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 16 printed pages.

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:

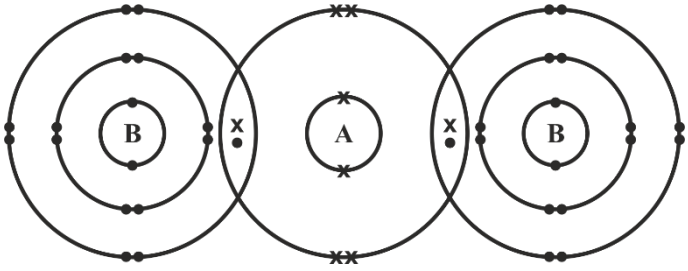
(a) Corundum

(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

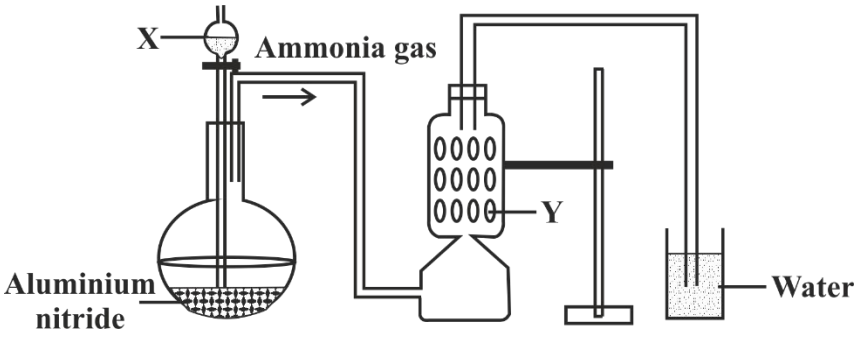
(b) 40 cm^3

(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 using aluminium 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]

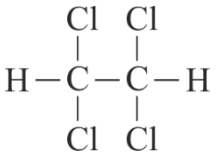
	Column A		**Column B**
(a)	$N_2 + 3H_2 \rightleftharpoons 2NH_3$	1.	Vanadium Pentoxide
(b)	$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$	2.	Nickel
(c)	$2SO_2 + O_2 \rightleftharpoons 2SO_3$	3.	Iron
(d)	$C_2H_4 + H_2 \rightarrow C_2H_6$	4.	Concentrated Sulphuric acid
(e)	$CuSO_4.5H_2O \rightarrow CuSO_4 + 5H_2O$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

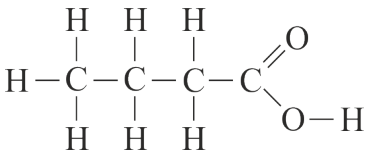
(v) (a) Draw the structural diagram for the following organic compounds: [5]

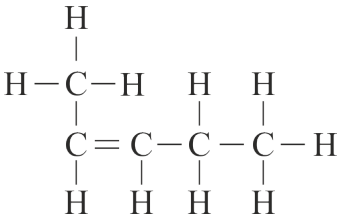
1. 2-methyl propene

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 450 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?

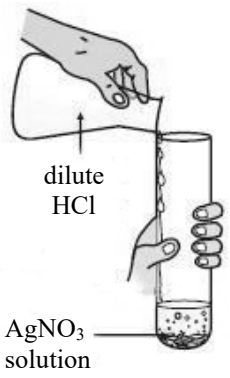
(iii) Give balanced equations for the following: [3]

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

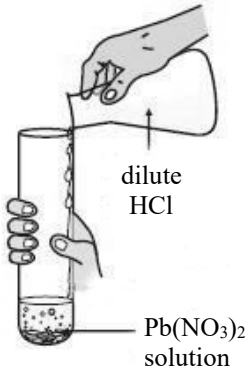
(b) Oxidation of sulphur with hot concentrated nitric acid.

(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 dilute HCl to each of the two 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:

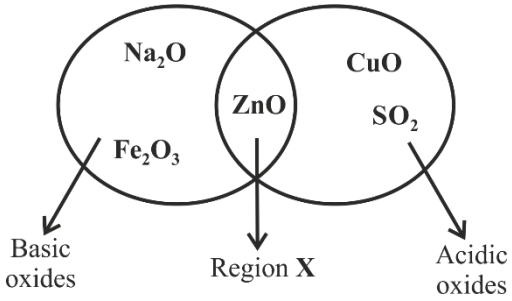
(a) one common observation made by Rohit in both the reactions.

(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.

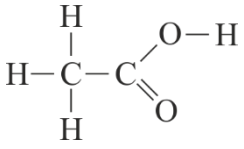
(b) Identify the oxide which has been **incorrectly** placed in the above diagram.

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

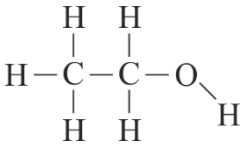
(ii) Given below are organic compounds labelled **A** to **F**. [3]

Answer the questions that follow:

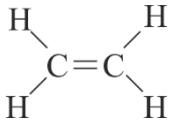
A.



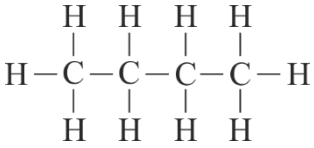
B.



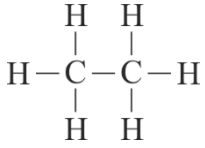
C.



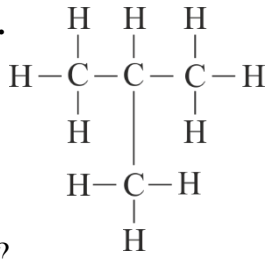
D.



E.



F.



(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