



ST. JOSEPH'S COLLEGE, PRAYAGRAJ
HALF YEARLY EXAM – OCTOBER 2023
(SCIENCE PAPER 2) CHEMISTRY

Time: 2:00 Hrs.

Class X

M.M.: 80

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

(Attempt all questions from this Section.)

Question 1

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

[15]

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

(i) A compound with empirical formula XY_2 , has the vapour density equal to its empirical formula weight, its molecular formula is-

- (a) X_2Y_4
- (b) X_2Y_2
- (c) XY
- (d) X_4Y_2

(ii) Which of the following element have zero electron affinity?

- (a) Fluorine
- (b) Chlorine
- (c) Neon
- (d) Caesium

(iii) A salt solution which gives a dirty green precipitate with sodium hydroxide solution and a white precipitate with barium chloride solution is

- (a) Iron (III) sulphate
- (b) Iron (II) sulphate
- (c) Iron (II) chloride
- (d) Iron (III) chloride

(iv) The number of moles present in 7.1g of Cl_2 (At. Wt. Cl= 35.5)

- (a) 0.01
- (b) 0.2
- (c) 0.1
- (d) 1.0

(v) The metal zinc and tin are present in the alloy:

- (a) Solder
- (b) Brass
- (c) Bronze
- (d) Duralumin



(vi) The particles present in the aqueous solution of ammonium hydroxide.

- (a) Ions only
- (b) Molecules only
- ✓ (c) Ions and molecules both
- (d) Does not dissociate

✓ (vii) The concentrated ore which is generally roasted to convert it to its oxide is-

- (a) Alumina
- (b) Calamine
- (c) Zinc blende
- (d) Corundum

✓ (viii) The catalyst used in Contact process is _____.

- (a) Finely divided iron
- (b) Graphite
- (c) Vanadium pentoxide
- (d) Molybdenum

✓ (ix) Which of the following is NOT a typical property of an ionic compound

- (a) High melting point
- (b) Conduct electricity in the molten and in aqueous solution state
- (c) They are insoluble in water
- (d) They exist as oppositely charged ions even in the solid state.

✓ (x) Products formed by the action of dilute sulphuric acid on metal sulphide are:

- (a) Salt and water
- (b) Water and hydrogen sulphide
- (c) Salt and hydrogen sulphide
- (d) Salt, water and sulphur dioxide

✓ (xi) Among the following compounds, identify the compound or compounds that has all three bonds, ionic, covalent and coordinate bond.

- (P) Ammonia
- (Q) Sodium chloride
- (R) ammonium chloride
- (S) Calcium chloride

- (a) Only P
- (b) Both P and Q
- (c) Only R
- (d) Both R and S

✓ (xii) Rohan wants to refine a block of impure copper. He should connect

- (a) Impure Cu to cathode and pure Cu to anode
- (b) Impure Cu at anode and pure ~~cathode~~ ^{copper} at cathode
- (c) Pure Cu at both anode and cathode
- (d) Impure Cu to both the electrode

✓ (xiii) Which of the following is **Incorrect**.

- (a) Reactive metals are extracted from their aqueous solution by electrolysis process.
- (b) Impurities which get settles down during electrolytic refining are called anode mud.
- (c) Cations migrates toward cathode.
- (d) Oxidation reaction takes place at anode during electrolysis process.

(xiv) **Assertion:** Avogadro's law states that "equal volumes of all gases under similar conditions of temperature and pressure contain the same number of molecules".
Reason: The smallest particles of a gaseous element is the molecule and not the atom though it may contain one, two or more atoms.

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

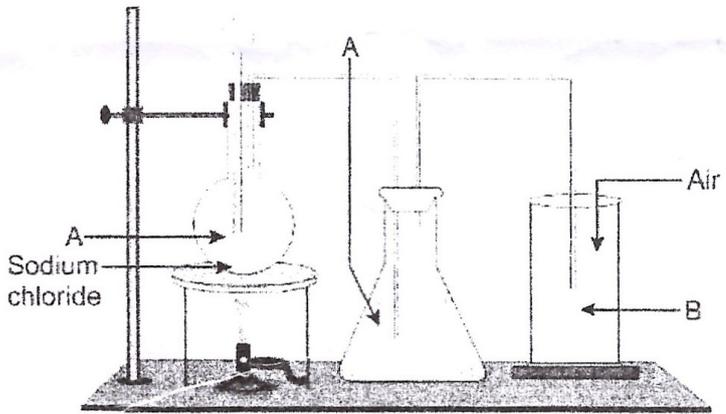
(xv) **Assertion:** Lower the concentration of the ion greater the probability of it being discharged at the respective electrode.

Reason: The preferential discharge of ions present in an electrolyte at the respective electrodes is known as selective discharge of ions.

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

Question 2

(i) The diagram shows an experiment set up of the laboratory preparation of an acidic gas. Answer the following questions related to the diagram: [5]



- (a) Name the gas collected in the gas jar 'B'
 - (b) Name the substance 'A' and what is the property of it as a reactant?
 - (c) Write a balanced chemical equation for the reaction which takes place in the round bottom flask below 200°C?
 - (d) How is the gas produced above collected?
 - (e) Concentrated Nitric acid cannot be used as a reactant for the above preparation. Explain
- (ii) Match the following Column A with Column B. [5]

Column A	Column B
(a) Cryolite	1. Reduction
(b) Cathode	2. HCl
(c) Highest ionisation energy	3. H ₂ SO ₄
(d) Polar covalent	4. Na ₃ AlF ₆
(e) Contact process	5. He

(iii) Complete the following by choosing the correct answers from the bracket: [5]

- (a) The _____ ion [SO_4^{2-} / Br^- / NO_3^- / OH^-] is discharged at the anode with most difficulty.
- (b) In period 3, _____ [sodium/ magnesium/ aluminium] is the most metallic element.
- (c) For the formation of the electrovalent bond between elements x and y which are a metal and a non-metal respectively, x should have _____ [high / low] ionisation potential and y have _____ [high / low] electron affinity.
- (d) In the froth flotation process, the froth which floats on the top – consist of the _____ [ore/gangue] wetted by the oil.
- (e) The process of separation of ions is known as [separation/ dissociation/ionisation]

(iv) Identify the following: [5]

- (a) A homogenous mixture of two or more metals or a metal and a non-metal in a definite proportion in their molten state.
- (b) A bond formed between two atoms by sharing of a pair of electrons, with both electrons being provided by the same atom.
- (c) A fusible mass formed when flux combines with the gangue.
- (d) Anti suction device used to prevent back suction of HCl gas.
- (e) The energy required to remove an electron from a neutral gaseous atom.

(v) (a) Draw the electron dot diagram for the following compounds: [3]

1. Ammonium ion
2. Hydronium ion
3. Magnesium chloride

(b) State the colour and solubility of the following precipitates. [2]

- 1 The precipitate formed when potassium sulphite reacts with barium chloride solution. [solubility in mineral acid]
- 2 The precipitate formed when copper sulphate reacts with ammonium hydroxide solution. [solubility in excess of ammonium hydroxide]

SECTION B

(Attempt any four questions.)

Question 3

(i) Identify the reactant and write the balanced equation for the following: [2]

Hydrochloric acid reacts with compound Y to give a salt FeCl_3 and water

(ii) What property of Sulphuric acid is exhibited in each of the following cases: [2]

- (a) Reaction of carbon with concentrated sulphuric acid.
- (b) When sugar turns black in presence of concentrated sulphuric acid.

(iii) State whether the following statements are TRUE or FALSE. Justify your answer. [3]

1. An aqueous solution of sodium chloride conducts electricity.
2. Alkali metals are good oxidising agents.
3. Alumina cannot be reduced by carbon.

(iv) The electronegativity of an element P is greater than that of element Q. [3]

- (a) How is the oxidising power of P likely to compare with that of Q?
- (b) How is the electron affinity of P likely to compare with that of Q?
- (c) State whether P is likely to be placed to the left or to the right of Q in the periodic table?

Question 4

(i) (a) Shobhit wants to prove that concentrated hydrochloric acid can be readily oxidised by strong reducing agent. To demonstrate this, he heated manganese dioxide with concentrated hydrochloric acid. What will he observe? [2]

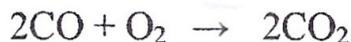
(b) Write a balanced chemical equation for the above reaction.

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

- (a) Powdered coke is sprinkled on the top of the electrolyte in the process of extraction aluminium from alumina.
- (b) The anode has to be replaced from time to time in the electrolytic reduction of alumina.

(iii) (a) State Gay-Lussac's law. [3]

(b) Calculate 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. Also find the volume occupied by 80g of carbon dioxide at STP.



(iv) Arrange the following according to the instruction given in the brackets: [3]

- (a) Mg, C, Cl, Ne (decreasing order of ionisation potential)
- (b) F, B, N, O (increasing order of electron affinity)
- (c) X^{1+} , X, X^{2+} , X^{-1} (decreasing order of atomic size)

Question 5

(i) Copy and complete the following table: [2]

	Reaction at anode	Electrolyte used
Electroplating an article with silver		

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

- (a) Dilute HCl acid with iron (II) sulphide
- (b) Concentrated sulphuric acid with glucose



(iii) The following question refers to the electrolytic reduction of fused alumina. [3]

(a) Name the process.

(b) Write the electrolytic reaction taking place at cathode and anode.

(c) What is the function of cryolite used in this process?

(iv) An organic compound with vapour density 94 contains ^{carbon} 12.67%; hydrogen 2.13% and bromine ~~88.11%~~ ^{85.11%}. Find its molecular formula. [C=12; H=1; Br=80] [3]

Question 6

(i) Distinguish between the following pairs of compounds using the reagent given in the bracket. [2]

(a) Calcium sulphate and zinc sulphate [using ammonium hydroxide]

(b) Lead nitrate and copper nitrate [using sodium hydroxide in excess]

(ii) Mr. Ramesh wants to electroplate his key chain with nickel to prevent rusting. For this electroplating: [2]

(a) Name the electrolyte which he should use.

(b) Name the cathode and anode.

(iii) How much calcium oxide is formed when 82g of calcium nitrate is heated. Also find the volume of nitrogen dioxide evolved. Atomic weights: (Ca = 40, N=14, O=16) $2\text{Ca}(\text{NO}_3)_2 \rightarrow \text{CaO} + 4\text{NO}_2 + \text{O}_2$ [3]

(iv) X [2, 8, 7] and Y [2, 8, 8, 2] are two elements. Using this information complete the following: [3]

(a) _____ belongs to 4 period.

(b) _____ is an electronegative element and _____ is an electropositive element.

(c) _____ is an oxidising agent.

Question 7

(i) (a) Write the balanced chemical equation for the Catalytic oxidation of sulphur dioxide. [2]

(b) Why SO_3 formed during the preparation of sulphuric acid is not absorbed directly in water?

(ii) State your observation in each of the following case: [2]

(a) At the cathode when molten lead bromide solution is electrolysed with graphite electrodes.

(b) When silver nitrate solution reacts with hydrochloric acid.

(iii) Identify the following substances: [3]

(a) An alkaline gas which produces dense white fumes when reacted with HCl gas.

- (b) The anion present in the salt, which produces a gas with the smell of rotten eggs when reacted with dil. HCl.
- (c) The particles present kerosene.

(iv) Write the balanced chemical equations pertaining to the conversion of impure bauxite to pure alumina. [3]

Question 8

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

- (a) Concentrated sulphuric acid liberates sulphur dioxide on reaction with carbon but dilute does not.
- (b) Dry HCl gas does not conduct electricity.

(ii) Solve: [2]

1250cc of oxygen was burnt with 300cc of ethane (C₂H₆). Calculate the volume of the unused oxygen and the volume of carbon dioxide formed.



(iii) The table given below shows the mass number and the number of protons in four elements P, Q, R, S. [3]

Element	P	Q	R	S
Number of protons	6	10	11	17
Mass number	12	20	23	35

- a) Write down the atomic number and electronic configuration of S.
- b) To which group and period S belong?
- c) What will be the nature of bond formed in the compound of
 - (1) R and S
 - (2) P and S

(iv) In the lab preparation of hydrochloric acid, HCl gas is dissolved in water. [3]

- (a) Draw a well labelled diagram to show the arrangement used for dissolving HCl gas in water.
- (b) Why is such an arrangement necessary? Give two reasons.
- (c) What if the tube is made of ordinary narrow glass tubing?

***** ALL THE BEST *****