

Answers to this Paper must be written on the paper provided separately. You will NOT be allowed to write during the first 15 minutes. This time is to be spent in reading the Question Paper.

The time given at the head of this Paper is the time allowed for writing the answers.

SECTION A is compulsory. Attempt **any four** questions from **SECTION B**. The intended marks for questions are given in brackets [].

SECTION A - 40 MARKS

Answer *all* questions from this section.

Question 1

Choose one correct answer to the questions from the given options:

[15]

- (i) The correct order of reactivity of metals is:
 (a) $K > Na > Al > Mg > Zn > Fe$ (b) $Pt < Au < Ag < Al < Zn < Ca$
 (c) $Al > Fe > Pb > Zn > Cu > Hg$ (d) $Pt < Au < Ag < Al < Mg < Ca$
- (ii) **Assertion (A)** : Oxyhydrogen flame is used for cutting and welding metals.
Reason (R) : For cutting and welding metals, a low temperature is required.
 (a) Both **A** and **R** are true and **R** is the correct explanation of **A**.
 (b) Both **A** and **R** are true but **R** is not the correct explanation of **A**.
 (c) **A** is true but **R** is false. (d) **A** is false but **R** is true.
- (iii) Suhail was analysing the metal reactivity series while studying the single displacement reactions. Help him identify the possible single displacement reactions from the following sets of reactions P to S:
 (P) $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$ (Q) $Cu + PbSO_4 \rightarrow CuSO_4 + Pb$
 (R) $Mg + CuSO_4 \rightarrow MgSO_4 + Cu$ (S) $Ag + 2HCl \rightarrow AgCl + H_2$
 (a) Only P (b) Only Q (c) Both P and R (d) Only S
- (iv) In the manufacture of ammonia (NH_3) ----- acts as a positive catalyst and ----- acts as a promoter.
 (a) Fe, Cr_2O_3 (b) Fe, MnO_2 (c) Alcohol, Mo (d) Fe, Mo
- (v) Electric current enters the electrolyte through ----- and leaves the electrolyte through -----.
 (a) Cathode, anode (b) Electrolyte, cathode
 (c) Electrolytic cell, electrolyte (d) Anode, cathode
- (vi) ----- is a strong oxidizing agent and hence is not used in the preparation of hydrogen as it oxidizes hydrogen to -----.
 (a) H_2 , H_2O (b) HNO_3 , H_2O (c) HCl , O_2 (d) HNO_3 , O_2
- (vii) ----- is a suspension, while ----- is a colloid.
 (a) Blood, milk (b) Muddy water, milk
 (c) Chalk in water, sugar solution (d) Butter, oil in water
- (viii) A saturated solution has ----- solute, while an unsaturated solution has -----

solute:

- (a) less, maximum (b) maximum, more
(c) less, minimum (d) maximum, minimum
- (ix) Temporary and permanent hardness of water is due to ----- and -----.
(a) Carbonates of Ca and Mg, sulphates of Ca and Mg
(b) Bicarbonates of Ca and Mg, sulphates of Ca and Mg
(c) Chlorides of Ca and Mg, Sulphates of Ca and Mg
(d) Chlorides of Ca and Mg, sulphates of Ca and Mg
- (x) Burning of a metal in air represents a ----- reaction whereas liberation of CO_2 on opening a bottle of soda represents a ----- reaction.
(a) Synthesis, combination (b) Combination, decomposition
(c) Elimination, displacement (d) Decomposition, neutralization
- (xi) Match the columns A and B correctly and then select the correctly matched option given below:

Column A	Column B
1. A metal which reacts with cold water to form hydrogen.	A. Hydrogen
2. A gas which is inflammable and a non-supporter of combustion.	B. Reduction
3. A process in which vanaspati ghee is prepared from vegetable oils.	C. Oxidation
4. The addition of hydrogen or removal of oxygen.	D. Hydrogenation
5. The removal of hydrogen or addition of oxygen.	E. Sodium

- (a) 1 - E 2 - C 3 - B 4 - D 5 - A (b) 1 - E 2 - A 3 - D 4 - B 5 - C
(c) 1 - A 2 - B 3 - D 4 - B 5 - C (d) 1 - E 2 - B 3 - D 4 - C 5 - A
- (xii) Weak electrolytes like ----- dissociates partially into ions in their solutions, while strong electrolytes like ----- dissociates completely into ions in their solutions.
(a) Acetic acid, hydrochloric acid (b) Nitric acid, hydrochloric acid
(c) Sodium chloride, ammonium hydroxide (d) Hydrochloric acid, sulphuric acid
- (xiii) The decreasing order of forming positive ions by the metals in accordance with the reactivity series is :
(a) $\text{Fe} > \text{Pb} > \text{Hg} > \text{Ag} > \text{Au} > \text{Pt}$ (b) $\text{Zn} < \text{Al} < \text{Pb} < \text{Mg} < \text{Ca} < \text{K}$
(c) $\text{K} > \text{Na} > \text{Ca} > \text{Hg} > \text{Cu} > \text{Au}$ (d) $\text{Pb} > \text{Fe} > \text{Cu} > \text{Hg} > \text{Au} > \text{Pt}$
- (xiv) The chemical formula of sodium sulphide, sodium sulphate and sodium hydroxide are -----, ----- and ----- respectively.
(a) Na_2SO_3 , Na_2S , NaOH (b) Na_2S , Na_2SO_4 , NaOH
(c) Na_2SO_4 , Na_2SO_3 , NaOH (d) Na_2S , Na_2SO_3 , NaOH
- (xv) **Assertion (A)** : A solution is a heterogeneous mixture of two or more substances with variable composition.
Reason (R) : The component of a solution that dissolves is called as solute, while the other component in which the solute dissolves is called a solvent.

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

Question 2

- (i) Study the given table and answer the questions that follow. A student took the samples of four metals A, B, C and D from the reactivity series and added the following solutions one by one. With certain solutions, single displacement reaction took place, while with certain other solutions no reaction occurred. A blank (-) in certain columns indicates that reaction was not carried out by the student. The results obtained have been tabulated as follows:

[5]

Metals from the reactivity series	FeSO ₄	CuSO ₄	ZnSO ₄	AgNO ₃
A	No reaction	Displacement of Cu occurs	--	--
B	Displacement of Fe occurs	--	No reaction	--
C	No reaction	No reaction	No reaction	Displacement of Ag occurs
D	No reaction	No reaction	No reaction	No reaction

- (a) Write the metal reactivity series in the correct order.
 (b) Among Pt, Zn and Ag which metal can be A?
 (c) Is metal B above or below [H] in the reactivity series?
 (d) Among Cu, Ag and Pt which metal can be C?
 (e) Among the different metals in the reactivity series, only two metals can be predicted as D as per the above table of reactions. Which are those two metals?
 (f) Which among the metals A, B, C and D do you think is most reactive?
 (g) Which among the metals A, B, C and D do you think is least reactive?
 (h) Can metal A displace [H] ?
 (i) Can metal D displace [H] ?
 (j) Which is the most reactive metal in the reactivity series?
- (ii) **Fill in the blanks choosing the correct word/ words from the brackets:**
- [copper, iron, aqueous, non- aqueous, polar, minerals, ores, underground, surface, 10^{-10} , 10^{-7} , 10^{-12} , H₂SO₄, NaOH, 60-70%, 80-90%, 50-60%]
- (a) The solutions prepared in water are called ----- solutions and those prepared in other solvents are called ----- solutions.

[5]

(b) The particle size is less than ----- m in a solution and is greater than ----- m in suspension.

(c) Peat, a form of carbon contains ----- carbon, while bituminous coal contains ----- of carbon.

(d) ----- cannot displace hydrogen from HCl, while Al can displace hydrogen from -----.

(e) ----- water is found to possess medicinal properties as it is rich in -----.

(iii) Give reasons for the following observations: [5]

(a) Food is cooked in less time in a pressure cooker.

(b) Sea water doesn't freeze so easily.

(c) Water is used as an excellent cooling agent in car engines and nuclear reactors.

(d) In colder parts of the world, water pipes burst when the water inside them freezes.

(e) Boiled water has a flat taste.

(iv) Write the chemical formula of the following compounds: [5]

(a) Calcium chloride

(b) Potassium hydroxide

(c) Zinc carbonate

(d) Magnesium oxide

(e) Ferric chloride

(f) Ferrous bromide

(g) Ammonium sulphide

(h) Potassium sulphate

(i) Aluminium nitride

(j) calcium phosphate

(v) Copy down the below given equations. Complete and balance these equations. [5]

(a) $\text{Na} + \text{O}_2 \rightarrow \text{-----}$

(b) $\text{Ca} + \text{O}_2 \rightarrow \text{-----}$

(c) $\text{Zn} + \text{O}_2 \rightarrow \text{-----}$

(d) $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{-----}$

(e) $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{-----}$

SECTION B - 40 MARKS

Answer *any four* questions.

Question 3

(i) Write balanced equations for the following: [2]

(a) Action of H_2 with chlorine

(b) Action of H_2 with sulphur

(c) Action of H_2 with nitrogen

(d) Action of H_2 with oxygen

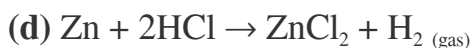
(ii) When different chemical reactions were carried out during the lab activity period, students noted various characteristics of chemical reactions. [2]

These characteristics are illustrated by the following chemical equations. Write down the below given equations and against each of them state which characteristic of chemical reaction is illustrated.

(a) $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl}\downarrow + \text{NaNO}_3$

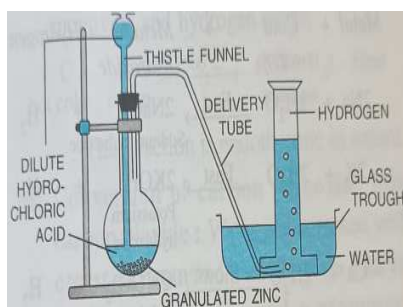
(b) $\text{NH}_3 (\text{g}) + \text{HCl} (\text{g}) \rightarrow \text{NH}_4\text{Cl} (\text{s})$

(c) $\text{Fe} + \text{CuSO}_4 (\text{blue}) \rightarrow \text{FeSO}_4 (\text{green}) + \text{Cu}$



- (iii) Below given is the experimental set up for the laboratory preparation of H_2 gas. Answer the below given questions based on its preparation.

[3]



- (a) Give the balanced chemical equation for the lab preparation of H_2 .
- (b) Why is granulated zinc preferred over pure zinc?
- (c) Though the metals above Hydrogen in the reactivity series can displace H_2 still metals like K, Ca are not preferred for the preparation of H_2 . Why?
- (d) The Bosch process is a two-step large scale industrial process that produces hydrogen gas from water and coke. The process involves passing steam over red-hot coke to create water gas, then treating the water gas with more steam and a catalyst to produce hydrogen gas. Give the balanced equation for the preparation of Hydrogen through this process.
- (iv) Copy down the following equations and classify the reactions as combination, decomposition, single displacement, neutralization and precipitation reactions:
- (a) $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$
- (b) $\text{KOH} + \text{HCl} \rightarrow \text{KCl} + \text{H}_2\text{O}$
- (c) $\text{AgNO}_3 (\text{aq}) + \text{HCl} (\text{aq}) \rightarrow \text{AgCl} \downarrow (\text{aq}) + \text{HNO}_3 (\text{aq})$
- (d) $\text{Pb} + \text{H}_2\text{SO}_4 \rightarrow \text{PbSO}_4 + \text{H}_2$
- (e) $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
- (f) $2\text{KOH} + \text{H}_2\text{SO}_4 \rightarrow \text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$

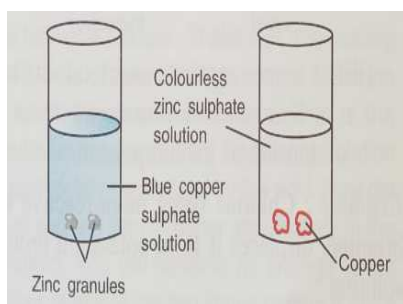
[3]

SECTION B - 40 MARKS

Answer any four questions.

Question 4

(i)



[2]

Aariv performed an experiment by adding a few granules of Zinc to the blue coloured CuSO_4 solution as shown above. Observe carefully the reaction and

answer the following

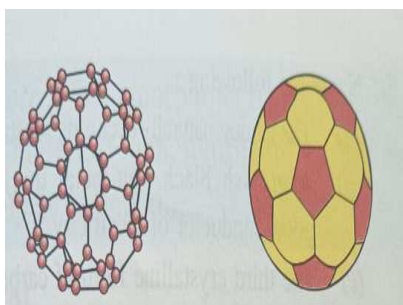
(a) Is Zinc displacing Cu from CuSO_4 ? Why or why not?

(b) What is this type of reaction called as?

(c) Give a balanced chemical equation for the above reaction.

(d) In the reactivity series, is Cu above or below Zn?

- (ii) The structure of buckminster fullerene is shown below. This structure has hexagons and pentagons, just as there in a foot ball. Answer the below given questions based on this allotrope of carbon. [2]



(a) Is fullerene a crystalline or amorphous allotrope?

(b) Where have been these fullerenes found to exist?

(c) In buckminster fullerene, how many carbon atoms are arranged spherically?

(d) Give two uses of fullerene.

- (iii) Below given is a simple traditional method of preparing an allotrope of carbon. [3]



(a) Name this allotrope of carbon. (b) Is this crystalline or amorphous?

(c) Give two uses of this allotrope. (d) What is the colour of this allotrope?

- (iv) Diamond is a crystalline form of carbon while coal is an amorphous form of carbon. They both contain carbon, but their physical properties are different. [3]

(a) What is this property of the existence of an element in two different forms with similar chemical nature known as?

(b) Give one use each for Diamond and Coal.

(c) What is the percentage of carbon in anthracite and lignite?

(d) Which form of diamond is coloured - pure or impure?

Question 5

- (i) Copy down the below given redox reactions. Identify these reactions as both oxidation and reduction. (Draw arrows from left to right and show the oxidation and [2]

reduction reactions)



- (ii) Neutralization is important in daily life because it allows us to counteract the effects of excess acids or bases by using a complementary substance to achieve a neutral pH, which is crucial for various applications like treating indigestion, maintaining oral hygiene, managing soil pH and even neutralizing stings from insects like bees and wasps. Fill in the blanks by selecting the correct word from the brackets (alkaline, antacids, acidic, quick lime, calamine, milk of magnesia, sulphates, vinegar) [2]

(a) Acidic soil can be neutralised with ---- while basic soil are neutralised with -----.

(b) Wasp stings are ----- in nature and can be neutralized with -----.

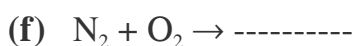
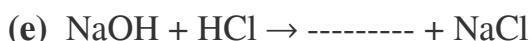
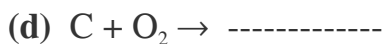
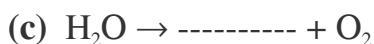
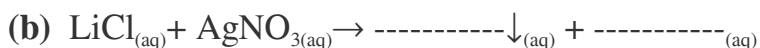
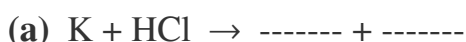
(c) Bee stings are ---- in nature and can be neutralized with -----.

(d) The acidity and indigestion can be overcome by taking ----- like -----.

- (iii) Match the following: [3]

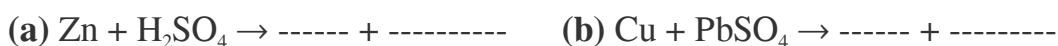
Oxides of metals	Neutral oxide
1. Water	A. Exothermic reaction
2. Burning	B. Basic oxides
3. Electrolysis	C. acid + alkali (or base) \rightarrow salt and water
4. Strong electrolyte	D. Passing electric current to split a solution
5. Positively charged ions	E. H_2SO_4
6. Neutralization reaction	F. Cations

- (iv) Copy down the below given chemical equations. Complete and balance them: [3]



Question 6

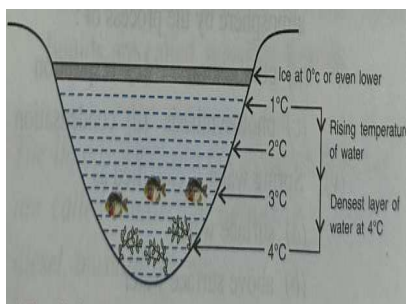
- (i) Complete the following reactions based on the reactivity series. One reaction among them is not possible. Identify that reaction. [2]



- (ii) Write the names of the following compounds: [2]



- (iii) When a piece of magnesium ribbon is burnt in air, a white powder is formed. This white powder is actually the oxide of Mg metal. When metals combine with oxygen, they form the respective oxides. Answer the following questions: [3]
- What is the formula of magnesium oxide?
 - What are oxides? How are they broadly classified?
 - Give two examples for each type of oxides.
- (iv) It is a general fact, that the solid form of a given substance has greater density and hence it is heavier than the liquid form for the same volume. In the case of water, its solid form (ice) is lighter than its liquid form (water). This is an anomalous natural phenomenon. This phenomenon has enabled the sustainability of aquatic life in colder regions. The below given picture shows a freezing lake. [3]



Answer the following questions:

- Name and explain the natural phenomenon that causes the formation of these freezing lakes?
- Why is this natural phenomenon considered as a great boon/ blessing to aquatic life in colder regions? Explain.
- Why do large masses of icebergs float on sea water?
- Water has the ----- density and ----- volume at 4°C. (minimum, maximum)
- To melt the ice covered roads in polar regions, sodium chloride is sprinkled on the roads. Why?

Question 7

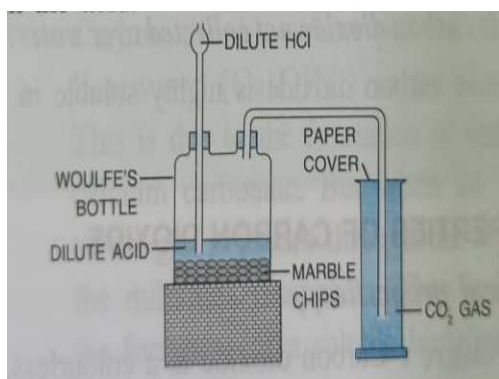
- (i) Below given are few acidic and basic radicals. Write their symbols with the charges. [2]
- (a) Ammonium (b) Calcium (c) Hydroxide (d) Chloride
- (ii) Few metals from the reactivity series are given in the box. [2]
- Na, K, Mg, Al, Ag, Hg, Fe, Cu, Pt
- Arrange them in the increasing order of reactivity.
 - Which among them can displace the maximum and minimum number of metals?
- (iii) Balance the given chemical equations: [3]
- $\text{NH}_3 + \text{O}_2 \rightarrow \text{N}_2\text{O} + \text{H}_2\text{O}$
 - $\text{P} + \text{Cl}_2 \rightarrow \text{PCl}_3$
 - $\text{SO}_2 + \text{O}_2 \rightarrow \text{SO}_3$
 - $\text{KClO}_3 \rightarrow \text{KCl} + \text{O}_2$



- (iv) Nihal and his friend, Rahul were trying to prepare saturated, super saturated and unsaturated solutions of sugar and water. They took 250 mL water each in three beakers labelled as 1, 2 and 3. They had several packets of sugar with different weights. Nihal added a packet weighing 30 grams of sugar to the 1st beaker and clearly found that no more sugar was getting dissolved in it upon further additions. [3]
- (a) Name the solute and solvent used by Nihal and Rahul.
- (b) Had Nihal made a saturated, super saturated or an unsaturated solution?
- (c) If there were 25g, 45g and 50g packets of sugar, which sugar pack should now Rahul add to the 2nd beaker to prepare an unsaturated sugar solution?
- (d) How can the friends make a supersaturated solution? Explain.
- (e) What are the factors upon which the solubility of a solid in a liquid depends upon?
- (f) Sugar dissolves in hot water more easily than in cold water. Why?

Question 8

- (i) Give reasons for the following: [2]
- (a) When a soda bottle is opened, a hissing sound is heard.
- (b) Often during summer, fishes in shallow ponds die.
- (ii) Give one use each for the following: [2]
- (a) Charcoal (b) Graphite (c) Coke (d) Hydrogen
- (iii) Below given is the laboratory preparation of CO_2 . Carefully analyse the chemical reaction occurring in the figure. Further answer the below given questions: [3]



- (a) Complete and balance the given equation for the preparation of CO_2 using the chemicals given in the brackets (CO_2 , CaCl_2 , HCl)
- $$\text{CaCO}_3 \text{ (marble chips)} + \text{-----} \rightarrow \text{-----} + \text{H}_2\text{O} + \text{-----}$$
- (b) Why is CO_2 collected by upward displacement of air?
- (c) Give any two uses of CO_2 .
- (d) Why marble chips are preferred in the laboratory preparation of CO_2 ?
- (iv) The resort owners in a rural area notices that their soap does not lather well when [3]

washing dishes or showering, and there is a noticeable buildup on their taps and shower head. They suspect their water is hard.

(a) What is responsible for the hardness of water?

(b) Which are the two types of hardness of water?

(c) Which type of hardness of water among the two in above (ii) can be removed by boiling?

(d) If a small packet of detergent powder is given to detect whether the given two samples of water are hard or soft, how can we identify the given two samples of water as hard or soft?
