sulphate solution to form zinc sulphate.
9. C is most reactive and B is least reactive.
10. Aluminium is more reactive than mercury and it displaces mercury from mercuric chloride solution and mercury deposits on aluminium solution giving it silvery shiny surface. Aluminium is less reactive than magnesium. Hence cannot displace magnesium from magnesium sulphate. Hence no change is observed.

EXPERIMENT NO.5

Objective: To study the physical and chemical properties of acetic acid (ethanoic acid).

Materials required: Acetic acid, test tubes, litmus paper (blue and red), sodium bicarbonate and distilled water.

Theory:

Acetic acid is an organic acid with the formula CH₃COOH. Its functional group is –COOH group. It is a weak monocarboxylic acid since it has only one carboxylic group. This acid ionizes in polar media to give H⁺ ions which are responsible for its acidic nature.

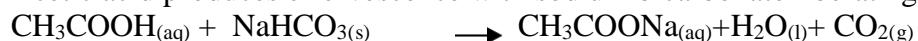


Pure acetic acid is also known as glacial acetic acid because it freezes to form ice like crystals.

Acetic acid has vinegar like smell.

Acetic acid turns blue litmus paper red.

Acetic acid produces effervescence with sodium bicarbonate liberating carbon dioxide gas.



Carbon dioxide turns lime water (solution of calcium hydroxide) milky due to the formation of insoluble calcium carbonate.



Procedure and Observation table:

S.No	Experiment	Observation	Inference
2	<p>Physical Properties:</p> <p>a) Take a small amount of acetic acid in a test tube and observe its colour and odour.</p> <p>b) Dissolve acetic acid in the distilled water.</p> <p>c) Take a small amount of acetic acid in a test tube and dip a strip of blue litmus paper in the solution.</p> <p>d) Take a small amount of acetic acid in a test tube and dip a strip of red litmus paper in the solution</p> <p>Chemical properties:</p> <p>a) Take sodium bicarbonate in a dry test tube and add slowly few drops of acetic acid.</p>	<p>Colourless liquid having pungent smell</p> <p>Colourless homogeneous solution obtained.</p> <p>Blue litmus turns red.</p> <p>No change in the colour of red litmus paper.</p> <p>Brisk effervescence is evolved.</p>	<p>Acetic acid is a colourless liquid having irritating pungent smell.</p> <p>Acetic acid is highly soluble in water.</p> <p>Acetic acid is acidic in nature.</p> <p>Acetic acid is acidic in nature.</p> <p>When sodium bicarbonate reacts with acetic acid it produces CO_2 gas.</p>

Precautions:

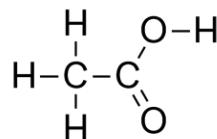
- 1) Do not inhale the vapours of acetic acid directly.
- 2) Carbon dioxide should be passed through freshly prepared limewater only, for a short duration
- 3) Acetic acid should be handled with care.

PRACTICAL BASED QUESTIONS:

- Q1) Give the IUPAC name, molecular formula and structural formula of Acetic acid
- Q2) Write two tests you would perform to detect, whether the given colourless liquid is acetic acid or not.
- Q3) What happens when acetic acid is added in a solution of $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ in a test tube? Write the chemical equation for the same.
- Q4) what is the freezing temperature of ethanoic acid? Write the name & formula of the ester formed when ethanoic acid reacts with ethanol
- Q5) Name the functional group and alkyl group present in acetic acid.
- Q6) Give a test for carbon di oxide also write the chemical equation for the test. Write the formula of freshly prepared lime water.
- Q7) Give four precaution to be taken while performing this experiment
- Q8) How can you prepare fresh lime water? What is it used for?
- Q9) What happens when acetic acid solution is added to Na_2CO_3 in a test tube? Write the equation for detecting the gas evolved.
- Q10) Why should we not pass excess of CO_2 through lime water? What is vinegar?

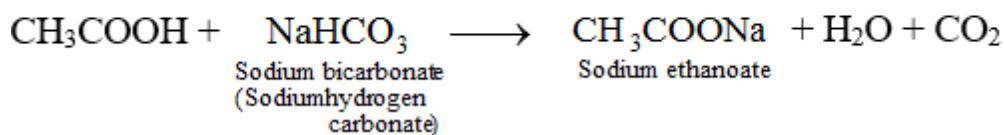
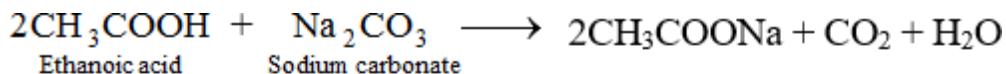
Answers

Q1) Ethanoic acid, CH_3COOH ,



Q2 Test 1:- If we put a drop of the given colourless liquid on blue litmus paper , it will change to red.
Test 2:- If we smell the given liquid it will smell like that of vinegar.

Q3) Brisk effervescence of gas is evolved. Sodium acetate, water and CO_2 is formed.



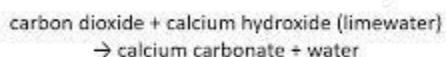
Q4) 16.6°C or 289.6K , Ethyl Ethanoate, $\text{CH}_3\text{COOC}_2\text{H}_5$

Q5) Carboxylic group and methyl group

Q6) $\text{Ca}(\text{OH})_2$

Test for Carbon Dioxide

Carbon Dioxide turns limewater cloudy



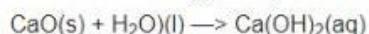
7) Acetic acid should be handled with care.

Only small amount of chemicals should be used.

Fresly prepared lime water should be used.

A8)

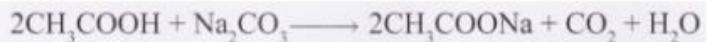
Lime and water together gives fresh lime water, the reaction is highly exothermic in nature.



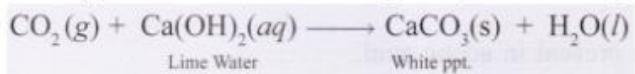
When carbon dioxide is passed through freshly prepared lime water, the lime water turns milky.

A9)

CO_2 gas is evolved with brisk bubbles in this reaction.



White ppt. is formed, when CO_2 gas is passed through the lime water.



Q10) The precipitate will dissolve due to formation of calcium bi carbonate. 5-8% solution of acetic acid is Vinegar

Experiment 6

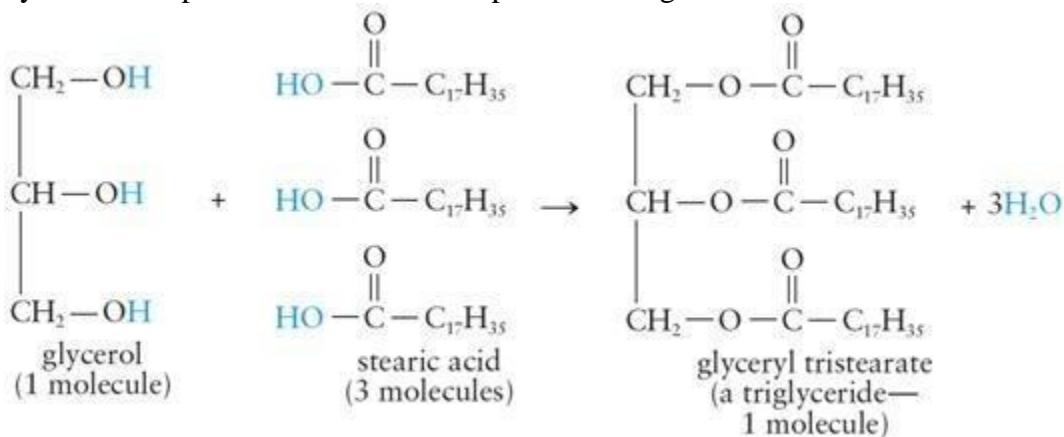
Aim:

To study saponification reaction for preparation of soap.

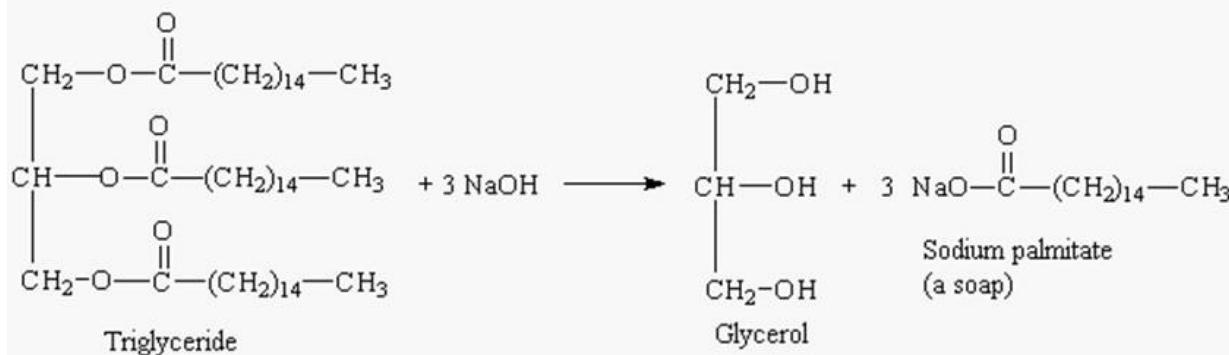
Theory

Soaps are sodium or potassium salt of higher fatty acids such as Oleic acid, stearic acid, palmitic acid etc.

Glycerides: they are esters of glycerol, an alcohol containing three hydroxyl groups and fatty acids. Glycerides are present in fats or oils of plants and vegetables.



Saponification: it is process in which esters are split with the help of an alkali. Esters are reacted with sodium hydroxide salt to form sodium salt of acid and alcohol.



Materials Required:

Sodium hydroxide solution, plant oil (use castor oil + oleic acid) and common salt.

Apparatus: Beakers, glass rod, tripod stand, Bunsen burner, wire gauze and pair of tongs.

Procedure:

1. Take a beaker and add 20ml. of castor oil into it. Heat the oil by constant stirring.
2. Take 20ml. of concentrated sodium hydroxide solution in another beaker.

3. Add the sodium hydroxide solution into the beaker containing hot castor oil. Heat the mixture slowly to boil for about 10 mins.
4. Now add 5g. of sodium chloride into this mixture with constant stirring and then allow to cool it. Addition of common salt decreases the solubility of soap. The soap molecules gets separated from the solution and floats on the surface. This is called salting out of soap.
5. On cooling the beaker, a crust is formed on the surface of the liquid. This crust is called soap.
6. The castor oil will produce a soap molecule named sodium oleate ($C_{17}H_{33}COONa$).

Conclusion:

The reaction mixture of (oil) carboxylic acid with sodium or potassium hydroxide produces a soap molecule.

Precautions:

1. Be careful while handling concentrated sodium hydroxide as it is corrosive in nature.
2. Do not overheat the beaker while heating procedures.
3. Add very small amount of common salt for salting the soap.

PRACTICAL BASED QUESTIONS:

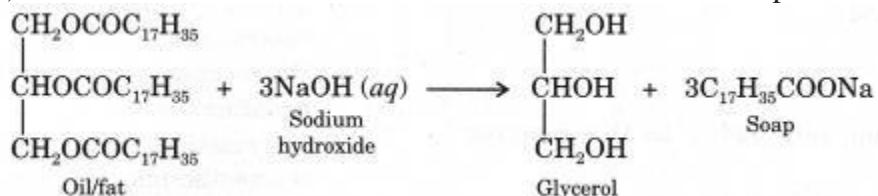
- Q1) What are soaps? Name one by product of soap formation.
- Q2) Name the part of soap molecule that attracts water. Give one advantage of soap over detergent.
- Q3) What is the nature of the soap? What happens when soap is added to hard water?
- Q4) What are detergents? Give one advantage of detergent over soap.
- Q5) What is saponification? Why is it advised to add common salt while preparing soap?
- 6) Mention the essential material (chemicals) to prepare soap in the laboratory. Describe in brief the test of determining the nature (acidic/alkaline) of the reaction mixture of saponification reaction.
- Q7) What is the chemical reaction involved in the manufacture of soap? Can you suggest a method to separate glycerine from the reaction mixture?
- Q8) What are esters? What are the commonly used esters?
- Q9) Give 4 precautions to be taken while preparing soap in laboratory.
- Q10) What does the hydrophilic and hydrophobic parts of soap means to you? Give two disadvantages of soap.

Answers

- 1) Soaps are the potassium or sodium salts of fatty acids. Glycerol
- 2) Hydrophilic part. Soaps are bio degradable
- 3) Soap is basic in nature. It turns red litmus blue. Due to the formation of scum the cleansing property of water is reduced
- 4) Detergents are sodium salts of long chain benzene sulphonic acid. Detergents can be used in hard water as well
- 5) Saponification is hydrolysis of ester under basic condition to form salt of carboxylic acid and alcohol. Common salt decreases the solubility of soap
- 6) A 6) Raw Materials Required For preparation of soap in laboratory are :
Vegetable oil , Sodium Hydroxide and Common salt

Test to determine the nature of reaction mixture: When a red litmus paper is dipped in the reaction mixture, the paper changes its colour to blue. Hence, the reaction mixture of the saponification reaction is basic in nature.

7) The chemical reaction involved in the manufacture of soap is as follows:



Glycerine is separated from the reaction mixture by the addition of salt. Solubility of soap in the reaction mixture decreases, soap curdles and floats to the top. It can then be skimmed off from the reaction mixture which would then contain glycerine.

8) Esters are carbon compounds with general formula RCOOR' where R & R' are alkyl groups. Fats and oils are commonly used esters.

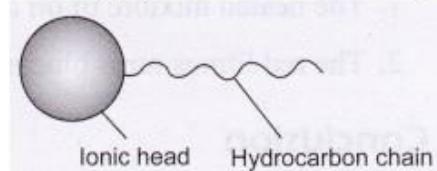
1. Be careful while handling concentrated sodium hydroxide as it is corrosive in nature.
2. Do not overheat the beaker while heating.
3. Stir the soap solution carefully so that it does not spill out.
4. Add very small amount of common salt for salting out of soap.

9)

Q10)

A soap molecule has ionic head which attracts water and is called hydrophilic.

The long hydrocarbon chain stays away from water and is called hydrophobic part of soap.



Disadvantages of Soap

- > Soap is less effective in cleaning stubborn stains of clothes/laundry.
- > Soap forms scum with hard water. Hence, larger amount of soap is needed to wash clothes in hard water.

Experiment 7

Aim:

To study the comparative cleaning capacity of a soap in soft and hard water.

Theory

Soap: it is the sodium or potassium salt of long chained carboxylic acids.

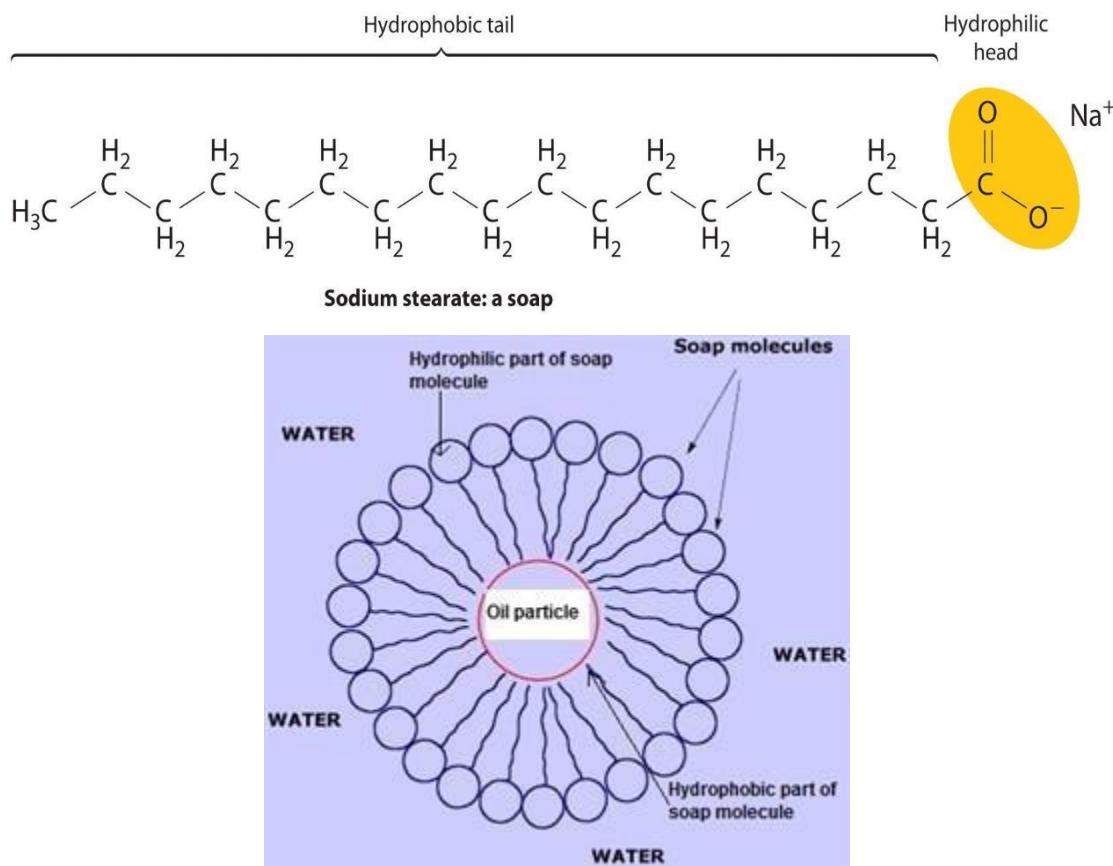
Soap dissolving in water: the ionic end of soap dissolves in water while the carbon chain does not dissolve in water but can dissolve in oil.

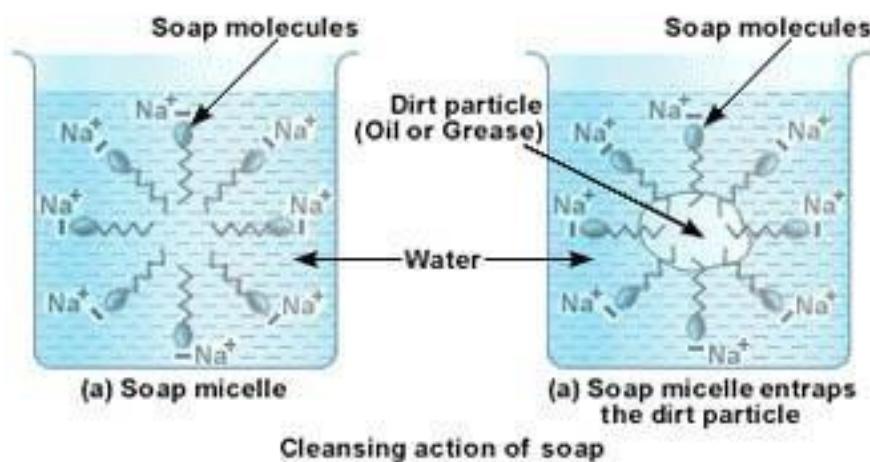
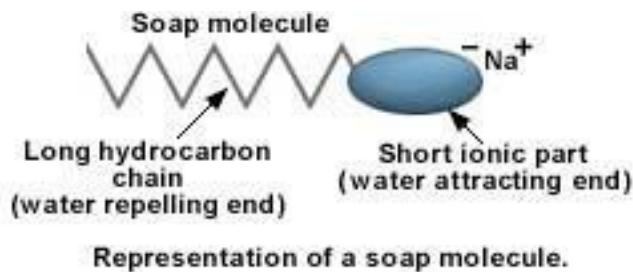
Soft water: the water with no salt in it.

Hard water: the water with dissolved salt in it. It maybe calcium or magnesium salts. Soap after dissolving in soft water shows the cleansing property by forming foam, but on dissolving in hard water it forms white scum due to the reaction of soap with the calcium and magnesium salts. The charged ions off soap combine with these salts already present in water to form the scum.

Cleansing action of Soap:

1. Soaps and detergents have a large hydrocarbon tail (hydrophobic) and a negatively charged head (hydrophilic)
2. When a soap or detergent is dissolved in water, the molecules gather together as cluster called **micelles**. The tail stick towards inwards and head towards outwards as water being polar in nature.
3. When water is agitated, the oily dirt tends to lift off from the dirty surface and dissociate into fragments. Thus the solution contains small globules of oily dirt surrounded by soap molecules.
4. The oily dirt as soap micelles is removed along with the water used to wash dirty clothes.





Materials required:

Two test tubes, test tube stand, samples of hard and soft water, soap solution and cooking oil.

Procedure (part A):

1. Take 10ml of distilled water (soft water) in a test tube. Label it as 'A'.
2. Take 10ml of hard water (water from hand pump, underground water) in another test tube. Label it as 'B'.
3. In both the test tubes add few drops of soap solution.
4. Shake the test tubes 'A' and 'B' vigorously for an equal period of time. Keep them in the test tube stand and record your observations.

Observations:

1. In test tube A, soap formed lather or foam.
2. In test tube B, white precipitate was formed with no lather or foam.

Conclusion:

Soaps are effective cleaner only in soft water because the soap molecules separate in soft water. But in the case of hard water, the soap molecules do not remain as soap molecules but the ionic end of soap reacts with the salts present in hard water to form curdy white precipitate called scum.

Note:

If hard water is not available prepare some hard water by dissolving hydrogen carbonate/sulphate/chlorides of calcium or magnesium in water.

Procedure (Part B):

1. Take 10ml of distilled water/soft water and add a drop of cooking oil in it. Label this test tube as 'A'.
2. Take 10ml. of hard water and add a drop of cooking oil in it. Label this test tube as 'B'.
3. Now add a few drops of soap solution in both the test tubes 'A' and 'B'.
4. Shake both the test tubes vigorously for the same period of time.
5. Keep them on the test tube stand and record your observations.

Observations:

1. The test tube 'A' with soft water showed the oil emulsified due to soap solution.
2. The test tube 'B' showed no emulsification due to soap solution.

Conclusion:

The formation of emulsion of oil in soft water by soap shows that soap is not very effective in cleaning with hard water. Soaps are more effective cleaners in soft water than in hard water.

PRACTICAL BASED QUESTIONS

1. When boilers of water are used for very long time, then white layers get deposited on inside of these boilers. How can these white layers be removed?

When hard water is used in these boilers, then white scum of salts present in the hard water gets deposited inside the boilers making a white layer. These white layers can be removed by washing the boilers with dil HCl acid.

2. Why are soaps effective in soft water and not in hard water?

In hard water it forms insoluble scum whereas in soft water it does not form any such compound and hence shows its cleansing property.

3. How will you test in the laboratory, whether the given sample of water is hard or soft. Name two salts which make the water hard.

When few drops of soap solution are added in the given sample of water, if lather is formed with soap then water is soft water. If lather is not formed, then water is hard. Calcium chloride and magnesium sulphate salts present in water make the water hard

4. Name two sources of soft and hard water.

Soft water—Rain water, boiled water

Hard water—Sea water, ground water

5. What do you understand by temporary and permanent hardness of water?

Temporary hardness is caused due to the presence of calcium and magnesium bicarbonates in water and can be removed by boiling or by adding Na₂CO₃ to hard water.

Permanent hardness is caused due to the presence of chlorides and sulphates of calcium and magnesium and can be removed by using an ion exchanger

6. write any two disadvantages of detergents over soap?

1. The major **disadvantage of detergents** is that they are non-biodegradable. 2) They cause soil pollution and water pollution.

7. Advantages of synthetic detergents over soaps

a) detergent work well even with hard water but soap do not.

b) detergent may be used in saline or acidic water.

c) detergent are more easily soluble in water than soaps.

d) detergent can be used of washing woolen garments whereas soaps cannot be used

8) What is soft water? Which ions are present in soft water?

The water which has low mineral content and produces lather on mixing soap to it is called soft water..

Only sodium ion is present in soft water

9) Can hard water be softened? How?

Yes.

By boiling or by chemical treatment.

10 Can you explain why sodium salts in water do not make it hard water?

Soaps are sodium salts of fatty acids. On adding sodium salts to water containing soap, no scum is formed as can be understood by the following equation.

