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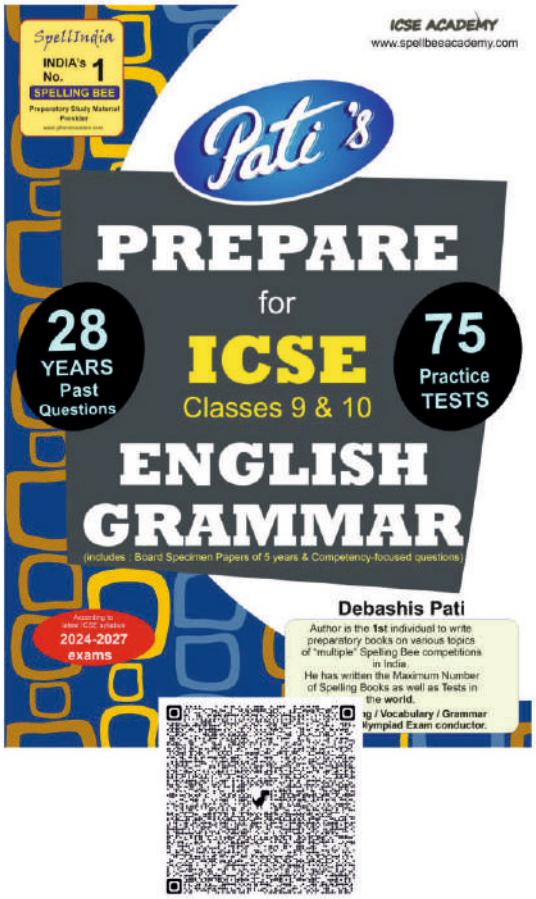

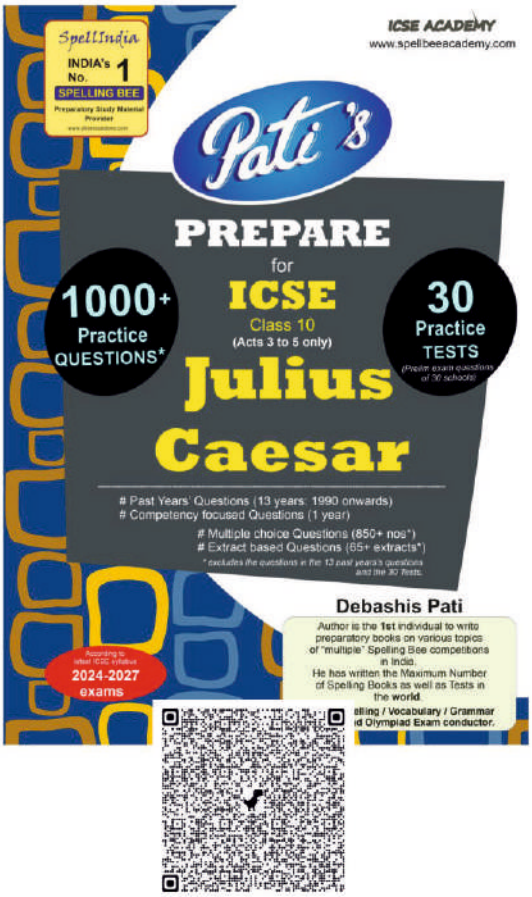

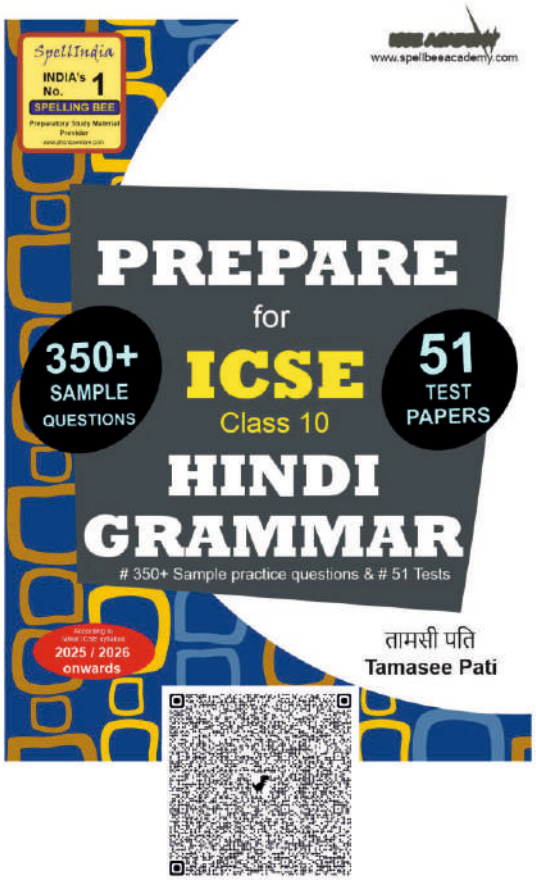

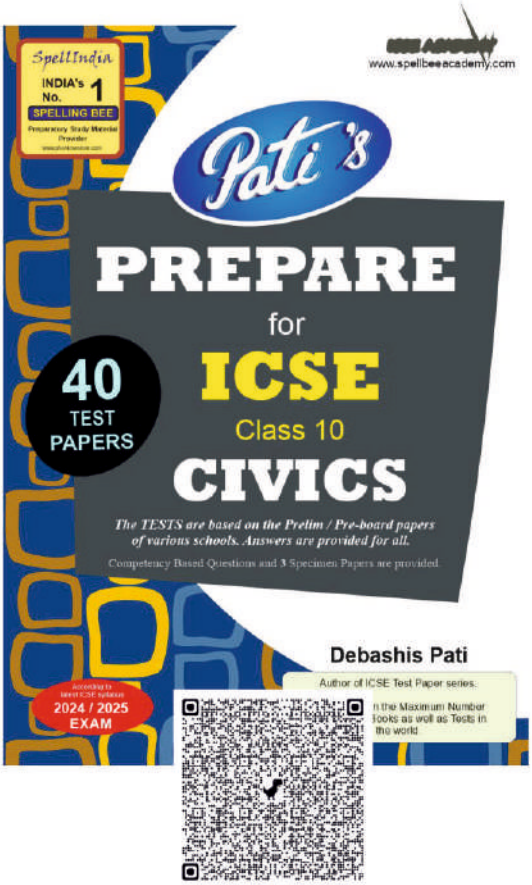

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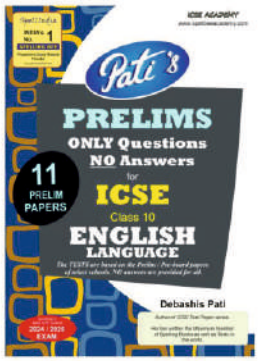

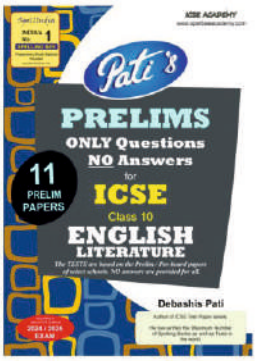

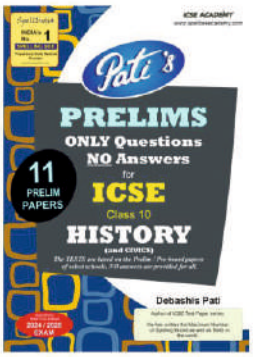

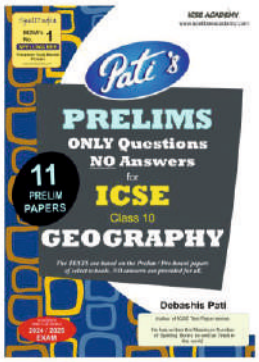

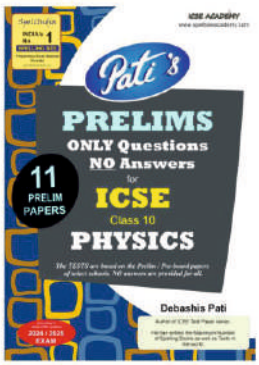

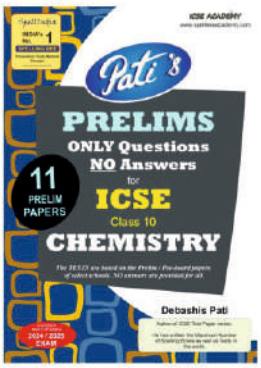

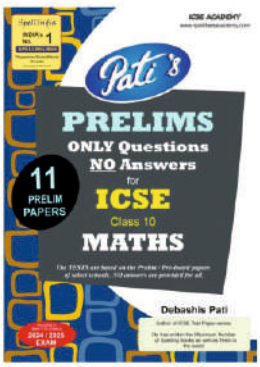

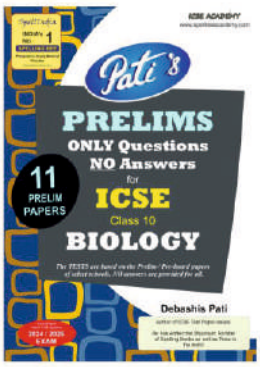

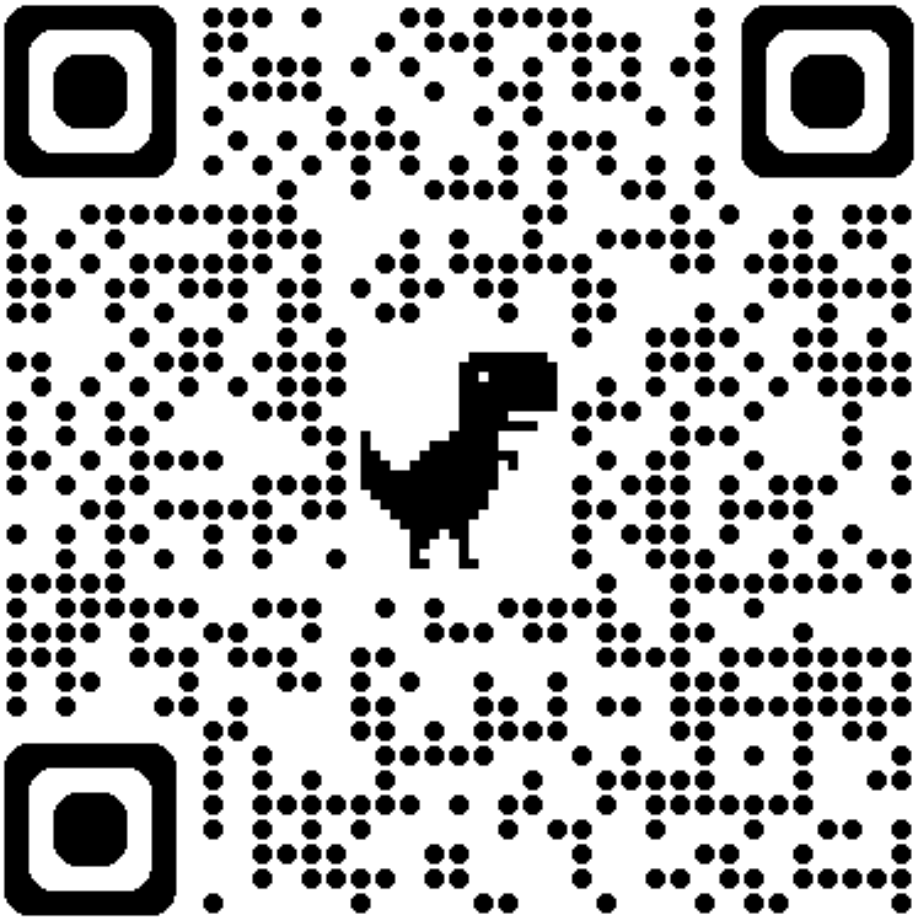

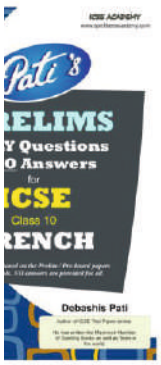

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Note : There was no board exam in 2021 and 2022 due to COVID.

ICSE Board Class 10 2026 Chemistry (Science Paper 2) Question Paper

Time Allowed :2 Hour	Maximum Marks :80	Total Questions :08

General Instructions

Read the following instructions very carefully and strictly follow them:

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 or parts of questions are given in brackets [ ].

SECTION A

(Attempt all questions from this Section.)

Question 1
Choose the correct answers to the questions from the given options.

(i) A non-metal which reacts with concentrated sulphuric acid to form two gases which turn lime water milky is _____.

(a) Sulphur
(b) Carbon
(c) Oxygen
(d) Nitrogen

(ii) Which of the following element pairs will form an ionic bond?

Pair	
P	Elements of Group 1 & Group 2
Q	Elements of Group 14 & Group 16
R	Elements of Group 2 & Group 17
S	Elements of Group 15 & Group 18

(a) P
(b) Q
(c) R
(d) S

(iii) The electronic configuration of an element is 2,8,2. The hydroxide of this element can produce _____ hydroxyl ions per molecule.

(a) 3
(b) 2
(c) 1
(d) 4

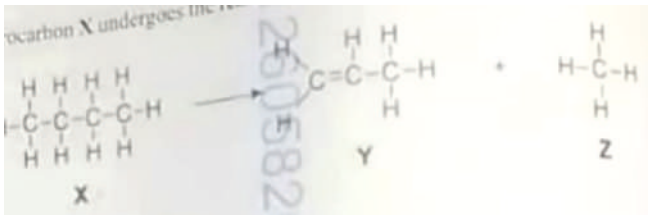
(iv) With respect to the electrolysis of copper (II) sulphate solution using copper electrodes, which statement is correct?

(a) Copper metal is deposited at the negative electrode.
(b) Oxygen gas is produced at the positive electrode.
(c) The positive electrode increases in mass.
(d) The negative electrode decreases in mass.

(v) Identify the equation that shows the reaction of ethane with chlorine in the presence of ultraviolet light.

(a) $C_2H_6 + Cl_2 \;\; C \;\; {}_2H_6Cl_2$
(b) $C_2H_6 + Cl_2 \;\; C \;\; {}_2H_4Cl_2 + H_2$
(c) $C_2H_6 + Cl_2 \;\; C \;\; {}_2H_5Cl + HCl$
(d) $C_2H_6 + Cl_2 \;\; 2CH \;\; {}_3Cl$

(vi) A hydrocarbon X undergoes the reaction under suitable conditions as shown below.



(a) X only
(b) Y only
(c) X and Z
(d) Y and Z

(vii) Rita added dilute hydrochloric acid to four metals. She recorded her observations in the table given below. While noting her observations she made some errors.

	Metals	Observations
1	copper	a gas was given off
2	iron	a gas was given off
3	magnesium	no gas was given off
4	zinc	a gas was given off

(a) 1 only
(b) 3 only
(c) Both 1 and 4
(d) Both 2 and 4

(viii) An atom of X forms an ion according to the equation $X + 2e \quad X^{2}$. The atomic number of the atom X is:

(a) 16
(b) 10
(c) 12
(d) 14

(ix) The method which cannot be used for the preparation of copper salts is:

(a) 1 (Action of acid on bases)
(b) 2 (Action of acid on carbonates)
(c) 3 (Action of acid on metals)
(d) 4 (Action of acid on sulphites)

(x) The compound that has the highest melting point amongst the following is:

(a) Methane
(b) Sodium chloride
(c) Ammonia
(d) Ethanol

(xi) Assertion (A): Dilute Sulphuric acid is a stronger electrolyte than concentrated Sulphuric acid.
Reason (R): Dilute Sulphuric acid has a higher concentration of mobile ions than concentrated Sulphuric acid.

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

(xii) What volume of carbon dioxide is produced at STP when 5 litres of propane is burnt completely according to the equation given below?

$$C_3H_8 + 5O_2 \;\; 3CO \;\; _2 + 4H_2O$$

(a) 10 litres
(b) 15 litres
(c) 20 litres
(d) 25 litres

(xiii) An unsaturated hydrocarbon with three atoms of carbon and six atoms of hydrogen is:

(a) propyne
(b) propane
(c) propene
(d) propanol

(xiv) Assertion (A): In the electrolysis of acidified water, the volume of hydrogen liberated is twice the volume of oxygen formed.

Reason (R): Water has hydrogen and oxygen in the ratio of 1:2 by volume.

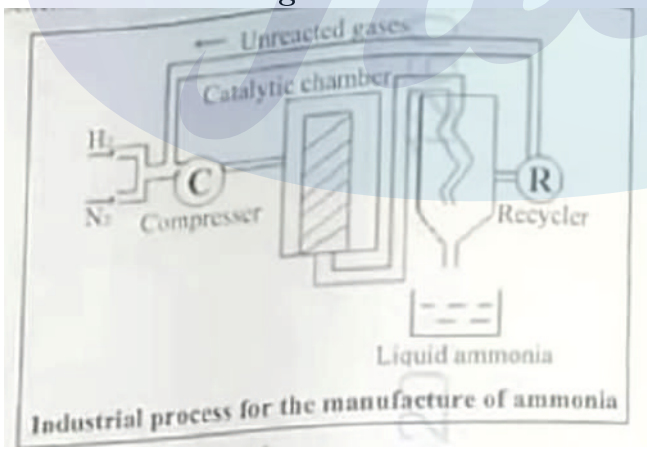
(a) (A) is true but (R) is false.
(b) (A) is false but (R) is true.
(c) Both (A) and (R) are true and (R) is the correct explanation of (A).
(d) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

(xv) The reaction that takes place at the negative electrode (cathode) in the electrolysis of molten aluminium oxide is:
$(Al^{3+} + 3e \quad Al)$
$(2O^2 \quad O \quad _2 + 4e \quad)$
$(C + O_2 \quad CO \quad _2)$
$(Al_2O_3 \quad 2Al \quad ^{3+} + 3O^2 \quad)$

(a) 1
(b) 2
(c) 3
(d) 4

Question 2

(i) Given below is the industrial process for the manufacture of ammonia gas. Study the schematic diagram to answer the following questions.

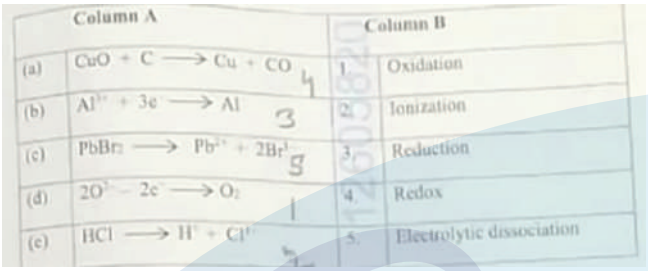


Industrial process for the manufacture of ammonia

(a) Name the process.
(b) Which catalyst is used in the above process?
(c) In the above diagrammatic setup, how is ammonia gas separated from the unreacted gases to obtain liquid ammonia?
(d) Which two properties of ammonia gas can be demonstrated by the Fountain Experiment?

(ii) Identify the following terms / compounds:
(a) A compound which reacts with water to give acetylene gas.
(b) The gas evolved when sodium propanoate is heated with soda lime.
(c) A reddish-brown precipitate formed when ferric chloride solution reacts with an alkali.
(d) A pair of electrons present in an atom which is not shared with any other atom during bond formation.
(e) The relative molecular mass of a substance expressed in grams.

(iii) Match Column A with Column B:



	Column A		Column B
(a)	$CuO + C \longrightarrow Cu + CO$	1.	Oxidation
(b)	$Al^{3+} + 3e \longrightarrow Al$	2.	Ionization
(c)	$PbBr_2 \longrightarrow Pb^{2+} + 2Br^-$	3.	Reduction
(d)	$2O^{2-} - 2e^- \longrightarrow O_2$	4.	Redox
(e)	$HCl \longrightarrow H^+ + Cl^-$	5.	Electrolytic dissociation

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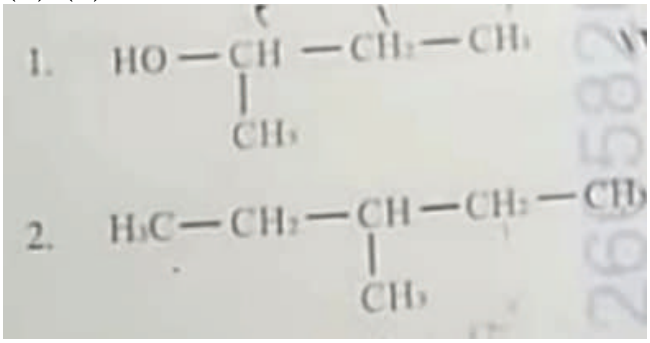
(iv) Complete the following sentences by choosing the correct option from the brackets:
(a) The oxide that dissolves in caustic potash (KOH) is [ZnO / CuO]
(b) The reaction that takes place at the anode during the electrolysis of molten lead bromide is [2Br Br $_2$ + 2e / 2Br + 2e 2Br]
(c) The volume occupied by 8 grams of oxygen gas at STP is _____ litres. [15 / 8.96] [Atomic weight of O = 16]
(d) _____ does not give hydrogen gas when it reacts with cold and very dilute nitric acid. [Cu / Mn]
(e) _____ is a polar covalent compound [HCl / CCl_4]

(v) (a) Give the IUPAC name for the following organic compounds:



1. $HO-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_3$

2. $H_3C-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_3$

(b) Draw the structural diagram for each of the following organic compounds:
1. Butanal
2. Pent-2-yne
3. The isomer of n-butane

SECTION B

(Attempt any four questions from this Section.)

Question 3

(i) Alex was given a solution of an unknown salt Y for analysis. He performed the following tests and recorded his observations:
To a part of the solution Y, he added silver nitrate solution and obtained a white precipitate which was soluble in ammonium hydroxide solution.
To the remaining solution he added a few drops of sodium hydroxide solution and obtained a pale blue precipitate.
Based on the observations made by Alex, identify:
(a) the anion and
(b) the cation present in salt Y.

(ii) Study the reaction given below and answer the questions that follow:

$$NaNO_3 + H_2SO_4 \xrightarrow{<200\ C} NaHSO_4 + HNO_3$$

(a) Give one reason for maintaining the temperature below 200 C.
(b) Why is concentrated Sulphuric acid used in the above reaction?

(iii) Element A belongs to group 15 and period 2 of the Periodic Table.
(a) Identify the element A.
(b) Write the formula of the compound formed when element A combines with hydrogen.
(c) Draw the dot () and cross ( ) structure of the compound formed in (b) above.

(iv) Complete and balance the following equations:
(a) $C_2H_4Br_2 + 2KOH$(alcoholic)
(b) $8NH_3$(excess) $+ 3Cl_2$
(c) $C_{12}H_{22}O_{11} \xrightarrow{\text{conc. } H_2SO_4}$

Question 4

(i) Differentiate between the following pairs based on the criteria given in the bracket:
(a) Acetic acid and Sulphuric acid (number of replaceable hydrogen ion per molecule)
(b) Electrolyte and Metallic conductor (the particles conducting electricity)

(ii) Equal volumes of ammonia gas and chlorine gas are kept in two different containers under the same conditions of temperature and pressure. Find the number of molecules contained in chlorine gas when the mass of ammonia is 34 g. (Atomic weight: Cl = 35.5, H = 1, N = 14)

(iii) Elements P, Q, and R are in the same period of the modern periodic table.
P readily loses its one valence electron to form a stable ion.
Q shares its electrons in bonding but does not form ions easily.
R has high electronegativity.

(iv) Using suitable chemicals from the box, write balanced chemical equations for the preparation of the following salts: Lead (II) carbonate, Copper (II) chloride, Iron (II) chloride.

Question 5

(i) An unsaturated hydrocarbon having two carbon atoms was made to react with two moles of hydrogen gas in the presence of a catalyst to give a saturated hydrocarbon. Using the above information, answer the following questions.
(a) The type of reaction that occurred is _____ (addition / substitution)
(b) Name a suitable catalyst which is used in the reaction
(c) Write a balanced chemical equation for the above reaction

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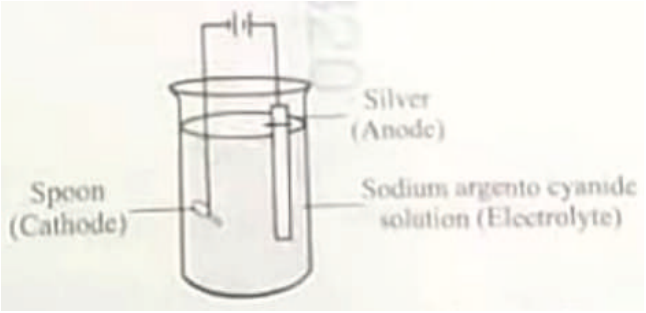
(ii) During the manufacture of sulphuric acid, a chemist collected the gas formed after catalytic oxidation of sulphur dioxide.
(a) Name the gas collected.
(b) Which acid is formed when the gas collected by the chemist is dissolved directly in water?
(c) Why should we not dissolve this gas directly in water?

(iii) The diagram given below shows the electroplating of a spoon with silver. Wi

reference to the diagram, answer the following questions.



(a) Write an equation for the reaction that occurs at the cathode.
(b) Silver nitrate solution is not preferred as an electrolyte in the above process. Give a reason.
(c) Why is alternating current not used in the process?
(d) What is the observation at the anode?

Question 6

(i) Give reasons why
(a) Hydrochloric acid cannot form an acid salt.
(b) Electronegativity increases across a period.

(ii) State whether the following statements are True or False.
(a) Organic compounds having different molecular formula, but same structural formula are called isomers.
(b) A salt is a compound formed by partial or complete replacement of the hydrogen ion of an acid by a metal or electropositive ion.

(iii) Anil is a laboratory assistant in a college. He prepared nitric acid but stored it in a transparent container exposed to sunlight. After a few days, brown fumes were observed in the container and the acid turned slightly yellowish in colour.
(a) What was the error made by Anil while storing the acid?
(b) Why were brown fumes observed in the container?
(c) How can the yellowish tinge in the acid be removed?

(iv) $Zn + 4HNO_3 \;\; Zn(NO \;\; _3)_2 + 2H_2O + 2NO_2$
32.5 g of zinc reacts with concentrated nitric acid as given in the above equation.
(a) How many moles of zinc was required in the reaction?
(b) Find the mass of nitric acid needed to react with 32.5 g of zinc.
(c) Find the volume of nitrogen dioxide liberated in (b).
(Atomic weight: H = 1, N = 14, O = 16, Zn = 65)

Question 7

(i) Carbon reacts with an acid to form carbon dioxide, water and nitrogen dioxide.
(a) Name the acid used in the reaction.
(b) Write a balanced chemical equation for the reaction that occurs.

(ii) Bauxite is the principal ore used in the commercial extraction of aluminium. The Bayers process is used to refine bauxite into pure alumina, with caustic soda playing a crucial role in the initial stage of the process. Based on this, answer the following questions:
(a) Explain the reason behind the addition of caustic soda during the Bayers process.
(b) Write a balanced chemical equation representing the reaction between bauxite and caustic soda during the Bayers process.

(iii) Give one relevant observation for the following:
(a) Sodium hydroxide is added dropwise to Calcium nitrate solution.
(b) Dilute Hydrochloric acid is added to Iron (II) sulphide.
(c) An amphoteric metal is added to hot concentrated alkali.

(iv) Study the reaction scheme shown below and identify the reactants A, B and C.

Question 8

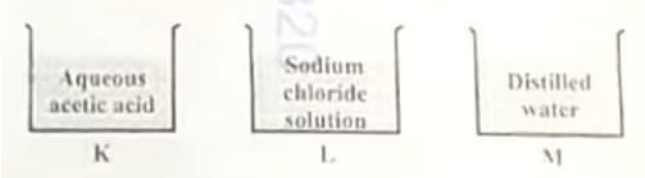
(i) 5.6 litres of gas Z weighs 32 g at STP. What is the molecular weight and vapour density of Z?

(ii) Name the following:
(a) The most electronegative element of Period 2
(b) The largest atom of Period 3

(iii) Given below are a few elements: Li, K, Cs, F.

Identify the element which:
(a) has the least atomic radius.
(b) has two valence electrons.
(c) is the most electropositive.

(iv) K, L and M are beakers containing three different solutions: [Beaker K: Aqueous acetic acid, Beaker L: Sodium chloride solution, Beaker M: Distilled water]. Name the beaker which:



(a) contains only ions.
(b) contains only molecules.
(c) has pH less than 7.

CHEMISTRY

(SCIENCE PAPER – 2)

Maximum Marks: 80

Time allowed: Two hours

1. *Answers to this Paper must be written on the paper provided separately.*
2. *You will **not** be allowed to write during first **15** minutes.*
3. *This time is to be spent in reading the question paper.*
4. ***The time given at the head of this Paper is the time allowed for writing the answers.***

5. ***Section A is compulsory**. Attempt **any four** questions from **Section B**.*
6. *The intended marks for questions or parts of questions are given in brackets [ ].*

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

This paper consists of 15 printed pages and 1 blank page.

SECTION A (40 Marks)

*(Attempt **all** questions from this **Section**.)*

Question 1

Choose the correct answers to the questions from the given options. [15]

(Do not copy the questions, write the correct answers only.)

(i) Read the statements given below:

I – Copper is a component in the alloy that is used to make medals.

II – Aluminium is used in making the alloy stainless steel.

III – Copper is a common component of both duralumin and brass.

Which of the statements are correct?

(a) I & II

(b) I & III

(c) II & III

(d) I, II & III

(ii) Sodium hydroxide can react with _____ acid to form an acid salt.

(a) Nitric acid

(b) Hydrochloric acid

(c) Acetic acid

(d) Sulphuric acid

(iii) How many moles are present in 10g of $CaCO_3$?

[*Atomic weight: Ca = 40, C = 12, O = 16*]

(a) 10 moles

(b) 1 mole

(c) 0.1 mole

(d) 0.11 mole

(iv) A white precipitate is formed when dilute hydrochloric acid reacts with **'X'**. The white precipitate is soluble in excess of NH_4OH and insoluble in dilute HNO_3. Identify **'X'**.

(a) $AgNO_3$

(b) NH_4Cl

(c) $AgCl$

(d) $CaCl_2$

(v) **Assertion (A):** In a solution containing equal concentration of Cu^{+2} ions and Ca^{+2} ions, Cu^{+2} ions will be discharged in preference to Ca^{+2} ions.

Reason (R): Ca^{+2} ions are placed above Cu^{+2} ions in the electrochemical series.

(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.

(vi) **Assertion (A):** Hydraulic washing is a method to separate impurities from the ore.

Reason (R): In Hydraulic washing denser particles float and lighter particles settle down.

(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.

(vii) The oxide which reacts with both dilute hydrochloric acid and sodium hydroxide solution to form salt and water is:

(a) Basic oxide

(b) Amphoteric oxide

(c) Acidic oxide

(d) Neutral oxide

(viii) Which of the following will occupy the volume 2.8 litres at S.T.P.?

(*Atomic weight: C = 12, O = 16, Cl = 35.5, S = 32*)

(a) 2 moles of carbon dioxide

(b) 7.1 g of chlorine

(c) 8 g of sulphur dioxide

(d) 56 g of carbon monoxide

(ix) A salt solution which gives a reddish-brown precipitate with NaOH and a white precipitate with $BaCl_2$ solution is:

(a) $CuSO_4$

(b) $Ca(NO_3)_2$

(c) $Fe_2(SO_4)_3$

(d) $FeCl_3$

(x) An alkane with molecular mass 44 is:

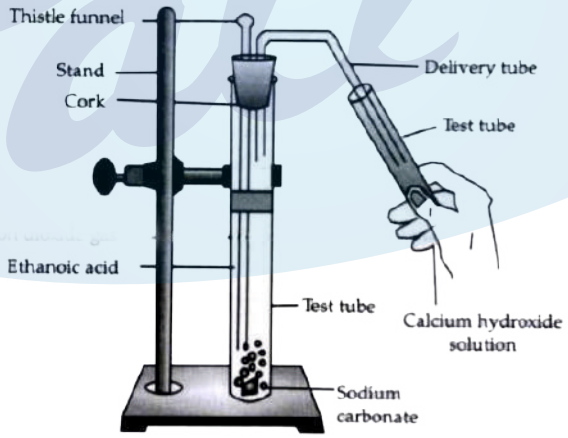
(a) CH_4

(b) C_3H_8

(c) C_4H_{10}

(d) C_2H_6

(xi) The gas evolved in the diagrammatic set up given below turns calcium hydroxide solution milky. The gas evolved is:



(a) CH_4

(b) C_2H_6

(c) CO_2

(d) SO_2

(xii) Which gas is evolved when ammonia gas is passed over buff yellow PbO?

(a) N_2O

(b) NO

(c) N_2

(d) NO_2

(xiii) Three different solutions **X** (sodium chloride solution), **Y** (acetic acid) and **Z** (sugar solution) were used for electrolysis by astudent . When the circuit was completed, he noticed that the bulb glowed in the electrolytic cell containing:

(a) X & Y

(b) Y & Z

(c) Z & X

(d) X, Y & Z

(xiv) An element **X** has an electronic configuration 2, 2. The compound formed when **X** combines with oxygen is most likely to be:

(a) a compound with a low melting point.

(b) a gas that dissolves in water to form an electrolyte.

(c) a good conductor in both solid and molten state.

(d) an ionic solid.

(xv) If an element has a low ionisation potential, it is most likely to be a:

(a) metal

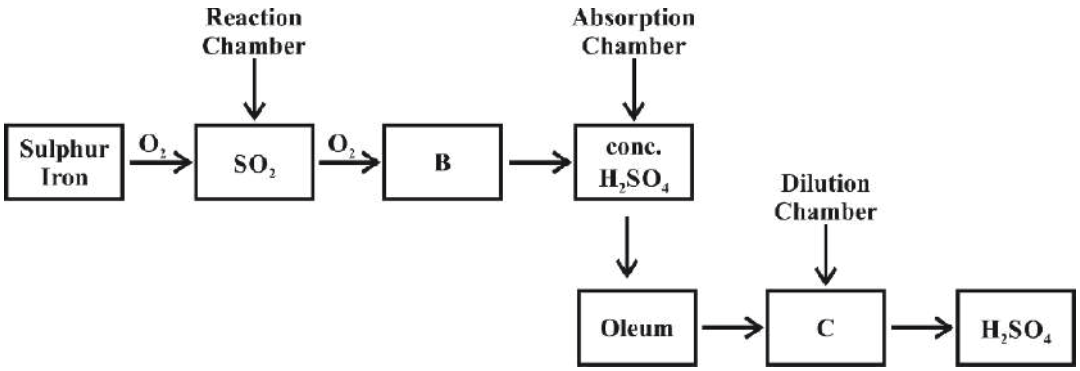
(b) non-metal

(c) metalloid

(d) inert gas

Question 2

(i) [5]



(a) Balance the chemical equation given below:

$FeS_2 + O_2 \rightarrow Fe_2O_3 + SO_2$

(b) Write balanced chemical equation for formation of **'B'**.

(c) Why is it necessary to convert **'B'** to Oleum?

(d) Identify **'C'**.

(e) Write an equation for the reaction between Oleum and **'C'**.

(ii) Ammonium hydroxide solution is added to the solution containing the ions mentioned in List **X**. List **Y** gives the details of the precipitate. Match the ions with their coloured precipitates. [5]

List X	List Y
(a) Zn^{2+}	1. No visible reaction
(b) Fe^{2+}	2. White precipitate insoluble in excess
(c) Pb^{2+}	3. Gelatinous white precipitate soluble in excess
(d) Fe^{3+}	4. Blue precipitate soluble in excess
(e) Ca^{2+}	5. Dirty green precipitate insoluble in excess
	6. Reddish brown precipitate insoluble in excess

(iii) Complete the following sentences by choosing the correct answer from the brackets: [5]

(a) The metal to be refined is kept at the_____ during the process of electro-refining. [*cathode / anode*]

(b) Dilute HCl and dilute H_2SO_4 can be distinguished by adding_____ solution. [$NaNO_3$ / $BaCl_2$]

(c) Ammonia gas is collected by _____ displacement of air. [*upward / downward*]

(d) The gas formed when copper carbonate is heated is _____. [O_2 / CO_2]

(e) Excess ammonia reacts with chlorine to form _____. [*nitrogen / nitrogen trichloride*]

(iv) State the **terms** for the following: [5]

(a) A substance which when dissolved in water forms hydronium ion as the only positive ion.

(b) A type ofcovalent bond in whichelectrons are shared equally betweent he combining atoms.

(c) The process by which a base metal is coated with another metal, either to protect the metal or to give it an attractive appearance.

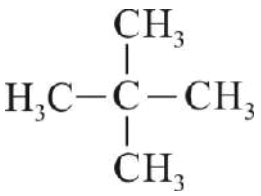
(d) The type of reaction characteristic for alkanes.

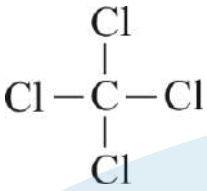
(e) The substance which oxidises the other substance and itself gets reduced.

(v) (a) Draw the structural diagram for the following organic compounds: [5]

1. bromoethane
2. methanal
3. but-2-yne

(b) Give IUPAC name for the following organic compounds:

1. 

2. 

SECTION B (40 Marks)

*(Attempt **any four** questions from this **Section**.)*

Question 3

(i) In the given equation [2]

$Zn + Pb^{+2} \rightarrow Zn^{+2} + Pb$

(a) _____ undergoes oxidation.

(b) _____ undergoes reduction.

(ii) Justify the following statements: [2]

(a) As one moves down a group, the reducing property of elements increases.

(b) Aluminium oxide cannot be reduced by carbon monoxide.

(iii) Arrange the following as per the instructions given in the brackets: [3]

(a) Mg, S, Si, P [*decreasing order of atomic size*]

(b) Cl, I, Br, F [*increasing electronegativity*]

(c) K, Na, Rb, Li [*decreasing metallic character*]

(iv) Harsh performed the following experiments in the laboratory. State **one significant observation** made by Harsh when: [3]

(a) he added concentrated sulphuric acid to blue vitriol.

(b) he passed ammonia gas over heated PbO.

(c) sodium hydroxide solution was added to $CuSO_4$ solution by him.

Question 4

(i) Choose the letters **L**, **M**, **N**, **O** & **P** to match the description (a) to (c) given below: [3]

[**L** – Ammonia, **M** – Nitrogen, **N** – Hydrogen sulphide

O – Hydrogenchloride gas, **P** – Nitrogen dioxide]

(a) When this gas comes in contact with ammonia dense white fumes are seen.

(b) The gas that turns moist lead acetate paper silvery black.

(c) The gas produced on heating lead nitrate.

(ii) Smith wrote the following statements incorrectly. Insert a word to correct the statements. [3]

(a) Lead bromide conducts electricity.

(b) Copper reacts with nitric acid to form nitrogen dioxide gas.

(c) Bromoethane reacts with sodium hydroxide to produce ethanol and sodium bromide.

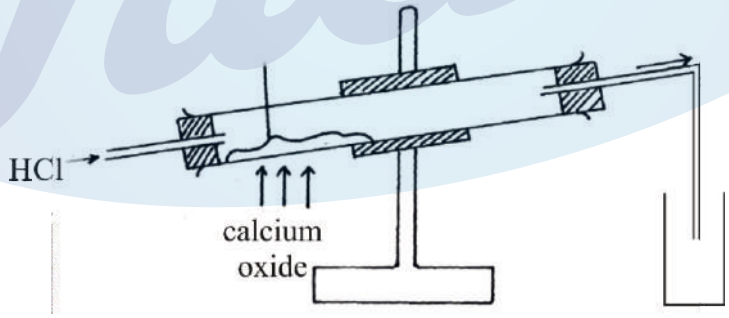
(iii) Match the Column **A** (showing the properties of H_2SO_4) with Column **B** (showing the reaction of H_2SO_4) [4]

Column A **Properties of H_2SO_4**	**Column B** **Reaction of H_2SO_4**
(a) Acidic property	1. $C_{12}H_{22}O_{11} + nH_2SO_4 \rightarrow 12C + 11H_2O + nH_2SO_4$
(b) Dehydrating property	2. $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$
(c) Non-volatile acid	3. $CaO + H_2SO_4 \rightarrow CaSO_4 + H_2O$
(d) Oxidizing agent	4. $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

Question 5

(i) Calcium oxide is a drying agent which removes water vapour. [2]

A student wanted to collect a dry sample of the hydrogen chloride gas produced. The student set up the apparatus as shown below but was unsuccessful in collecting any gas.



(a) What mistake did the student make?

(b) What change should be madeby the student in order to collect the dry HCl gas?

(ii) Select the correct answer from the options given in the brackets: [2]

(a) The ion which is discharged at the cathode during the electrolysis of $CuSO_4$ solution using copper electrodes. [Cu^{+2}, OH^-, SO_4^{2-}, H^+]

(b) During electroplating of an article with Ag using sodium argentocyanide as an electrolyte, the anode is made of. [*Cu, Ag, Pt, Na*]

(iii) Ethane C_2H_6 burns in oxygen to produce carbon dioxide and water as shown in the equation given below: [3]

$$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$$

Calculate the composition of the resulting gaseous mixture at room temperature when 60 c.c. of ethane burns in 250 c.c. of oxygen.

(iv) Match the uses of alloys in **List 1** with the appropriate answer from **List 2**. [3]

List 1	List 2
(a) Used in making decorative articles.	1. Stainless steel
(b) An alloy used in making aircraft and light tools.	2. Brass
(c) Used in making surgical Instruments.	3. Duralumin

Question 6

(i) You are provided with some compounds in the box. [3]

SO_2, PbO, CO, K_2SO_4, H_2SO_4, CH_3COOH, $NaHSO_4$, KCl

Choose the compound from the above box that fits the descriptions from (a) to (c).

(a) An acid present in vinegar.

(b) An oxide which dissolves in water forming an acid.

(c) A salt formed by the incomplete neutralization of an acid by a base.

(ii) Draw the dot and cross structure of the following: [3]

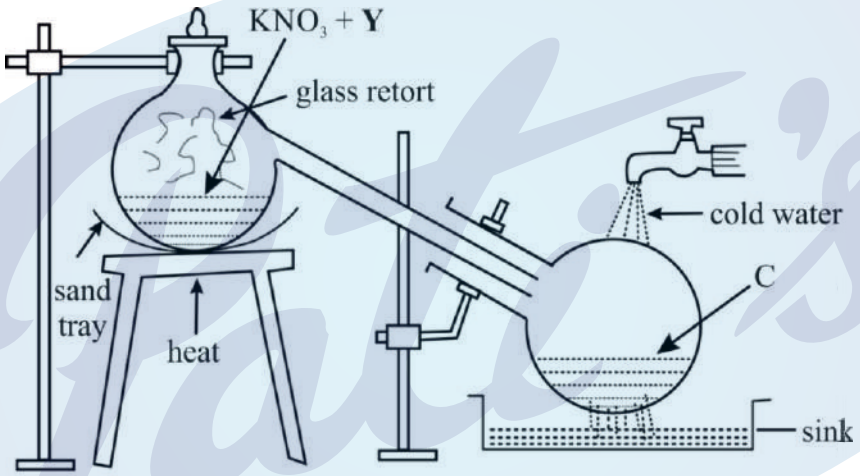
(a) Hydronium ion

(b) Oxygen molecule

(c) Calcium oxide

[*Atomic number: H = 1, O = 8, Ca = 20*]

(iii) Given below is the diagram for the laboratory preparation of Nitric Acid. [4]



(a) Name the reactant labelled **Y**.

(b) Write a balanced equation for the reaction between **Y** and KNO_3.

(c) The complete apparatus is made up of glass. Why?

(d) State why concentrated HNO_3 appears slightly yellowish in colour when left standing in a glass bottle for a long time.

Question 7

(i) Answer the following questions related to the electrolytic reduction of pure Alumina by Hall Heroult's process. [2]

(a) The reaction occurring at the anode.

(b) The reaction occurring at the cathode.

(ii) Give the chemical formula of the following ores: [2]

(a) Cryolite

(b) Haemetite

(iii) Write the balanced equations for the following reactions: [3]

(a) Potassium bicarbonate reacts with dilute HCl.

(b) Laboratory preparation of ethane using soda lime.

(c) Warm water is added to Aluminium nitride.

(iv) Nitrogen and hydrogen combine in the presence of a catalyst to give ammonia gas. [3]
With reference to the above reaction:

(a) Name the catalyst used.

(b) At what temperature does the above reaction occur?

(c) What optimum pressure should be maintained during the reaction?

Question 8

(i) 1 mole of CO_2 occupies 24 dm^3 at room temperature and pressure. [2]

Calculate the following:

(a) The mass of 6 litres of CO_2.

(b) The volume occupied by 60 g of CO_2.

[*Atomic weight: C=12, O=16*]

(ii) Define: [2]

(a) Electrolyte

(b) Catenation

(iii) Name the most appropriate method of preparation of the following salts: [3]

(a) Copper carbonate

(b) Sodium sulphate

(c) Ferric chloride

(iv) Complete and balance the following equation: [3]

(a) $C_2H_5Br + KOH$ (alcoholic) $\rightarrow$

(b) $C_2H_5OH \xrightarrow[170^oC]{\text{conc. } H_2SO_4}$

(c) $CH_4 + Cl_2 \rightarrow$

CHEMISTRY

(SCIENCE PAPER – 2)

Maximum Marks: 80

Time allowed: Two hours

1. *Answers to this Paper must be written on the paper provided separately.*
2. *You will **not** be allowed to write during first **15** minutes.*
3. *This time is to be spent in reading the question paper.*
4. ***The time given at the head of this Paper is the time allowed for writing the answers.***

5. ***Section A is compulsory**. Attempt **any four** questions from **Section B**.*
6. *The intended marks for questions or parts of questions are given in brackets [ ].*

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

SECTION A (40 Marks)

*(Attempt **all** questions from this **Section**.)*

Question 1

Choose the correct answers to the questions from the given options. [15]

(Do not copy the questions, write the correct answers only.)

(i) Which gas decolourises potassium permanganate ($KMnO_4$) solution?

(a) Sulphur dioxide

(b) Ammonia

(c) Hydrogen chloride

(d) Carbon dioxide

(ii) Which formula represents a *saturated* hydrocarbon?

(a) C_4H_8

(b) C_5H_{12}

(c) C_4H_6

(d) C_5H_{10}

(iii) The metal whose oxide can be reduced by common reducing agents:

(a) Copper

(b) Sodium

(c) Aluminium

(d) Potassium

(iv) An organic compound has a vapour density of 22. The molecular formula of the organic compound is:

[*Atomic weight: C = 12, H = 1*]

(a) CH_4

(b) C_2H_4

(c) C_2H_6

(d) C_3H_8

(v) In the reaction given below *sulphuric acid* acts as a/an:

$$S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$$

(a) Non-volatile acid

(b) Dibasic acid

(c) Oxidising agent

(d) Reducing agent

(vi) **Assertion (A):** The tendency of losing electrons increases down the Group.

Reason (R): The most reactive metal is placed at the top of Group 1.

(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.

(vii) The ore that can be concentrated by using magnetic separation:

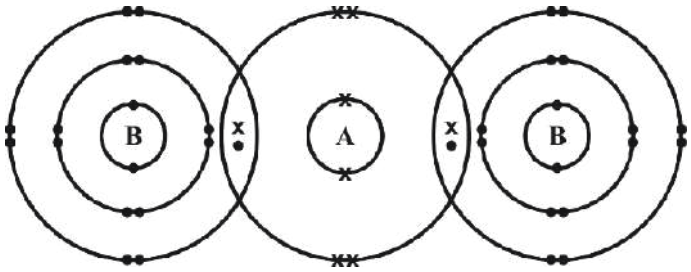
(a) Corundum

(b) Haematite

(c) Calamine

(d) Bauxite

(viii) The diagram given below shows the bonding in the covalent molecule AB_2.



Which option represents the correct electronic configuration of atoms **A** and **B** **before** combining together to form the above molecule?

	A	**B**
(a)	2, 4	2, 8, 6
(b)	2, 4	2, 8, 7
(c)	2, 8	2, 8, 8
(d)	2, 6	2, 8, 7

(ix) Which of the following options has all the compounds which are members of the *same* homologous series?

(a) CH_4, C_2H_6, C_3H_8

(b) CH_4, C_2H_6, C_3H_6

(c) C_3H_4, C_3H_6, C_3H_8

(d) C_2H_4, C_3H_6, C_4H_{10}

(x) **Assertion (A):** In the *Contact Process* SO_3 gas is not directly dissolved in water to obtain sulphuric acid.

Reason (R): Dense fog or misty droplets of sulphuric acid are formed which is difficult to condense.

(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.

(xi) Given below are four ions:

Cl^-, Li^+, Al^{3+}, K^+

Identify the pair of ions which have the same electronic configuration.

[*Atomic number: Cl = 17, Li = 3, Al = 13, K = 19*]

(a) Cl^- & Li^+

(b) Al^{3+} & K^+

(c) Cl^- & K^+

(d) Li^+ & K^+

(xii) Which pair of reactants can be **best** used to produce lead (II) sulphate?

(a) Sulphuric acid + Lead

(b) Sulphuric acid + Lead hydroxide

(c) Sodium sulphate + Lead nitrate

(d) Potassium sulphate + Lead oxide

(xiii) Aqueous copper (II) sulphate is electrolysed using copper electrodes.
Which statement about the electrolysis is **not** correct?

(a) An oxidation reaction occurs at the positive electrode.

(b) The current is carried through the electrolyte by ions.

(c) The positive electrode loses mass.

(d) The number of copper (II) ions in the electrolyte decreases.

(xiv) X, Y & Z are three metallic atoms in successive order belonging to the same group such that atomic radii of' X' is the smallest. Which of the three atoms is the **best** reducing agent?

(a) X

(b) Y

(c) Z

(d) All three have the same reducing power.

(xv) 40 cm^3 of methane (CH_4) is reacted with 60 cm^3 of oxygen.
The equation for the reaction is given below:

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

All volumes are measured at room temperature.
What is the **total** volume of the gases remaining at the end of the reaction?

(a) 60 cm^3

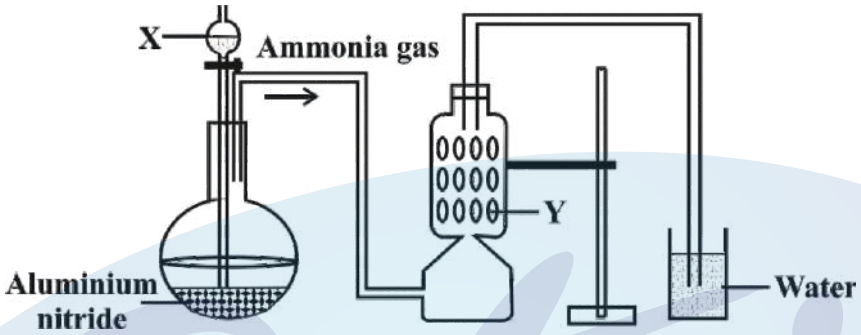
(b) 40 cm^3

(c) 45 cm^3

(d) 50 cm^3

Question 2

(i) A student was instructed by the teacher to prepare and collect ammonia gas in the laboratory by usingaluminium nitride. The student had set up the apparatus as shown in the diagram below. Study the given diagram and answer the following questions: [5]



(a) Name the substance **X** added through the thistle funnel by the student.

(b) Write a balanced equation for the reaction occurring between aluminium nitride and substance **X**.

(c) Identify the substance **Y**.

(d) State the function of **Y**.

(e) Why could the student **not collect** ammonia gas at the end of the experiment?

(ii) State the **terms** for the following: [5]

(a) *Undistilled* alcohol containing a large amount of methanol.

(b) A *salt* formed by the *partial* replacement of the *hydroxyl group* of a di-acidic or a tri-acidic base by an acid radical.

(c) Organic compounds having the *same* molecular formula but *different* structural formula.

(d) The tendency of an atom to attract the shared pair of electrons towards itself when combined in a compound.

(e) The type of covalent bond in which electrons are shared *unequally* between the combining atoms.

(iii) Complete the following sentences by choosing the *correct word(s)* from the brackets: [5]

(a) _____ solution forms a coloured precipitate with ammonium hydroxide which is soluble in excess of ammonium hydroxide.
[*Ferrous chloride / Copper nitrate*]

(b) Zinc blende is converted to zinc oxide by _____. [*Calcination / Roasting*]

(c) _____ conducts electricity by the movement of ions.
[*Molten iron / Molten sodium chloride*]

(d) The reaction that takes place at the anode during the electrolysis of aqueous Sodium argentocyanide with silver electrodes is _____.
[$Ag \rightarrow Ag^+ + e^-$ / $Ag^+ + e^- \rightarrow Ag$]

(e) The salt formed when ZnO reacts with hot concentrated NaOH is _____. [*sodium zincate / zinc hydroxide*]

(iv) Match the **Column A** with **Column B**: [5]

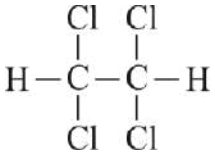
	Column A		**Column B**
(a)	$N_2 + 3H_2 \rightleftharpoons 2NH_3$	1.	Vanadium Pentoxide
(b)	$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$	2.	Nickel
(c)	$2SO_2 + O_2 \rightleftharpoons 2SO_3$	3.	Iron
(d)	$C_2H_4 + H_2 \rightarrow C_2H_6$	4.	Concentrated Sulphuric acid
(e)	$CuSO_4.5H_2O \rightarrow CuSO_4 + 5H_2O$	5.	Platinum

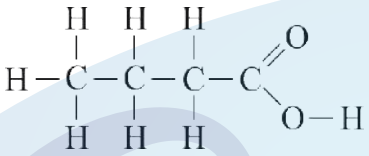
(v) (a) Draw the structural diagram for the following organic compounds: [5]

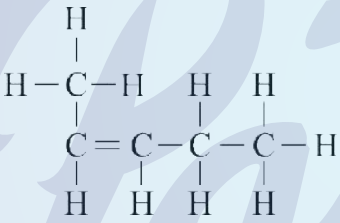
1. 2-methyl propene

2. butanal

(b) Give IUPAC name for the following organic compounds:

1. 

2. 

3. 

SECTION B (40 Marks)

*(Attempt **any four** questions from this **Section**.)*

Question 3

(i) The atomic number of two atoms **'X'** and **'Y'** are 14 and 8 respectively. [2]

State:

(a) the period to which **'X'** belongs.

(b) the formula of the compound formed between **'X'** and **'Y'**.

*(Do not identify **X** and **Y**)*

(ii) Justify the following statements: [2]

(a) Anode is known as the oxidizing electrode.

(b) Graphite electrodes are preferred in the electrolysis of molten lead bromide.

(iii) The reaction between concentrated sulphuric acid and magnesium can be represented by the equation given below: [3]

$$Mg + 2H_2SO_4 \rightarrow MgSO_4 + 2H_2O + SO_2$$

If 60 g of magnesium is used in the reaction, calculate the following:

(a) The mass of sulphuric acid needed for the reaction.

(b) The volume of sulphur dioxide gas liberated at S.T.P.
[*Atomic weight: Mg=24, H=1, S=32, O=16*]

(iv) Give one **significant** observation when: [3]

(a) a solution of barium chloride is added to zinc sulphate solution.

(b) lead nitrate is heated in a test tube.

(c) chlorine gas is passed over moist starch iodide paper.

Question 4

(i) A gas cylinder can hold 150 g of hydrogen under certain conditions of temperature and pressure. If an identical cylinder with the same capacity can hold 40 g of gas **'G'** under the same conditions of temperature and pressure, find: [2]

(a) the vapour density of the gas **'G'**.

(b) the molecular weight of gas **'G'**.

(ii) Complete and balance the following equations: [2]

(a) $CH_3COONa + NaOH \xrightarrow[\Delta]{CaO}$

(b) $CH_3COOH + Mg \rightarrow$

(iii) Name the **gas** produced during each of the following reactions: [3]

(a) When copper is treated with hot, concentrated nitric acid.

(b) When ammonia is burnt in an atmosphere of oxygen.

(c) When ferrous sulphide reacts with dilute hydrochloric acid.

(iv) Study the table given below. Use only the letters given in the table to answer the questions. **Do not identify** the elements. [3]

IA	IIA				IIIA	IVA	VA	VIA	VIIA	0
						E		J		Q
	L						G			
	M				D				P	
	N									

(a) State the valency of element 'G'.

(b) Which element can exhibit catenation?

(c) Write the formula of the compound formed between 'M' and 'P'.

Question 5

(i) Given below are two sets of elements from two different periods. [2]

Name the element with the **highest** ionisation potential in each of the following sets.

(a) Al, Cl, Mg

(b) Ne, O, F

(ii) Ammonia gas is passed over heated copper (II) oxide in a combustion tube: [2]

(a) Name the gas evolved.

(b) What will be the colour of the residue that is left in the combustion tube at the end of the reaction?

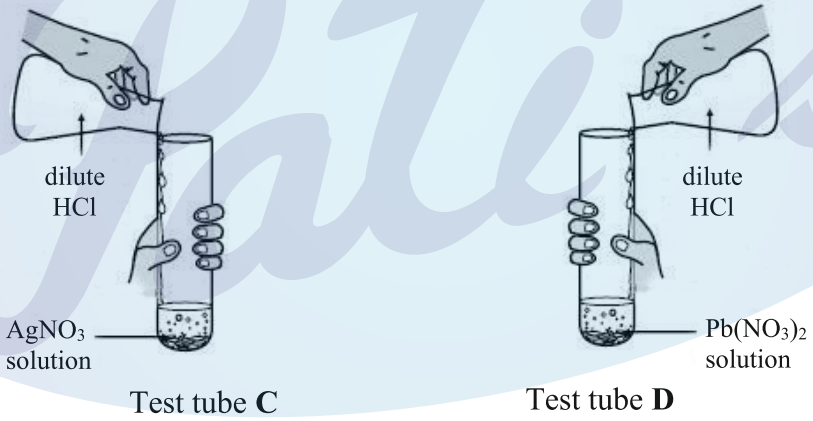
(iii) Give balanced equations for the following: [3]

(a) Action of dilute hydrochloric acid on ammonium carbonate.

(b) Oxidation of sulphur with hot concentrated nitric acid.

(c) Reaction of concentrated sulphuric acid with carbon.

(iv) Rohit took two different salt solutions in test tubes **C** and **D** as shown in the figure below. He added dil ute HCl to each of thetwo test tubes. The products formed in the test tubes **C** and **D** are *silver chloride* and *lead chloride* respectively. [3]



Test tube **C** Test tube **D**

State:

(a) one common observation made by Rohit in both the reactions.

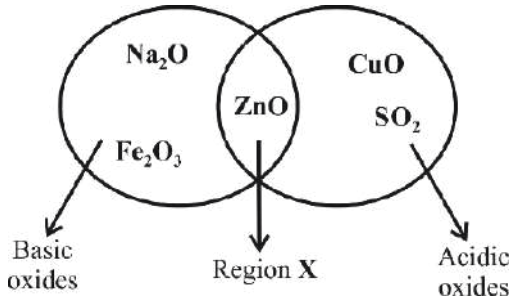
(b) the observations made by him on addition of excess of ammonium hydroxide to the products formed in:

1. test tube **C**

2. test tube **D**

Question 6

(i) Given below is a diagram showing the placement of five different oxides. With respect to the given diagram answer the following questions: [3]



(a) Name the **type** of oxide represented in region **X** in the diagram.

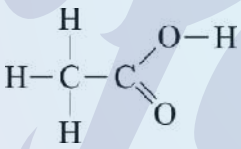
(b) Identify the oxide which has been **incorrectly** placed in the above diagram.

(c) Name the oxide from the above diagram which will form an **alkali** when dissolved in water.

(ii) Given below are organic compounds labelled **A** to **F**. [3]

Answer the questions that follow:

A.



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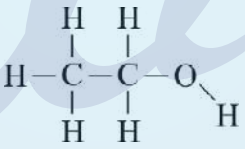

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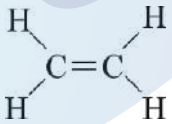

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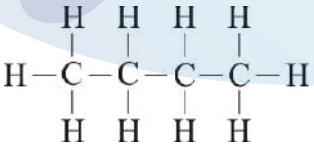

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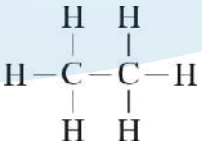

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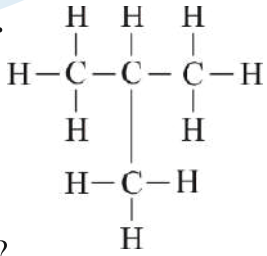


(a) Which compound forms a **single** product with **bromine**?

(b) Which **two** compounds have the **same** molecular formula?

(c) Which **two** compounds will react together in the presence of concentrated H_2SO_4 to form a product with a **fruity smell**?

(iii) An organic compound '**X**' contains carbon, oxygen and hydrogen only. The percentage of carbon and hydrogen are 47.4% and 10.5% respectively. The relative molecular mass of **'X'** is 76. Find the **empirical** formula and the **molecular** formula of **'X'**. [4]

[*Atomic weight: C = 12, O = 16, H = 1*]

Question 7

(i) Seema added a few pieces of copper turnings to a test tube containing concentrated acid **P** and she noticed that a reddish-brown gas evolved. [2]

(a) Name the acid **P** used by Seema.

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

(ii) Answer the following questions with reference to the concentration of **bauxite ore**. [2]

(a) Name the process used to concentrate the ore.

(b) Give a balanced chemical equation for the conversion of aluminium hydroxide to pure alumina.

(iii) Draw the **dot and cross** structure of the following: [3]

(a) An ionic compound formed when Mg reacts with the dilute HCl.

(b) A covalent compound formed when H_2 reacts with Cl_2.

(c) The positive ion produced when ammonia gas is dissolved in water.

[*Atomic number: Mg = 12, Cl = 17, H = 1, N = 7*]

(iv) Acidulated water is electrolysed using platinum electrodes. [3]

Answer the following questions:

(a) Why is dilute sulphuric acid added to water?

(b) Write the reaction taking place at the cathode.

(c) What is the observation at the anode?

Question 8

(i) (a) State Avogadro's Law. [2]

(b) Define Co-ordinate bond.

(ii) Differentiate between the following pairs of compounds using the **reagent** given in the bracket: [2]

(a) Ammonium chloride and Sodium chloride *(using an alkali)*

(b) Zinc Nitrate solution and Calcium Nitrate solution *(using excess sodium hydroxide solution)*

(iii) You are provided with some compounds in the box. [3]

PbO	CH_4	PbO_2	CO_2
HCl	NCl_3	SO_2	

Choose the most appropriate compound which fits the descriptions (a) to (c) given below:

(a) A colourless gas which turns acidified $K_2Cr_2O_7$ from *orange to green*.

(b) A *yellow explosive* oily liquid formed when excess chlorine gas reacts with ammonia gas.

(c) A *yellow metallic* oxide formed on thermal decomposition of $PbCO_3$.

(iv) **P**, **Q**, **R** and **S** are the different methods of preparation of salts. [3]

P – Simple displacement

Q – Neutralisation by titration

R – Precipitation

S – Direct combination

Choose the **most appropriate** method to prepare the following salts:

(a) $PbCl_2$

(b) $FeCl_3$

(c) Na_2SO_4

2024

CHEMISTRY

(SCIENCE PAPER – 2)

Maximum Marks: 80

Time allowed: Two hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during 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 or parts of questions are given in brackets [ ].

SECTION A (40 Marks)

*(Attempt **all** questions from this **Section**.)*

Question 1

Choose the correct answers to the questions from the given options. [15]

(Do not copy the questions, write the correct answers only.)

(i) Unsaturated hydrocarbons undergo:

(a) Addition reaction

(b) Substitution reaction

(c) Oxidation reaction

(d) Redox reaction

(ii) In the 2nd period Neon has maximum Ionization Potential because:

(a) It has unstable electronic configuration.

(b) It easily accepts electrons.

(c) It easily loses electrons.

(d) The outer most shell is completely filled.

(iii) Copper, Zinc and Tin are the metals alloyed to form:

(a) Duralumin

(b) Brass

(c) Bronze

(d) Solder

(iv) The metal hydroxide which reacts with both acids and alkalis to form salt and water is:

(a) Calcium hydroxide

(b) Magnesium hydroxide

(c) Aluminium hydroxide

(d) Ferric hydroxide

(v) Reaction of an alcohol with a carboxylic acid in the presence of concentrated H_2SO_4 is termed as:

(a) Halogenation

(b) Esterification

(c) Hydrogenation

(d) Dehydrohalogenation

(vi) Conversion of Ethanol to Ethene by the action of concentrated sulphuric acid involves:

(a) Dehydration

(b) Dehydrogenation

(c) Dehydrohalogenation

(d) Hydrolysis

(vii) The oxidizing agent in the equation $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$ is:

(a) Sulphur

(b) Sulphuric acid

(c) Sulphur dioxide

(d) Water

(viii) Electron Affinity is maximum in:

(a) Mg

(b) Ar

(c) Li

(d) Br

(ix) The compound that is **not** a constituent of the electrolytic mixture used in the Hall-Heroult's process is:

(a) Al_2O_3

(b) $NaAlO_2$

(c) Na_3AlF_6

(d) CaF_2

(x) On passing ammonia gas over heated copper oxide for some time, a reddish-brown residue is left behind. What property of ammonia is demonstrated here?

(a) Basic property

(b) Oxidising property

(c) Reducing property

(d) Acidic property

(xi) Rotten egg smell is due to the liberation of:

(a) HCl gas

(b) H_2S gas

(c) Cl_2 gas

(d) SO_2 gas

(xii) Ammonia gas is collected by downward displacement of air since ammonia is:

(a) very slightly soluble in water.

(b) heavier than air.

(c) lighter than air.

(d) insoluble in water.

(xiii) Which of the following would occupy 22.4 litres at S.T.P.?

1. 32g of oxygen gas
2. 2 moles of hydrogen gas
3. 6.022×10^{23} molecules of ammonia

(a) 1 & 2

(b) 1 & 3

(c) 2 & 3

(d) 1, 2 & 3

[Atomic weights: O = 16, H = 1, N = 14]

(xiv) In the molecule of water, oxygen atom has:

(a) One shared pair of electrons.

(b) Three shared pairs of electrons.

(c) Two lone pairs of electrons.

(d) One lone pair of electrons.

(xv) A mineral from which the metal can be extracted economically and conveniently is known as:

(a) Matrix

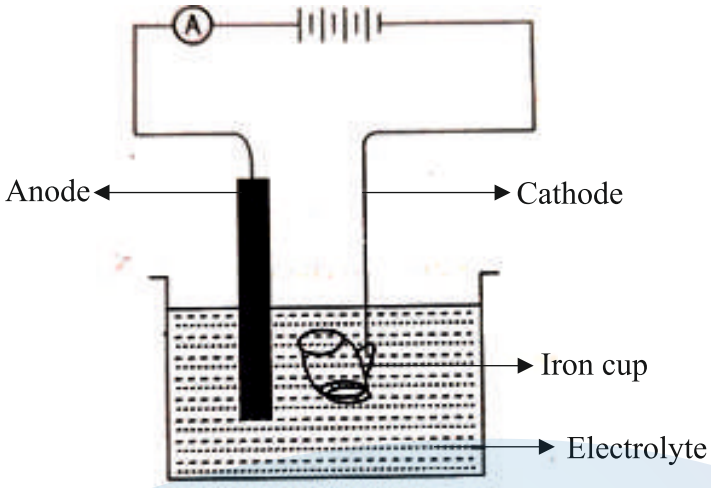
(b) Ore

(c) Flux

(d) Alloy

Question 2

(i) The following sketch represents the electroplating of an Iron cup with Nickel metal. [5]
Study the diagram and answer the following questions:



(a) During electroplating the iron cup is placed at the cathode. Why?

(b) Name the ion that **must** be present in the electrolyte.

(c) State one condition that is necessary to ensure that the deposit is smooth, firm and even.

(d) Write the reaction taking place at the cathode.

(e) What change would you observe at the anode?

(ii) Match the *Column A* with *Column B*: [5]

Column A	**Column B**
(a) Water	1. Lithium
(b) Alkali metal	2. Iodine
(c) Halogen	3. Covalent compound
(d) Calcium oxide	4. Acetic acid
(e) Weak acid	5. Ionic compound
	6. Sulphuric acid

(iii) Complete the following sentences by choosing the correct answer from the brackets: [5]

(a) The salt that can be prepared by Direct combination is _____. *[$FeCl_3$ / $FeCl_2$]*

(b) The metallic oxide which can be reduced by using common reducing agents is _____. *[Fe_2O_3 / Al_2O_3]*

(c) The metal nitratewhich on thermal decomposition forms a black residue is _____. *[zinc nitrate / copper nitrate]*

(d) During the electrolysis of copper sulphate solution, if _____ is used as electrodes, the colour of the electrolyte does not fade. *[copper / platinum]*

(e) The process of heating the concentrated ore in a limited supply or absence of air is _____ *[roasting / calcination]*

(iv) State the **terms** for the following: [5]

(a) The group obtained by removing one hydrogen atom from the parent alkane.

(b) Two metal plates or wires through which the current enters and leaves the electrolytic cell.

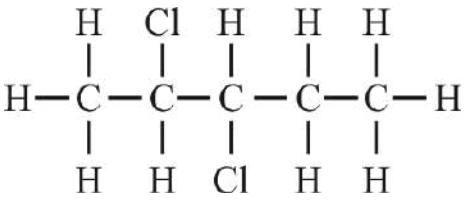
(c) The amount of substance which contains the same number of units as the number of atoms in carbon-12.

(d) The tendency of an atom to pull a shared pair of electrons towards itself in a compound.

(e) The formula which represents the simplest ratio between the atoms of elements present in a compound.

(v) (a) Give the IUPAC names of the organic compounds represented by the structural formulae given below: [5]

1.



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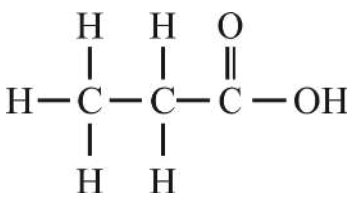


(b) Draw the *structural diagram* for the following organic compounds:

1. 3-methyl pentane
2. propyne
3. methanal

SECTION B (40 Marks)

*(Attempt **any four** questions from this **Section**.)*

Question 3

(i) Rewrite the following statements by adding the correct word as shown in the example: [2]

Example:
Given Statement: Ammonia changes moist red litmus to blue.
Correct Statement: <u>Aqueous</u> ammonia changes moist red litmus to blue.

(a) Sulphuric acid acts as a dehydrating agent.

(b) Ammonia reacts with chlorine to give ammonium chloride and nitrogen.

(ii) Identify **only** the **anion** present in the following compound: [2]

(a) The compound on heating produces a colourless , odourless gas which turns lime water milky and has no effect on acidified potassium dichromate solution.

(b) The solution of the compound which on treating with concentrated sulphuric acid and freshly prepared ferrous sulphate solution produces a brown ring.

(iii) Mohan has three solutions **P**, **Q** and **R** having a pH of 13, 5 and 2 respectively. Which of the above solutions **P**, **Q** or **R**: [3]

(a) will react with Magnesium to liberate hydrogen gas?

(b) will liberate ammonia gas when it reacts with ammonium chloride?

(c) will contain molecules as well as ions?

(iv) The following table is related to an Industrial process of an acid. [3]

Name of the process	Reactant	Catalyst	Final product
(a)	$SO_2 + O_2$	(b)	(c)

Identify (a), (b) and (c).

Question 4

(i) Define the following terms: [2]

(a) Molar volume

(b) Normal salt

(ii) Draw the *electron dot* structure of: [2]

(a) Methane molecule

(b) Nitrogen molecule

[Atomic number: N = 7, C = 6, H = 1]

(iii) Complete and balance the following equations: [3]

(a) $Al_2O_3 + NaOH \rightarrow$

(b) $C_2H_5COONa + NaOH \xrightarrow[CaO]{\Delta}$

(c) $C_2H_4Br_2 +$ alcoholic $KOH \xrightarrow{\Delta}$

(iv) Choose the organic compound from the list given below to answer the following questions: [3]

Ethene	Ethanoic acid	Ethanol	Methanal

(a) The compound which does **not** have a double bond in its structure.

(b) The compound which in its pure form turns into an ice like solid on cooling.

(c) The compound which is used for artificial ripening of fruits.

Question 5

(i) Name the **main metal** used in making of the alloys given below: [2]

(a) Duralumin

(b) Stainless steel

(ii) Differentiate between the following pairs based on the criteria given: [2]

(a) Sulphuric acid and Nitric acid *(using barium chloride solution)*

(b) Unsaturated and Saturated hydrocarbons *(type of bond present)*

(iii) Calcium carbonate reacts with dilute hydrochloric acid as given below: [3]

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$$

(a) What is the mass of 5 moles of calcium carbonate?*(Relative molecular mass of calcium carbonate is 100)*

(b) How many moles of HCl will react with 5 moles of calcium carbonate?

(c) What is the volume of carbon dioxide liberated at S.T.P. at the same time?

(iv) Identify the *gas evolved* in each of the following reactions: [3]

(a) Methane undergoes complete combustion.

(b) Copper carbonate is heated.

(c) MnO_2 reacts with concentrated HCl.

Question 6

(i) **X -** $HCl \leftrightharpoons H^{1+} + Cl^{-}$ *(in solution state)* [2]

Y - $PbBr_2 \leftrightharpoons Pb^{2+} + 2Br^{1-}$ *(in molten state)*

From the above reactions **X** or **Y**, identify the reaction which exhibits:

(a) electrolytic dissociation

(b) ionization

(ii) Give reasons for the following: [2]

(a) Inert gases do not form ions.

(b) Covalent compounds have a low melting and boiling point.

(iii) Arrange the following as per the instructions given in the brackets: [3]

(a) Carbon, Fluorine, Beryllium *(decreasing order of atomic size)*

(b) Sulphuric acid, Phosphoric acid, Acetic acid *(increasing order of number of replaceable H atoms per molecule)*

(c) Potassium, Lithium, Sodium *(increasing order of ionization potential)*

(iv) Identify the following: [3]

(a) An element in period 1 which can be placed in both group 1 and group 17 of the Periodic Table.

(b) The element having electronic configuration 2, 8, 6.

(c) The most electronegative element of period 3.

Question 7

(i) Rita was given an unknown salt for identification. She prepared a solution of the salt and divided it into two parts. [2]

- To the first part of the salt solution, she added a few drops of ammonium hydroxide and obtained a reddish-brown precipitate.
- To the second part of the salt solution, she added a few drops of silver nitrate solution and obtained a white precipitate.

Name:

(a) the cation present and

(b) the anion present in the salt given for identification.

(ii) Fill in the blanks by choosing the correct answer from the bracket: [2]

(a) Carbon tetrachloride is a _____ *[polar / non-polar]* covalent molecule.

(b) During electrolysis of acidulated water, the gas liberated at the anode is _____ *[oxygen / hydrogen]*.

(iii) Ammonia burns in oxygen as shown below. [3]

$$4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$$

If 240 cc of ammonia is burnt in 300 cc of oxygen, find out the composition of the resultant gaseous mixture at room temperature.

(iv) The following table shows the electronic configuration of the atoms A, B, C and D. [3]

Element	A	B	C	D
Electronic configuration	2, 8, 8, 2	2, 6	2, 8, 7	2, 4

(a) Write the formula of the compound formed between:

1. A and B
2. D and C

(b) Which of the above elements will exhibit catenation?

Question 8

(i) Choose the correct answer from the list given below: [2]

zinc blende, C_2H_2, calamine, CH, haematite

(a) The ore which can be concentrated by magnetic separation.

(b) Empirical formula of Ethyne.

(ii) Give balanced equation for the following reactions: [2]

(a) Copper reacts with concentrated Nitric acid.

(b) Aluminium nitride is treated with warm water.

(iii) Match the salts underlined in Column A with the most suitable method of preparation given in Column B. [3]

	Column A		**Column B**
(a)	$\underline{ZnCl_2}$ from Zn	1.	Precipitation
(b)	$\underline{KNO_3}$ from KOH	2.	Direct combination
(c)	$\underline{CaCO_3}$ from $CaCl_2$	3.	Displacement reaction
		4.	Neutralization

(iv) Hydrogen chloride gas is prepared in the laboratory by the action of concentrated sulphuric acid on sodium chloride. [3]

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

(b) State the method of collection of the gas formed above.

(c) What is the property of sulphuric acid that makes it a suitable reagent for the reaction?

2023

CHEMISTRY

(SCIENCE PAPER – 2)

Maximum Marks: 80

Time allowed: Two hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during 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 or parts of questions are given in brackets [ ].

SECTION A (40 Marks)

*(Attempt **all** questions from this **Section**.)*

Question 1

Choose the correct answers to the questions from the given options. [15]

(Do not copy the questions, write the correct answers only.)

(i) An element in period **3**, whose electron *affinity* is *zero*:

(a) Neon

(b) Sulphur

(c) Sodium

(d) Argon

(ii) An element with the *largest* atomic radius among the following is:

(a) Carbon

(b) Nitrogen

(c) Lithium

(d) Beryllium

(iii) The compound that is **not** an ore of aluminium:

(a) Cryolite

(b) Corundum

(c) Fluorspar

(d) Bauxite

(iv) The vapour density of CH_3OH is _____. (At. Wt. C=12, H=1, O=16)

(a) 32

(b) 18

(c) 16

(d) 34

(v) Which of the following reactions takes place at the anode during the electroplating of an article with silver?

(a) $Ag - 1e^- \rightarrow Ag^{1+}$

(b) $Ag + 1e^- \rightarrow Ag^{1-}$

(c) $Ag - 1e^- \rightarrow Ag$

(d) None of the above

(vi) The metallic hydroxide which forms a deep inky blue solution with excess ammonium hydroxide solution is:

(a) $Fe(OH)_2$

(b) $Cu(OH)_2$

(c) $Ca(OH)_2$

(d) $Fe(OH)_3$

(vii) An example of a cyclic organic compound is:

(a) Propene

(b) Pentene

(c) Butene

(d) Benzene

(viii) In the laboratory preparation, HCl gas is dried by passing through:

(a) dilute nitric acid

(b) concentrated sulphuric acid

(c) dilute sulphuric acid

(d) acidified water

(ix) The nitrate which on thermal decomposition leaves behind a residue which is yellow when hot and white when cold:

(a) Lead nitrate

(b) Ammonium nitrate

(c) Copper nitrate

(d) Zinc nitrate

(x) The salt formed when concentrated sulphuric acid reacts with KNO_3 above 200°C:

(a) K_2SO_4

(b) K_2SO_3

(c) $KHSO_4$

(d) $KHSO_3$

(xi) The property exhibited by concentrated sulphuric acid when it is used to prepare hydrogen chloride gas from potassium chloride:

(a) Dehydrating property

(b) Drying property

(c) Oxidizing property

(d) Non-volatile acid property

(xii) The hydrocarbon formed when sodium propanoate and soda lime are heated together:

(a) Methane

(b) Ethane

(c) Ethene

(d) Propane

(xiii) The acid which does **not** form acid salt by a basic radical:

(a) H_2CO_3

(b) H_3PO_4

(c) H_2SO_4

(d) CH_3COOH

(xiv) The general formula of hydrocarbons with single covalent bonds is:

(a) C_nH_{2n+2}

(b) C_nH_{2n}

(c) C_nH_{2n-2}

(d) C_nH_{2n-6}

(xv) The indicator which changes to pink colour in an alkaline solution is:

(a) Blue Litmus

(b) Methyl Orange

(c) Red Litmus

(d) Phenolphthalein

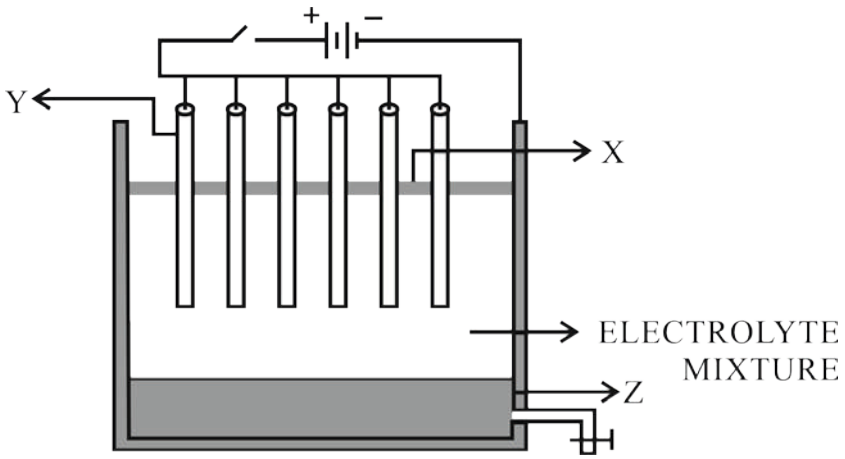
Question 2

(i) Match the *Column A* with *Column B*: [5]

Column A		Column B
(a) Sodium Chloride	1.	has two shared pair of electrons
(b) Methane	2.	has high melting and boiling points
(c) Hydrogen chloride gas	3.	a greenhouse gas
(d) Oxidation reaction	4.	has low melting and boiling points
(e) Water	5.	$Zn - 2e^- \rightarrow Zn^{2+}$
	6.	$S + 2e^- \rightarrow S^{2-}$

(ii) The following sketch illustrates the process of conversion of **Alumina** to Aluminium: [5]

Study the diagram and answer the following:



(a) Name the constituent of the electrolyte mixture which has a divalent metal in it.

(b) Name the powdered substance **'X'** sprinkled on the surface of the electrolyte mixture.

(c) What is the name of the process?

(d) Write the reactions taking place at the electrodes **'Y'** (anode) and **'Z'** (cathode) respectively.

(iii) Fill in the blanks with the *choices* given in the brackets: [5]

(a) Metals are good _____. [*oxidizing agents / reducing agents*]

(b) Non-polar covalent compounds are _____ [*good / bad*] conductors of heat and electricity.

(c) Higher the pH value of a solution, the more _____ [*acidic / alkaline*] it is.

(d) _____, [*Silver chloride /Lead chloride*] is a white precipitatethat is soluble in excess of Ammonium hydroxide solution.

(e) Conversion of ethene to ethane is an example of _____. [*hydration / hydrogenation*]

(iv) **State the terms / process** for the following: [5]

(a) The energy released when an atom in the gaseous state accepts an electron to form an anion.

(b) Tendency of an element to form *chains* of identical atoms.

(c) The name of the process by which *Ammonia* is manufactured on a large scale.

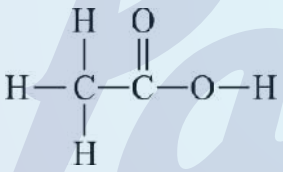
(d) A type of salt formed by partial replacement of hydroxyl radicals with an acid radical.

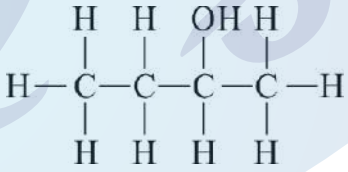
(e) The ratio of the mass of a certain volume of gas to the same volume of hydrogen measured under the same conditions of temperature and pressure.

(v) (a) Give the *structural formula* of the following organic compounds: [5]

1. 2-chlorobutane
2. Methanal
3. But-2-yne

(b) Give the IUPAC name of the following organic compounds:

1. 

2. 

SECTION B (40 Marks)

*(Attempt **any four** questions from this **Section**.)*

Question 3

(i) Identify the **cation** in each of the following cases: [2]

(a) Ammonium hydroxide solution when added to Solution **B** gives a white precipitate which does not dissolve in excess of ammonium hydroxide solution.

(b) Sodium hydroxide solution when added to Solution **C** gives a white precipitate which is insoluble in excess of sodium hydroxide solution.

(ii) Fill in the blanks by choosing the correct answer from the brackets: [2]

(a) During electrolysis, the compound _____ in its molten state liberates reddish brown fumes at the anode. [$NaCl$ / $PbBr_2$]

(b) The ion which could be discharged most readily during electrolysis is _____. [Fe^{2+} / Cu^{2+}]

(iii) Arrange the following as per the instruction given in the brackets: [3]

(a) Al, K, Mg, Ca (*decreasing order of its reactivity*)

(b) N, Be, O, C (*increasing order of non-metallic character*)

(c) P, Si, F, Be (*decreasing order of valence electrons*)

(iv) Complete and *balance* the following equations: [3]

(a) $NH_4Cl + Ca(OH)_2 \rightarrow$

(b) $CuSO_4 + NH_4OH \rightarrow$

(c) $Cu +$ Conc. $HNO_3 \rightarrow$

Question 4

(i) State a *relevant reason* for the following: [2]

(a) Hydrogen chloride gas cannot be dried over quick lime.

(b) Ammonia gas is not collected over water.

(ii) Identify the **alloy** in each case from the given composition: [2]

(a) aluminium, magnesium, manganese, copper

(b) iron, nickel, chromium, carbon

(iii) Solve the following *numerical* problem. [3]

Ethane burns in oxygen according to the chemical equation:

$$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$$

If 80 ml of ethane is burnt in 300 ml of oxygen, find the composition of the resultant gaseous mixture when measured at room temperature.

(iv) The following questions are pertaining to the laboratory preparation of **Ammonia gas** from **Magnesium nitride**: [3]

(a) Write a balanced chemical equation for its preparation.

(b) Why is this method seldom used?

(c) How do you identify the *gas* formed?

Question 5

(i) Write *one use* of the following *alloys*: [2]

(a) Bronze

(b) Fuse metal

(ii) Draw the *electron* dot structure for the following: [2]

(a) Ammonium ion

(b) A molecule of nitrogen

[At. No.: N =7, H = 1]

(iii) Give a *balanced chemical* equation for the following conversions with conditions: [3]

(a) Ethene from ethanol

(b) Ethyne from calcium carbide

(c) Monochloromethane from methane

(iv) Study the following *observations* and name the **anions** present in each of the reactions. [3]

(a) When a crystalline solid **'P'** is warmed with concentrated H_2SO_4 and copper turnings a *reddish brown* gas is released.

(b) When few drops of dilute sulphuric acid is added to salt **'R'** and heated, a colourless gas is released which turns moist lead acetate paper *silvery black*.

(c) When few drops of barium nitrate solution is added to the salt solution **'Q'**, a *white precipitate* is formed which is insoluble in HCl.

Question 6

(i) Define / State: [2]

(a) Electronegativity

(b) Gay-Lussac's Law of combining volumes

(ii) The *Empirical* formula of an organic compound is $CHCl_2$. [2]

If its relative molecular mass is 168, what is its molecular formula?

[At. Wt. C = 12, H = 1, Cl = 35.5]

(iii) Choose the substances given in the box below to answer the following questions: [3]

Iron	Magnesium sulphite	Zinc	Sodium sulphide
Lead	Ferric chloride	Copper	Ferrous sulphate

(a) The metal that will **not** produce hydrogen gas when reacted with dilute acids.

(b) The compound that will produce sulphur dioxide gas when reacted with dilute HCl.

(c) The solution of this compound produces dirty green precipitate with NaOH.

(iv) State one *relevant observation* for each of the following: [3]

(a) To the copper nitrate solution, initially few drops of sodium hydroxide solution is added and then added in excess.

(b) Burning of ammonia in excess of oxygen.

(c) Dry ammonia gas is passed over heated PbO.

Question 7

(i) Name the following: [2]

(a) Organic compounds with *same* molecular formula but *different* structural formula.

(b) Group of organic compounds where the **successive members** follow a regular structural pattern, successive compounds differ by a **'CH_2'** group.

(ii) Give reason for the following: [2]

(a) Ionisation potential decreases down a group.

(b) Ionic compounds do not conduct electricity in solid state.

(iii) Calculate: [3]

(a) The *percentage* of phosphorus in the fertilizer super phosphate $Ca(H_2PO_4)_2$ correct to 1 decimal point. [At. Wt. H=1, P=31, O=16, Ca=40]

(b) Write the empirical formula of C_8H_{18}.

(iv) Answer the following questions with reference to electrorefining of copper: [3]

(a) What is the anode made of?

(b) What do you observe at the cathode?

(c) Write the reaction taking place at the cathode.

Question 8

(i) Arrange the following according to the *instructions* given in *brackets*: [2]

(a) C_2H_2, C_3H_6, CH_4, C_2H_4 (*In the increasing order of the molecular weight*)

(b) Cu^{2+}, Na^+, Zn^{2+}, Ag^+ (*The order of Preferential discharge at the cathode*)

(ii) Differentiate between the *following pairs* based on the *criteria* given in the *brackets*: [2]

(a) Cane sugar and hydrated copper sulphate [*using concentrated* H_2SO_4]

(b) Sulphuric acid and hydrochloric acid [*type of salts formed*]

(iii) Convert the following reactions into a *balanced chemical equation*: [3]

(a) Ammonia to nitric oxide using oxygen and platinum catalyst.

(b) Sodium hydroxide to sodium sulphate using sulphuric acid.

(c) Ferrous sulphide to hydrogen sulphide using hydrochloric acid.

(iv) Choose the answer from the *list* which *fits* in the *description*: [3]

[CCl_4, PbO, NaCl, CuO, NH_4Cl]

(a) A compound which undergoes thermal dissociation.

(b) An amphoteric oxide.

(c) A compound which is a non-electrolyte.

CHEMISTRY

SCIENCE Paper – 2

(Two hours)

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 I** is compulsory. Attempt **any four** questions from **Section II**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION I (40 Marks)

*Attempt **all** questions from this Section*

Question 1

(a) Choose the correct answer from the options given below: [5]

(i) The element with *highest* ionization potential, is:

A. Hydrogen
B. Caesium
C. Radon
D. Helium

(ii) The *inert* electrode used in the electrolysis of acidified water, is:

A. Nickel
B. Platinum
C. Copper
D. Silver

(iii) A compound with *low* boiling point, is:

A. Sodium chloride

B. Calcium chloride

C. Potassium chloride

D. Carbon tetrachloride

(iv) The *acid* which can produce carbon from cane sugar, is:

A. Concentrated Hydrochloric acid

B. Concentrated Nitric acid

C. Concentrated Sulphuric acid

D. Concentrated Acetic acid

(v) The organic compound having a *triple* carbon-carbon covalent bond, is:

A. C_3H_4

B. C_3H_6

C. C_3H_8

D. C_4H_{10}

(b) State *one relevant observation* for each of the following reactions: [5]

(i) Action of concentrated nitric acid on copper.

(ii) Addition of excess ammonium hydroxide into copper sulphate solution.

(iii) A piece of sodium metal is put into ethanol at room temperature.

(iv) Zinc carbonate is heated strongly.

(v) Sulphide ore is added to a tank containing oil and water, and then stirred or agitated with air.

(c) Write a balanced chemical equation for each of the following: [5]

(i) Reaction of carbon powder and concentrated nitric acid.

(ii) Reaction of excess ammonia with chlorine.

(iii) Reaction of lead nitrate solution with ammonium hydroxide.

(iv) Producing ethane from bromo ethane using Zn / Cu couple in alcohol.

(v) Complete combustion of ethane.

(d) (i) Draw the structural formula for each of the following: [5]

1. 2,2 dimethyl pentane
2. methanol
3. Iso propane

(ii) Write the IUPAC name for the following compounds:

1. acetaldehyde
2. acetylene

(e) State one relevant reason for each of the following: [5]

(i) Graphite anode is preferred to platinum in the electrolysis of molten lead bromide.

(ii) Soda lime is preferred to sodium hydroxide in the laboratory preparation of methane.

(iii) Hydrated copper sulphate crystals turn white on heating.

(iv) Concentrated nitric acid appears yellow, when it is left for a while in a glass bottle.

(v) Hydrogen chloride gas fumes in moist air.

(f) Calculate: [5]

(i) The amount of each reactant required to produce 750 ml of carbon dioxide, when two volumes of carbon monoxide combine with one volume of oxygen to produce two volumes of carbon dioxide.

$$2CO + O_2 \rightarrow 2CO_2$$

(ii) The volume occupied by 80 g of carbon dioxide at STP.

(iii) Calculate the number of molecules in 4.4 gm of CO_2.
[Atomic mass of C= 12, O=16]

(iv) State the law associated in question no. (f)(i) above.

(g) Give *one word or a phrase* for the following statements: [5]

(i) The chemical bond formed by a shared pair of electrons, each bonding atom contributing one electron to the pair.

(ii) Electrode used as cathode in electrorefining of impure copper.

(iii) The substance prepared by adding other metals to a base metal in appropriate proportions to obtain certain desirable properties.

(iv) The tendency of an atom to attract electrons to itself when combined in a compound.

(v) The reaction in which carboxylic acid reacts with alcohol in the presence of conc. H_2SO_4 to form a substance having a fruity smell.

(h) Fill in the blanks from the choices given in brackets: [5]

(i) The polar covalent compound in gaseous state that does not conduct electricity is _____.

(carbon tetra chloride, ammonia, methane)

(ii) A salt prepared by displacement reaction is _____.

(ferric chloride, ferrous chloride, silver chloride)

(iii) The number of moles in 11gm of nitrogen gas is _____.

(0.39, 0.49, 0.29) [atomic mass of N=14]

(iv) An alkali which completely dissociates into ions is _____.

(ammonium hydroxide, calcium hydroxide, lithium hydroxide)

(v) An alloy used to make statues is_____.

(bronze, brass, fuse metal)

SECTION II (40 Marks)

*Attempt **any four** questions from this Section*

Question 2

(a) The following table represent the elements and the atomic number. [3]

With reference to this, answer the following using only the alphabets given in the table.

Element	Atomic number
P	13
Q	7
R	10

(i) Which element combines with hydrogen to form a basic gas?

(ii) Which element has an electron affinity zero?

(iii) Name the element, which forms an ionic compound with chlorine.

(b) Draw the electron dot diagram for the compounds given below. Represent the electrons by (**.**) and (**x**) in the diagram. [3]

[Atomic No.: Ca = 20, O = 8, Cl = 17, H = 1]

(i) Calcium oxide

(ii) Chlorine molecule

(iii) Water molecule

(c) Choose the correct word which refers to the process of electrolysis from A to E, to match the description (i) to (iv): [4]

A: Oxidation B: Cathode C: Anode D: An electrolyte E: Reduction

(i) Conducts electricity in aqueous or in molten state.

(ii) Loss of electron takes place at anode.

(iii) A reducing electrode.

(iv) Electrode connected to the positive end or terminal of the battery.

Question 3

(a) Baeyer's process is used to concentrate bauxite ore to alumina. [3]

Give balanced chemical equations for the reaction taking place for its conversion from bauxite to alumina.

(b) Complete the following by selecting the *correct option* from the choices given: [3]

(i) pH of acetic acid is greater than dilute sulphuric acid. So acetic acid contains _____ concentration of H^+ ions. *(greater, same, low)*

(ii) The indicator which does not change colour on passage of HCl gas is _____. *(methyl orange, moist blue litmus, phenolphthalein)*

(iii) The acid which cannot act as an oxidizing agent is _____. *(conc. H_2SO_4, conc. HNO_3, conc. HCl)*

(c) Match the gases given in column I to the identification of the gases mentioned in column II: [4]

Column I	Column II
(i) Hydrogen sulphide	A. Turns acidified potassium dichromate solution green.
(ii) Nitric oxide	B. Turns lime water milky.
(iii) Carbon dioxide	C. Turns reddish brown when it reacts with oxygen.
(iv) Sulphur dioxide	D. Turns moist lead acetate paper silvery black.

Question 4

(a) Differentiate between the following pairs based on the information given in the brackets. [3]

(i) Conductor and electrolyte (conducting particles)

(ii) Cations and anions (formation from an atom)

(iii) Acid and Alkali (formation of type of ions)

(b) Draw the structures of isomers of pentane. [3]

(c) Hydrogen chloride gas is prepared in the laboratory using concentrated sulphuric acid and sodium chloride. Answer the questions that follow based on this reaction: [4]

(i) Give the balanced chemical equation for the reaction with suitable condition(s) if any.

(ii) Why is concentrated sulphuric acid used instead of concentrated nitric acid?

(iii) How is the gas collected?

(iv) Name the drying agent not used for drying the gas.

Question 5

(a) Distinguish between the following pairs of compounds using a reagent as a chemical test: [3]

(i) Calcium nitrate and Zinc nitrate solution.

(ii) Ammonium sulphate crystals and Sodium sulphate crystals.

(iii) Magnesium chloride and Magnesium nitrate solution.

(b) Calculate the percentage of: [3]

(i) Fluorine

(ii) Sodium and

(iii) Aluminium

in sodium aluminium fluoride $[Na_3AlF_6]$, to the nearest whole number.
[Atomic Mass: Na = 23, Al= 27, F= 19]

(c) (i) State the volume occupied by 40 gm of methane at STP, if its vapour density (V.D.) is 8. [4]

(ii) Calculate the number of moles present in 160 gm of NaOH.
[Atomic Mass: Na = 23, H= 1, O= 16]

Question 6

(a) Identify the salts **P, Q, R** from the following observations: [3]

(i) Salt **P** has light bluish green colour. On heating, it produces a black coloured residue. Salt **P** produces brisk effervescence with dil. HCl and the gas evolved turns lime water milky, but no action with acidified potassium dichromate solution.

(ii) Salt **Q** is white in colour. On strong heating, it produces buff yellow residue and liberates reddish brown gas. Solution of salt **Q** produces chalky white insoluble precipitate with excess of ammonium hydroxide.

(iii) Salt **R** is black in colour. On reacting with concentrated HCl, it liberates a pungent greenish yellow gas which turns moist starch iodide paper blue black.

(b) Identify the substance underlined in each of the following: [3]

(i) The <u>electrode</u> that increases in mass during the electro-refining of silver.

(ii) The <u>acid</u> that is a dehydrating as well as a drying agent.

(iii) The <u>catalyst</u> used to oxidize ammonia into nitric oxide.

(c) Copy and complete the following paragraph using the options given in brackets: [4]

Alkenes are a homologous series of (i) _____ (saturated / unsaturated) hydrocarbons characterized by the general formula (ii) _____ (C_nH_{2n+2} / C_nH_{2n}). Alkenes undergo (iii) _____ (addition / substitution) reactions and also undergo (iv) _____ (hydrogenation / dehydrogenation) to form alkanes.

Question 7

(a) Write balanced chemical equations, for the preparation of the given salts (i) to (iii) by using the methods A to C respectively: [3]

A: Neutralization *B: Precipitation* *C: Titration*

(i) Copper sulphate

(ii) Zinc carbonate

(iii) Ammonium sulphate

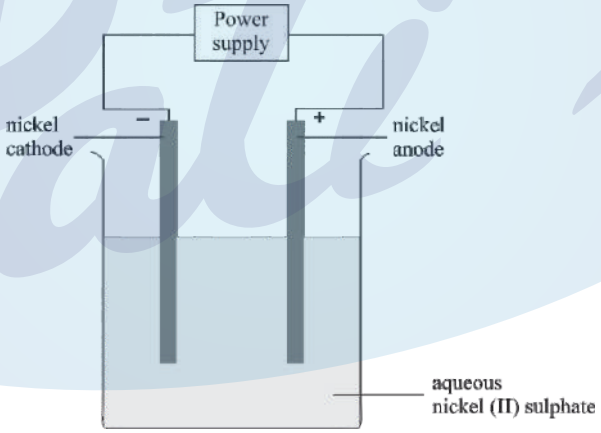
(b) Name the following elements: [3]

(i) An alkaline earth metal present in group 2 and period 3.

(ii) A trivalent metal used to make light tools.

(iii) A monovalent non-metal present in fluorspar.

(c) An aqueous solution of nickel (II) sulphate was electrolyzed using nickel electrodes. Observe the diagram and answer the questions that follow: [4]



(i) What do you observe at the **cathode** and **anode** respectively?

(ii) Name the cation that remains as a spectator ion in the solution.

(iii) Which equation for the reaction at the anode is correct?

1. $Ni \rightarrow Ni^{2+} + 2e^-$
2. $Ni + 2e^- \rightarrow Ni^{2+}$
3. $Ni^{2+} \rightarrow Ni + 2e^-$
4. $Ni^{2+} + 2e^- \rightarrow Ni$

CHEMISTRY

SCIENCE Paper – 2

(Two hours)

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***Section I** is compulsory. Attempt **any four** questions from **Section II**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION I (40 Marks)

*Attempt **all** questions from this Section*

Question 1

(a) Choose the correct answer from the options given below: [5]

(i) An *electrolyte* which completely dissociates into ions is:

A. Alcohol

B. Carbonic acid

C. Sucrose

D. Sodium hydroxide

(ii) The most *electronegative element* from the following elements is:

A. Magnesium

B. Chlorine

C. Aluminium

D. Sulphur

(iii) The reason for using *Aluminium* in the alloy duralumin is:

A. Aluminium is brittle.

B. Aluminium gives strength.

C. Aluminium brings lightness.

D. Aluminium lowers melting point.

(iv) The *drying agent* used to *dry HCl* gas is:

A. Conc. H_2SO_4

B. ZnO

C. Al_2O_3

D. CaO

(v) A hydrocarbon which is a *greenhouse gas* is:

A. Acetylene

B. Ethylene

C. Ethane

D. Methane

(b) Fill in the blanks with the choices given in brackets: [5]

(i) Conversion of *ethanol to ethene* by the action of *concentrated sulphuric acid* is an example of _____. (dehydration / dehydrogenation / dehydrohalogenation)

(ii) When *sodium chloride* is heated with *concentrated sulphuric* acid *below* 200^oC, one of the products formed is _____. (sodium hydrogen sulphate / sodium sulphate / chlorine)

(iii) *Ammonia* reacts with *excess chlorine* to form _____. (nitrogen / nitrogen trichloride / ammonium chloride)

(iv) *Substitution reactions* are characteristic reactions of _____. (alkynes / alkenes / alkanes)

(v) In Period 3, the *most metallic* element is _____. (sodium / magnesium / aluminium)

(c) Write a balanced chemical equation for each of the following reactions: [5]

(i) Reduction of copper (II) oxide by hydrogen.

(ii) Action of dilute sulphuric acid on sodium hydroxide.

(iii) Action of dilute sulphuric acid on zinc sulphide.

(iv) Ammonium hydroxide is added to ferrous sulphate solution.

(v) Chlorine gas is reacted with ethene.

(d) State one observation for each of the following: [5]

(i) Concentrated nitric acid is reacted with sulphur.

(ii) Ammonia gas is passed over heated copper (II) oxide.

(iii) Copper sulphate solution is electrolysed using copper electrodes.

(iv) A small piece of zinc is added to dilute hydrochloric acid.

(v) Lead nitrate is heated strongly in a test tube.

(e) (i) Calculate: [5]

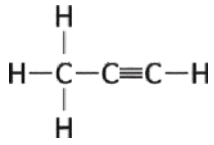
1. The number of moles in 12g of oxygen gas. [O = 16]

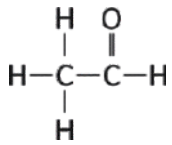
2. The weight of 10^{22} atoms of carbon.

[C = 12, Avogadro's No. = 6 x 10^{23}]

(ii) Molecular formula of a compound is $C_6H_{18}O_3$. Find its empirical formula.

(f) (i) Give the IUPAC name of the following organic compounds: [5]

1. 

2. 

(ii) What is the special feature of the structure of ethyne?

(iii) Name the saturated hydrocarbon containing two carbon atoms.

(iv) Give the structural formula of Acetic acid.

(g) Give the appropriate term defined by the statements given below: [5]

(i) The formula that represents the simplest ratio of the various elements present in one molecule of the compound.

(ii) The substance that releases hydronium ion as the only positive ion when dissolved in water.

(iii) The tendency of an atom to attract electrons towards itself when combined in a covalent compound.

(iv) The process by which certain ores, specially carbonates, are converted to oxides in the absence of air.

(v) The covalent bond in which the electrons are shared equally between the combining atoms.

(h) Arrange the following according to the instructions given in brackets: [5]

(i) K, Pb, Ca, Zn. (In the increasing order of the reactivity)

(ii) Mg^{2+}, Cu^{2+}, Na^{1+}, H^{1+} (In the order of preferential discharge at the cathode)

(iii) Li, K, Na, H (In the decreasing order of their ionization potential)

(iv) F, B, N, O (In the increasing order of electron affinity)

(v) Ethane, methane, ethene, ethyne. (In the increasing order of the molecular weight) [H = 1, C = 12]

SECTION II (40 Marks)

*Attempt **any four** questions from this Section*

Question 2

(a) Draw the electron dot structure of: [3]

(i) Nitrogen molecule [N = 7]

(ii) Sodium chloride [Na = 11, Cl = 17]

(iii) Ammonium ion [N = 7, H = 1]

(b) The pH values of three solutions A, B and C are given in the table. Answer the following questions: [3]

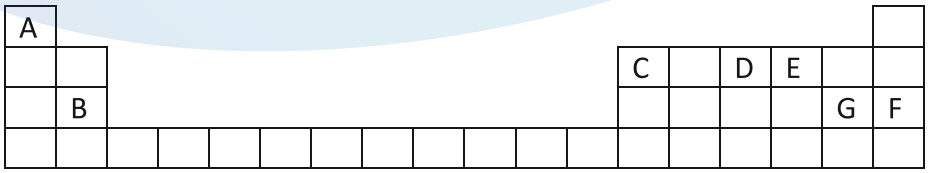
Solution	pH value
A	12
B	2
C	7

(i) Which solution will have no effect on litmus solution?

(ii) Which solution will liberate CO_2 when reacted with sodium carbonate?

(iii) Which solution will turn red litmus solution blue?

(c) Study the extract of the Periodic Table given below and answer the questions that follow. Give the alphabet corresponding to the element in question. DO NOT repeat an element. [4]



(i) Which element forms electrovalent compound with G?

(ii) The ion of which element will migrate towards the cathode during electrolysis?

(iii) Which non-metallic element has the valency of 2?

(iv) Which is an inert gas?

Question 3

(a) Name the particles present in: [3]

(i) Strong electrolyte

(ii) Non- electrolyte

(iii) Weak electrolyte

(b) Distinguish between the following pairs of compounds using the reagent given in the bracket. [3]

(i) Manganese dioxide and copper (II) oxide. (using concentrated HCl)

(ii) Ferrous sulphate solution and ferric sulphate solution. (using sodium hydroxide solution)

(iii) Dilute hydrochloric acid and dilute sulphuric acid. (using lead nitrate solution)

(c) Choose the method of preparation of the following salts, from the methods given in the list: [4]

[List: A. Neutralization B. Precipitation

C. Direct combination D. Substitution]

(i) Lead chloride

(ii) Iron (II) sulphate

(iii) Sodium nitrate

(iv) Iron (III) chloride

Question 4

(a) Complete the following equations: [3]

(i) $S + \text{conc. } HNO_3 \rightarrow$

(ii) $C + \text{conc. } H_2SO_4 \rightarrow$

(iii) $Cu + \text{dil. } HNO_3 \rightarrow$

(b) Write a balanced chemical equation for the preparation of: [3]

(i) Ethene from bromoethane

(ii) Ethyne using calcium carbide

(iii) Methane from sodium acetate.

(c) Name the following organic compounds: [4]

(i) The compound with 3 carbon atoms whose functional group is a carboxyl.

(ii) The first homologue whose general formula is C_nH_{2n}.

(iii) The compound that reacts with acetic acid to form ethyl ethanoate.

(iv) The compound formed by complete chlorination of ethyne.

Question 5

(a) Give the chemical formula of: [3]

(i) Bauxite

(ii) Cryolite

(iii) Sodium aluminate

(b) Answer the following questions based on the extraction of aluminium from alumina by **Hall-Heroult's Process**.: [3]

(i) What is the function of cryolite used along with alumina as the electrolyte?

(ii) Why is powdered coke sprinkled on top of the electrolyte?

(iii) Name the electrode, from which aluminium is collected.

(c) Match the alloys given in column I to the uses given in column II: [4]

COLUMN I	COLUMN II
(i) Duralumin	A. Electrical fuse
(ii) Solder	B. Surgical instruments
(iii) Brass	C. Aircraft body
(iv) Stainless Steel	D. Decorative articles

Question 6

(a) Identify the substances underlined: [3]

(i) The catalyst used to oxidise ammonia.

(ii) The organic compound which when solidified, forms an ice like mass.

(iii) The dilute acid which is an oxidizing agent.

(b) Copper sulphate solution reacts with sodium hydroxide solution to form a precipitate of copper hydroxide according to the equation: [3]

$$2NaOH + CuSO_4 \rightarrow Na_2SO_4 + Cu(OH)_2 \downarrow$$

(i) What mass of copper hydroxide is precipitated by using 200 gm of sodium hydroxide?

[H = 1, O = 16, Na = 23, S = 32, Cu = 64]

(ii) What is the colour of the precipitate formed?

(c) Find the **empirical formula** and the **molecular formula** of an organic compound from the data given below: [4]

C = 75.92%, H = 6.32% and N = 17.76%

The vapour density of the compound is 39.5.

[C = 12, H = 1, N = 14]

Question 7

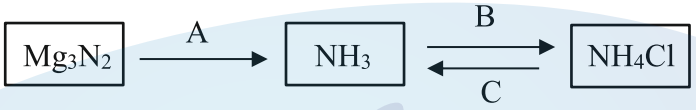
(a) Name the gas evolved in each of the following cases: [3]

(i) Alumina undergoes electrolytic reduction.

(ii) Ethene undergoes hydrogenation reaction.

(iii) Ammonia reacts with heated copper oxide.

(b) Study the flow chart given and give balanced equations to represent the reactions **A, B** and **C**: [3]



(c) Copy and complete the following table which refers to the **industrial method for the preparation** of ammonia and sulphuric acid: [4]

Name of the compound	Name of the process	Catalytic equation (with the catalyst)
Ammonia	(i)_____	(ii)_____
Sulphuric acid	(iii)_____	(iv)_____

CHEMISTRY

SCIENCE Paper – 2

(Two hours)

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The intended marks for questions or parts of questions are given in brackets [ ].

SECTION I (40 Marks)

*Attempt **all** questions from this Section*

Question 1

(a) Choose the correct answer from the options given below: [5]

(i) The salt solution which does not react with *ammonium hydroxide* is:

A. Calcium Nitrate

B. Zinc Nitrate

C. Lead Nitrate

D. Copper Nitrate

(ii) The organic compound which undergoes *substitution reaction* is:

A. C_2H_2

B. C_2H_4

C. $C_{10}H_{18}$

D. C_2H_6

(iii) The *electrolysis of acidified water* is an example of:

A. Reduction

B. Oxidation

C. Redox reaction

D. Synthesis

(iv) The *IUPAC* name of dimethyl ether is:

A. Ethoxy methane

B. Methoxy methane

C. Methoxy ethane

D. Ethoxy ethane

(v) The catalyst used in the *Contact Process* is:

A. Copper

B. Iron

C. Vanadium pentoxide

D. Manganese dioxide

(b) Give **one word** or a **phrase** for the following statements: [5]

(i) The energy released when an electron is added to a neutral gaseous isolated atom to form a negatively charged ion.

(ii) Process of formation of ions from molecules which are not in ionic state.

(iii) The tendency of an element to form chains of identical atoms.

(iv) The property by which certain hydrated salts, when left exposed to atmosphere, lose their water of crystallization and crumble into powder.

(v) The process by which sulphide ore is concentrated.

(c) Write a *balanced chemical equation* for each of the following: [5]

(i) Action of concentrated sulphuric acid on carbon.

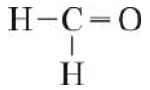
(ii) Reaction of sodium hydroxide solution with iron (III) chloride solution.

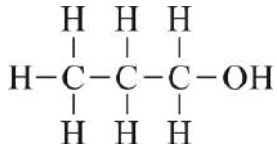
(iii) Action of heat on aluminum hydroxide.

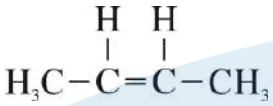
(iv) Reaction of zinc with potassium hydroxide solution.

(v) Action of dilute hydrochloric acid on magnesium sulphite.

(d) (i) Give the IUPAC name for each of the following: [5]

1. 

2. 

3. 

(ii) Write the structural formula of the two isomers of butane.

(e) State one *relevant observation* for each of the following: [5]

(i) Lead nitrate solution is treated with sodium hydroxide solution drop wise till it is in excess.

(ii) At the anode, when molten lead bromide is electrolyzed using graphite electrodes.

(iii) Lead nitrate solution is mixed with dilute hydrochloric acid and heated.

(iv) Anhydrous calcium chloride is exposed to air for some time.

(v) Barium chloride solution is slowly added to sodium sulphate solution.

(f) Give *a reason* for each of the following: [5]

(i) Ionic compounds have a high melting point.

(ii) Inert gases do not form ions.

(iii) Ionisation potential increases across a period, from left to right.

(iv) Alkali metals are good reducing agents.

(v) Conductivity of dilute hydrochloric acid is greater than that of acetic acid.

(g) **Name the gas** that is produced in each of the following cases: [5]

(i) Sulphur is oxidized by concentrated nitric acid.

(ii) Action of dilute hydrochloric acid on sodium sulphide.

(iii) Action of cold and dilute nitric acid on copper.

(iv) At the anode during the electrolysis of acidified water.

(v) Reaction of ethanol and sodium.

(h) Fill up the blanks with the correct choice given in brackets. [5]

(i) Ionic or electrovalent compounds do not conduct electricity in their _____ state. *(fused / solid)*

(ii) Electrolysis of aqueous sodium chloride solution will form _____ at the cathode. *(hydrogen gas / sodium metal)*

(iii) Dry hydrogen chloride gas can be collected by _____ displacement of air. *(downward / upward)*

(iv) The most common ore of iron is _____. *(calamine / haematite)*

(v) The salt prepared by the method of direct combination is _____. *(iron (II) chloride / iron (III) chloride)*

SECTION II (40 Marks)

*Attempt any **four** questions from this Section*

Question 2

(a) (i) What do you understand by a lone pair of electrons? [3]

(ii) Draw the electron dot diagram of Hydronium ion. (H=1; O=8)

(b) *In Period 3 of the Periodic Table, element **B** is placed to the left of element **A**.* [3]
On the basis of this information, choose the correct word from the brackets to complete the following statements:

(i) The element **B** would have *(lower / higher)* metallic character than **A**.

(ii) The element **A** would probably have *(lesser / higher)* electron affinity than **B**.

(iii) The element **A** would have *(greater / smaller)* atomic size than **B**.

(c) Copy and complete the following table which refers to the conversion of ions to neutral particles. [4]

Conversion	Ionic Equation	Oxidation / Reduction
Chloride ion to chlorine molecule	(i) _____	(ii) _____
Lead (II) ion to lead	(iii)_____	(iv) _____

Question 3

(a) (i) Write the balanced chemical equation to prepare ammonia gas in the laboratory by using an alkali. [3]

(ii) State why concentrated sulphuric acid is not used for drying ammonia gas.

(iii) Why is ammonia gas not collected over water?

(b) (i) Name the acid used for the preparation of hydrogen chloride gas in the laboratory. Why is this particular acid preferred to other acids? [3]

(ii) Write the balanced chemical equation for the laboratory preparation of hydrogen chloride gas.

(c) For the preparation of hydrochloric acid in the laboratory: [2]

(i) Why is direct absorption of hydrogen chloride gas in water not feasible?

(ii) What arrangement is done to dissolve hydrogen chloride gas in water?

(d) For the electro-refining of copper: [2]

(i) What is the cathode made up of?

(ii) Write the reaction that takes place at the anode.

Question 4

(a) The percentage composition of a gas is: [2]

Nitrogen 82.35%, Hydrogen 17.64%.

Find the empirical formula of the gas. [N = 14, H = 1]

(b) Aluminum carbide reacts with water according to the following equation: [4]

$Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$

(i) What mass of aluminum hydroxide is formed from 12g of aluminum carbide?

(ii) What volume of methane at s.t.p. is obtained from 12g of aluminum carbide?

[Relative molecular weight of $Al_4C_3 = 144$; $Al(OH)_3 = 78$]

(c) (i) If 150 cc of gas A contains X molecules, how many molecules of gas B will be present in 75 cc of B? [2]

The gases A and B are under the same conditions of temperature and pressure.

(ii) Name the law on which the above problem is based.

(d) Name the main component of the following alloys: [2]

(i) Brass

(ii) Duralumin

Question 5

(a) Complete the following table which relates to the homologous series of hydrocarbons. [6]

General formula	IUPAC name of the homologous series	Characteristic bond type	IUPAC name of the first member of the series
C_nH_{2n-2}	(A) _____	(B)_____	(C)_____
C_nH_{2n+2}	(D)_____	(E)_____	(F)_____

(b) (i) Name the most common ore of the metal aluminum from which the metal is extracted. Write the chemical formula of the ore. [4]

(ii) Name the process by which impure ore of aluminum gets purified by using concentrated solution of an alkali.

(iii) Write the equation for the formation of aluminum at the cathode during the electrolysis of alumina.

Question 6

(a) A compound **X** (having vinegar like smell) when treated with ethanol in the presence of the acid **Z**, gives a compound **Y** which has a fruity smell. [4]

The reaction is:

$C_2H_5OH + X \xrightarrow{Z} Y + H_2O$

(i) Identify **Y** and **Z**.

(ii) Write the structural formula of **X**.

(iii) Name the above reaction.

(b) Ethane burns in oxygen to form CO_2 and H_2O according to the equation: [4]

$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$.

If 1250 cc of oxygen is burnt with 300 cc of ethane.

Calculate:

(i) the volume of CO_2 formed.

(ii) the volume of unused O_2.

(c) Three solutions P, Q and R have pH value of 3.5, 5.2 and 12.2 respectively. [2]
Which one of these is a:

(i) Weak acid?

(ii) Strong alkali?

Question 7

(a) Give a chemical test to distinguish between the following pairs of chemicals: [4]

(i) Lead nitrate solution and Zinc nitrate solution

(ii) Sodium chloride solution and Sodium nitrate solution

(b) Write a balanced equation for the preparation of each of the following salts: [2]

(i) Copper sulphate from Copper carbonate.

(ii) Zinc carbonate from Zinc sulphate.

(c) (i) What is the type of salt formed when the reactants are heated at a suitable temperature for the preparation of Nitric acid? [2]

(ii) State why for the preparation of Nitric acid, the complete apparatus is made up of glass.

(d) Which property of sulphuric acid is shown by the reaction of concentrated sulphuric acid with: [2]

(i) Ethanol?

(ii) Carbon?

CHEMISTRY

SCIENCE Paper – 2

(Two hours)

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 I** is compulsory. Attempt **any four** questions from **Section II**.*

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION I (40 Marks)

*Attempt **all** questions from this Section*

Question 1

(a) Fill in the blanks from the choices given in brackets: [5]

(i) The energy required to remove an electron from a neutral isolated gaseous atom and convert it into a positively charged gaseous ion is called _____. *(electron affinity, ionisation potential, electronegativity)*

(ii) The compound that does not have a lone pair of electrons is _____. *(water, ammonia, carbon tetra chloride)*

(iii) When a metallic oxide is dissolved in water, the solution formed has a high concentration of _____ ions. *(H^+, H_3O^+, OH^-)*

(iv) Potassium sulphite on reacting with hydrochloric acid releases _____ gas. *(Cl_2, SO_2, H_2S)*

(v) The compound formed when ethene reacts with Hydrogen is _____. *(CH_4, C_2H_6, C_3H_8)*

(b) Choose the ***correct answer*** from the options given below: [5]

(i) A **chloride** which forms a precipitate that is soluble in excess of ammonium hydroxide, is:

1. Calcium chloride
2. Ferrous chloride
3. Ferric chloride
4. Copper chloride

(ii) If the molecular formula of an organic compound is $\mathbf{C_{10}H_{18}}$ it is:

1. alkene
2. alkane
3. alkyne
4. Not a hydrocarbon

(iii) Which of the following is a common characteristic of a **covalent compound**?

1. high melting point
2. consists of molecules
3. always soluble in water
4. conducts electricity when it is in the molten state

(iv) To increase the **pH** value of a neutral solution, we should add:

1. an acid
2. an acid salt
3. an alkali
4. a salt

(v) **Anhydrous iron(III) chloride** is prepared by:

1. direct combination
2. simple displacement
3. decomposition
4. neutralization

(c) Identify the **substance** underlined, in each of the following cases: [5]

(i) **Cation** that does not form a precipitate with ammonium hydroxide but forms one with sodium hydroxide.

(ii) The **electrolyte** used for electroplating an article with silver.

(iii) The **particles** present in a liquid such as kerosene, that is a non electrolyte.

(iv) An **organic compound** containing -- COOH functional group.

(v) A **solid** formed by reaction of two gases, one of which is acidic and the other basic in nature.

(d) Write a *balanced chemical equation* for each of the following: [5]

(i) Action of cold and dilute Nitric acid on Copper.

(ii) Reaction of Ammonia with heated copper oxide.

(iii) Preparation of methane from iodomethane.

(iv) Action of concentrated sulphuric acid on Sulphur.

(v) Laboratory preparation of ammonia from ammonium chloride.

(e) State ***one*** relevant observation for each of the following reactions: [5]

(i) Addition of ethyl alcohol to acetic acid in the presence of concentrated Sulphuric acid.

(ii) Action of dilute Hydrochloric acid on iron (II) sulphide.

(iii) Action of Sodium hydroxide solution on ferrous sulphate solution.

(iv) Burning of ammonia in air.

(v) Action of concentrated Sulphuric acid on hydrated copper sulphate.

(f) (i) Draw the *structural formula* for each of the following: [5]

1. 2, 3 – dimethyl butane
2. diethyl ether
3. propanoic acid

(ii) From the list of terms given, choose the most appropriate term to match the given description.

(calcination, roasting, pulverisation, smelting)

1. Crushing of the ore into a fine powder.
2. Heating of the ore in the absence of air to a high temperature.

(g) (i) Calculate the number of gram atoms in 4.6 grams of sodium (Na = 23). [5]

(ii) Calculate the percentage of water of crystallization in $CuSO_4.5H_2O$ (H = 1, O = 16, S = 32, Cu = 64)

(iii) A compound of X and Y has the empirical formula XY_2. Its vapour density is equal to its empirical formula weight. Determine its molecular formula.

(h) Match the atomic number 2, 4, 8, 15, and 19 with each of the following: [5]

(i) A solid non metal belonging to the third period.

(ii) A metal of valency 1.

(iii) A gaseous element with valency 2.

(iv) An element belonging to Group 2.

(v) A rare gas.

SECTION II (40 Marks)

*Attempt **any four** questions from this Section*

Question 2

(a) Arrange the following as per the instruction given in the brackets: [4]

(i) He, Ar, Ne *(Increasing order of the number of electron shells)*

(ii) Na, Li, K *(Increasing Ionisation Energy)*

(iii) F, Cl, Br *(Increasing electronegativity)*

(iv) Na, K, Li *(Increasing atomic size)*

(b) State the *type of Bonding* in the following molecules: [2]

(i) Water

(ii) Calcium oxide

(c) Answer the following questions: [2]

(i) How will you distinguish between Ammonium hydroxide and Sodium hydroxide using copper sulphate solution?

(ii) How will you distinguish between dilute hydrochloric acid and dilute sulphuric acid using lead nitrate solution?

(d) Identify the salts **P** and **Q** from the observations given below: [2]

(i) On performing the flame test salt **P** produces a lilac coloured flame and its solution gives a white precipitate with silver nitrate solution, which is soluble in Ammonium hydroxide solution.

(ii) When dilute HCl is added to a salt **Q**, a brisk effervescence is produced and the gas turns lime water milky.

When NH_4OH solution is added to the above mixture (after adding dilute HCl), it produces a white precipitate which is soluble in excess NH_4OH solution.

Question 3

(a) Draw an *electron dot diagram* to show the formation of each of the following compounds: [4]

(i) Methane

(ii) Magnesium Chloride

[H = 1, C = 6, Mg = 12, Cl = 17]

(b) State the ***observations*** at the anode and at the cathode during the electrolysis of: [4]

(i) fused lead bromide using graphite electrodes.

(ii) copper sulphate solution using copper electrodes.

(c) Select the ion in each case, that would get selectively discharged from the aqueous mixture of the ions listed below: [2]

(i) SO_4^{2-}, NO_3^- and OH^-

(ii) Pb^{2+}, Ag^+ and Cu^{2+}

Question 4

(a) Certain blank spaces are left in the following table and these are labelled as **A, B, C, D** and **E**. Identify each of them. [5]

	Lab preparation of	Reactants used	Products formed	Drying agent	Method of collection
(i)	HCl gas	NaCl + H_2SO_4	**A** _____	conc. H_2SO_4	**B** _____
(ii)	NH_3 gas	**C** _____	$Mg(OH)_2$ NH_3	**D** _____	**E** _____

(b) Write *balanced chemical equations* to show: [3]

(i) The oxidizing action of conc. Sulphuric acid on Carbon.

(ii) The behavior of H_2SO_4 as an acid when it reacts with Magnesium.

(iii) The dehydrating property of conc. Sulphuric acid with sugar.

(c) Write balanced chemical equations to show how SO_3 is converted to Sulphuric acid in the *contact process*. [2]

Question 5

(a) (i) Propane burns in air according to the following equation: [4]

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$.

What volume of propane is consumed on using 1000 cm^3 of air, considering only 20% of air contains oxygen?

(ii) The mass of 11.2 litres of a certain gas at s.t.p. is 24 g. Find the *gram molecular mass* of the gas.

(b) A gas cylinder can hold 1 kg of hydrogen at room temperature and pressure: [4]

(i) Find the number of moles of hydrogen present.

(ii) What weight of CO_2 can the cylinder hold under similar conditions of temperature and pressure? (H= 1, C = 12, O = 16)

(iii) If the number of molecules of hydrogen in the cylinder is X, calculate the number of CO_2 molecules in the cylinder under the same conditions of temperature and pressure.

(iv) State the law that helped you to arrive at the above result.

(c) Write a *balanced chemical equation* for the preparation of each of the following salts: [2]

(i) Copper carbonate

(ii) Ammonium sulphate crystals

Question 6

(a) Give a *balanced chemical equation* for each of the following: [4]

(i) Action of conc. Nitric acid on Sulphur.

(ii) Catalytic oxidation of Ammonia.

(iii) Laboratory preparation of Nitric acid.

(iv) Reaction of Ammonia with Nitric acid.

(b) Identify the ***term*** or ***substance*** based on the descriptions given below: [4]

(i) Ice like crystals formed on cooling an organic acid sufficiently.

(ii) Hydrocarbon containing a triple bond used for welding purposes.

(iii) The property by virtue of which the compound has the same molecular formula but different structural formulae.

(iv) The compound formed where two alkyl groups are linked by $-\overset{\overset{O}{\|}}{C}-$ group.

(c) Give a *balanced chemical equation* for each of the following: [2]

(i) Preparation of ethane from Sodium propionate

(ii) Action of alcoholic KOH on bromoethane.

Question 7

(a) Name the following: [4]

(i) The process of coating of iron with zinc.

(ii) An alloy of lead and tin that is used in electrical circuits.

(iii) An ore of zinc containing its sulphide.

(iv) A metal oxide that can be reduced by hydrogen.

(b) Answer the following questions with respect to the electrolytic process in the extraction of aluminum: [3]

(i) Identify the components of the electrolyte other than pure alumina and the role played by each.

(ii) Explain why powdered coke is sprinkled over the electrolytic mixture.

(c) Complete the following by selecting the correct option from the choices given: [3]

(i) The metal which does not react with water or dilute H_2SO_4 but reacts with concentrated H_2SO_4 is _____. *(Al/Cu/Zn/Fe)*

(ii) The metal whose oxide, which is amphoteric, is reduced to metal by carbon reduction _____. *(Fe/Mg/Pb/Al)*

(iii) The divalent metal whose oxide is reduced to metal by electrolysis of its fused salt is _____. *(Al/Na/Mg/K)*

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