THE FIRST COMPARATIVE EXAMINATION 2022-23

Class X (ICSE)

SCIENCE Paper-2

CHEMISTRY

Time: Two hours **Maximum marks: 80**

- *Answers to this paper must be written on the answer script 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*
- *The intended marks for questions or parts of questions are given in brackets [ ]*
- *All subsections of each question or parts of question must be answered in the correct order*
- *Please do **not** write anything on your question paper except your name and roll number*
- *This paper is divided into **two** sections. **Section I** [40 marks] and **Section II** [40 marks] Section I is **compulsory**. Attempt any **four** questions from Section II.*
- *Give balanced equations wherever required.*

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 metal which reacts with concentrated NaOH to produce Hydrogen gas is:

(A) Iron (B) Aluminium

(C) Copper (D) Gold

(ii) An alkaline earth metal is:

(A) Lead (B) Magnesium

(C) Copper (D) Zinc

(iii) The salt that gives a white precipitate with NaOH which is almost insoluble in excess is:

(A) $Ca(NO_3)_2$ (B) $FeCl_3$

(C) $FeSO_4$ (D) $CuSO_4$

(iv) A compound which has low boiling point is:

(A) Sodium chloride (B) Calcium chloride

(C) Potassium chloride (D) Carbon tetrachloride

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

(A) Conc. H_2SO_4 (B) ZnO

(C) Al_2O_3 (D) CaO

(b) Fill in the blanks by choosing the correct option from those given in the brackets [5]

(i) When Sodium chloride is heated with concentrated Sulphuric acid below 200°C, one of the products formed is _____ (Sodium hydrogen sulphate / Sodium sulphate / Chlorine)

(ii) In Period 3, the most metallic element is _____ (Sodium / Magnesium / Aluminium)

(iii) The ionisation potential of Potassium is _____ (greater than / less than) Sodium.

(iv) Hydrogen chloride gas is collected by _____ (downward / upward) displacement of air.

(v) The number of valence electrons present in the halogens are _____ (1/5/7)

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

(i) Action of dilute Hydrochloric acid on Sodium sulphite

(ii) Ammonium hydroxide is added to Lead (II) nitrate solution

(iii) Reaction of excess Ammonia with Chlorine

(iv) Reaction of Calcium bicarbonate with dilute Hydrochloric acid

(v) Catalytic oxidation of Ammonia gas.

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

(i) Ammonia gas is passed over heated Copper(II) oxide

(ii) Reaction of dilute Hydrochloric acid with Zinc sulphide

(iii) Reaction of excess Chlorine with Ammonia

(iv) Ammonium hydroxide is added to Copper sulphate solution first in little amount and then in excess

(v) Dilute Hydrochloric acid is added to Silver nitrate solution.

(e) (i) Calculate the percentage composition of Phosphorus in the fertilizer Super phosphate $Ca(H_2PO_4)_2$. [Atomic Weights: Ca = 40, H = 1, P = 31, O = 16] [2]

(ii) The empirical formula of a compound is C_2H_5. It has a vapour density of 29. Determine its molecular formula. [Atomic weights: C = 12. H = 1] [2]

(iii) The molecular formula of a compound is $C_6H_{18}O_3$. Find its empirical formula. [1]

(f) 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 tendency of an atom to attract electrons towards itself when combined in a compound

(iii) The covalent bond in which the shared pair of electrons are unequally distributed between the two atoms

(iv) The process in which an atom or ion loses electrons

(v) A bond formed by sharing of electrons with both electrons coming from the same atom.

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

(i) Li, K, Na, H **(decreasing order of ionization potential)**

(ii) F, B, N, O **(increasing order of electron affinity)**

(iii) Mg, Cl, Na, S, Si **(decreasing order of atomic size)**

(iv) Ar, He, Ne, Kr **(increasing order of number of electron shells)**

(v) I, Cl, Br, F **(increasing order of electronegativity).**

(h) Give a reason for each of the following statements: [5]

(i) Hydrogen chloride gas fumes in moist air.

(ii) Properties of elements are periodic function of their atomic number and not atomic weight.

(iii) Sodium chloride conducts electricity only in aqueous solution or fused state.

(iv) In the laboratory preparation of Hydrogen chloride gas, the temperature of the reaction mixture is always kept below 200°C.

(v) Ammonium nitrate salt is not used in the preparation of Ammonia.

SECTION II [40 marks]

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

Question 2

(a) In the periodic table given below the elements are shown with a letter. Using the **letters only** written in the periodic table, answer the questions that follow: [4]

Group No.	1	2	13	14	15	16	17	18
Period 3	Q	R	S	T	U	V	W	X
Period 4	Y	Z						

(i) Identify the element having five valence electrons.

(ii) Write the formula of the compound formed between the elements R and W.

(iii) Identify the most electropositive element.

(iv) Write the formula of the sulphate of the element Y.

(b) Draw the electron dot diagram to show the formation of hydronium ion. State the type of bond present in it. [H = 1, O = 8] [3]

(c) Give a chemical test to distinguish between each of the following pairs of compounds: [3]

(i) Iron (II) chloride and Iron (III) chloride **(by using Sodium hydroxide)**

(ii) Zinc nitrate and Lead nitrate **(by using Ammonium hydroxide)**

(iii) Hydrogen chloride gas and Ammonia gas **(action on litmus paper)**

Question 3

(a) The following table shows the electronic configuration of elements W, X, Y, Z: [4]

Element	W	X	Y	Z
Electronic configuration	2,8,1	2,8,7	2,5	1

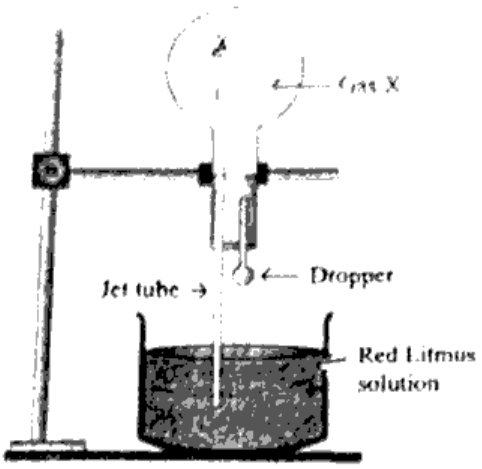
(i) What type of bond is formed between the following elements?

(1) W and X (2) Y and Z

(ii) What is the formula of compound formed between the following elements?

(1) X and Z (2) W and X

(b) Study the diagram given below and answer the questions that follow: [3]



(i) Name the experiment depicted in the diagram shown above.

(ii) Identify the gas 'X'.

(iii) What property of the gas 'X' filled in the round bottom flask is demonstrated by this experiment?

(c) Give a reason for each of the following statements: [3]

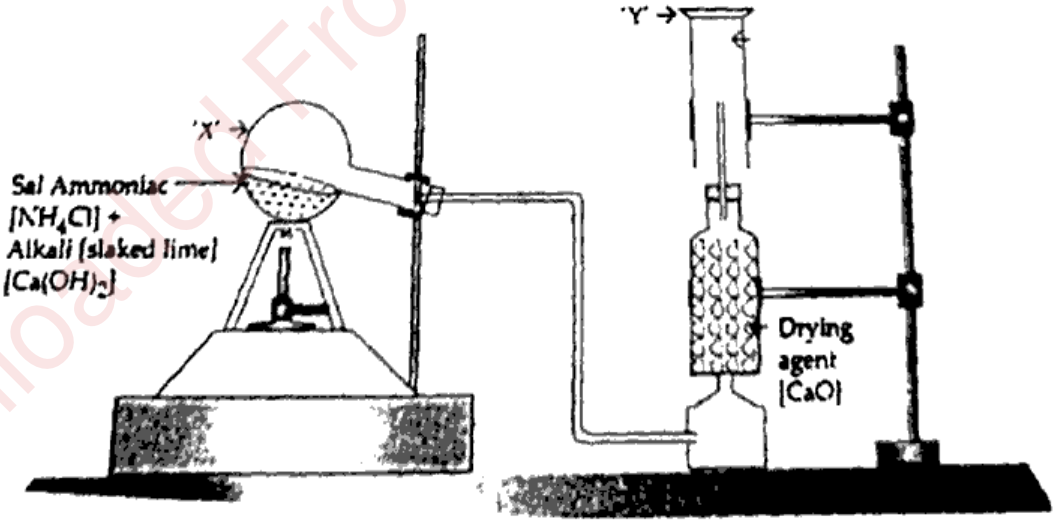
(i) Ionization potential decreases down the group in the modern periodic table.

(ii) Carbon tetrachloride is a non conductor of electricity.

(iii) Covalent compounds have low melting and boiling points.

Question 4

(a) The diagram given below shows the laboratory preparation of a pungent smelling alkaline gas '**Y**'. Study the same and answer the questions that follow: [4]



(i) Give a balanced chemical equation for the preparation of the gas **Y**.

(ii) State the method of collection for the gas collected in the jar.

(iii) What happens when a glass rod dipped in concentrated HCl is brought near gas **Y**? Give the equation also.

(b) Find the empirical formula and the molecular formula of an organic compound from the data given below: [3]

C = 75.92% , H = 6.32% and N = 17.76% The vapour density of the compound is 39.5 [Atomic Weight: C = 12 , H = 1 , N = 14]

(c) Fill in the blanks by choosing the suitable word from the brackets [3]

(i) If an element has low ionization potential then it is likely to be _____ [metallic / non metallic]

(ii) If an element has seven electrons in the outermost shell it is likely to have _____ [largest / smallest] atomic size among all the elements in the same period.

(iii) Electronegativity _____ (increases / decreases) down the group

Question 5

(a) Answer the questions given below which are related to the laboratory preparation of Hydrochloric acid: [4]

(i) Why is the direct absorption of HCl gas in water not feasible?

(ii) Which arrangement is used to dissolve Hydrogen chloride gas in water?

(iii) Draw a well labelled diagram for the arrangement used.

(b) Calculate the percentage of: (i) Fluorine (ii) Sodium (iii) Aluminium in Sodium aluminium fluoride [Na_3AlF_6], to the nearest whole number. [3]

[Atomic Mass: Na = 23, Al = 27, F = 19]

(c) Identify the cations in **W**, **X** and **Z** in each of the following reactions: [3]

(i) To solution '**W**', Ammonium hydroxide is added in excess. Gelatinous white precipitate is formed which dissolves in excess to form a colourless solution.

(ii) To solution '**X**', Ammonium hydroxide is added in excess. Pale blue precipitate is formed, which dissolves in excess to form inky blue solution.

(iii) To salt '**Z**', Sodium hydroxide is added and the mixture is heated. Pungent smelling gas is evolved which turns moist red litmus blue.

Question 6

(a) Name the gas produced during each of the following reactions: [4]

(i) Dilute HCl reacts with Sodium carbonate

(ii) Ammonia is burnt in an atmosphere of Oxygen

(iii) Sodium sulphide is treated with dilute Hydrochloric acid

(iv) Zinc reacts with concentrated Sodium hydroxide.

(b) State a relevant observation for each of the following reactions: [3]

(i) HCl gas from the dry gas jar is poured into the lower jar containing a burning candle.

(ii) Sodium hydroxide is heated with Ammonium sulphate.

(iii) Ammonia gas burns in excess Oxygen.

(c) Define each of the following terms: [3]

(i) Electron affinity

(ii) Lone pair of electrons

(iii) Ionization potential.

Question 7

(a) Answer the following questions related to the manufacture of Ammonia gas: [4]

(i) Name the process.

(ii) Give the balanced chemical equation along with all the conditions required for the process.

(iii) Name the techniques used to separate Ammonia gas from unreacted Nitrogen gas and Hydrogen gas.

(b) Draw the electron dot structure of each of the following: [3]

(i) Nitrogen molecule [N = 7]

(ii) Magnesium chloride [Mg = 12, Cl = 17]

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

(c) Name the following with respect to the Modern Periodic Table: [3]

(i) The element with largest atomic radius in the third period

(ii) The inert gas that does not have an octet configuration in its outermost shell

(iii) The most electronegative element of the second period.