The Council has released specimen papers for March 2023 examination. A new examination pattern has been proposed wherein 40 marks are allotted to Section A and 40 marks to Section B. Please note the suggested changes in the number of questions and their marks in the solved specimen paper given below as well as in the Model Question Papers given ahead.

ICSE 2023 EXAMINATION
SPECIMEN QUESTION PAPER
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.
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 one correct answer to the questions from the given options: **[15]**

(i) A weak electrolyte is :
(a) Alcohol (b) Potassium hydroxide
(c) Ammonium hydroxide (d) Glucose

Ans. (c) Ammonium hydroxide

(ii) Electron affinity is maximum in :
(a) Alkaline earth metals (b) Halogens
(c) Inert gases (d) Alkali metals

Ans. (b) Halogens

(iii) The main components of bronze are :
(a) Copper and tin (b) Copper and iron (c) Copper and lead (d) Copper and zinc

Ans. (a) Copper and tin

(iv) A polar covalent compound is :
(a) Methane (b) Ammonia (c) Nitrogen (d) Chlorine

Ans. (b) Ammonia

(v) An acid which has two replaceable hydrogen ions :
(a) Acetic acid (b) Hydrochloric acid (c) Phosphoric acid (d) Carbonic acid

Ans. (d) Carbonic acid

(vi) The hydroxide which is soluble in excess of NaOH is :
(a) Ferric hydroxide (b) Lead hydroxide (c) Copper hydroxide (d) Calcium hydroxide

Ans. (b) Lead hydroxide

(vii) If the RMM of carbon dioxide is 44, then its vapour density is :
(a) 22 (b) 32 (c) 44 (d) 88

Ans. (a) 22

(viii) Drying agent used to dry Hydrogen chloride gas :
(a) Concentrated Sulphuric acid (b) Calcium oxide
(c) Sulphurous acid (d) Calcium hydroxide

Ans. (a) Concentrated Sulphuric acid

(ix) The catalyst used in the Haber's Process is :

(a) Molybdenum (b) Platinum (c) Nickel (d) Finely divided Iron

Ans. (d) Finely divided Iron

(x) An aqueous compound which turns colourless phenolphthalein to pink :

(a) Ammonium hydroxide (b) Nitric acid

(c) Anhydrous calcium chloride (d) Sulphuric acid

Ans. (a) Ammonium hydroxide

(xi) The gas formed when carbon reacts with concentrated sulphuric acid :

(a) Hydrogen (b) Sulphur trioxide (c) Sulphur dioxide (d) Oxygen

Ans. (c) Sulphur dioxide

(xii) The organic compound prepared when Ethanol undergoes dehydration :

(a) Methane (b) Ethane (c) Acetylene (d) Ethene

Ans. (d) Ethene

(xiii) The IUPAC name of methyl acetylene is :

(a) Propyne (b) Ethene (c) Propane (d) Ethyne

Ans. (a) Propyne

(xiv) The product formed at the cathode in electroplating of an article with Nickel is :

(a) Hydrogen gas (b) Nickel ions (c) Nickel atoms (d) Oxygen gas

Ans. (c) Nickel atoms

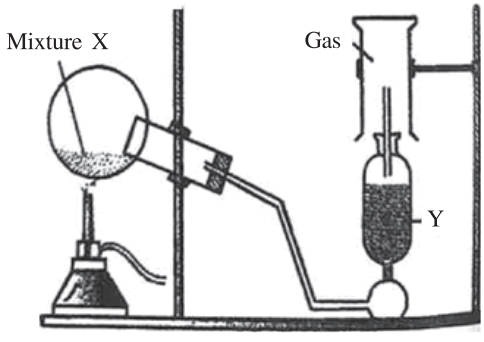
(xv) An alkali metal found in period 3 and group 1 is :

(a) Magnesium (b) Lithium (c) Sodium (d) Potassium

Ans. (c) Sodium

***Question* 2**

(a) The diagram shows an experiment set up for the laboratory preparation of a pungent smelling gas. The gas is alkaline in nature. **[5]**



(i) Name the gas collected in the gas jar.

Ans. Ammonia

(ii) Write a balanced chemical equation for the above preparation.

Ans. $2NH_4Cl + Cu(OH)_2 \rightarrow CuCl_2 + 2H_2O + 2NH_3$

(iii) How is the gas being collected?

Ans. Downward displacement of air.

(iv) What is the purpose of using Y?

Ans. Y is a drying agent used to dry Ammonia.

(v) How will you find that the jar is full of gas?

Ans. Bring a glass rod droped in HCl and it will give dense white fumes.

(b) Match the following Column A with Column B. **[5]**

Column A	**Column B**
(i) Acid Salt	1. Black in colour
(ii) Copper Oxide	2. Reddish brown
(iii) Zinc hydroxide	3. Hydrogen chloride
(iv) Copper Metal	4. Sodium Hydrogen Carbonate
(v) Polar compound	5. Soluble in excess sodium hydroxide

Ans. (i)-4, (ii)-1, (iii)-5, (iv)-2, (v)-3

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

(i) Ammonia in the liquefied form is ..... [neutral / basic]

(ii) Organic compounds are generally insoluble in ..... [Water / Organic solvents]

(iii) An inert electrode used in electrolysis of acidified water is ..... . [iron / platinum]

(iv) Hydrocarbons having double bond is ..... [alkenes / alkynes]

(v) An alkaline gas gives dense white fumes of ..... [NH_4OH / NH_4C1] with ..... hydrogen chloride gas.

Ans. (i) neutral, (ii) water, (iii) platinum, (iv) alkenes, (v) NH_4Cl

(d) Identify the following : **[5]**

(i) The property by which carbon bonds with itself to form a long chain.

Ans. Catenation.

(ii) A substance that conducts electricity in molten or aqueous state.

Ans. Electrolyte.

(iii) The energy required to remove an electron from the valence shell of a neutral isolated gaseous atom.

Ans. Ionisation potential.

(iv) The name of the process by which the Bauxite ore is concentrated.

Ans. Bayer's process.

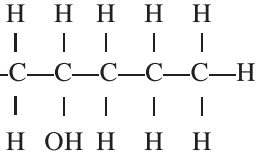
(v) The bond formed by a shared pair of electrons with both electrons coming from the same atom.

Ans. Coordinate bond.

(e) (i) Draw the structural formula for the following : **[5]**

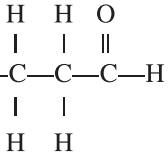
(1) 2-pentanol

Ans.



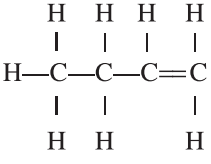
(2) Ethanal

Ans.



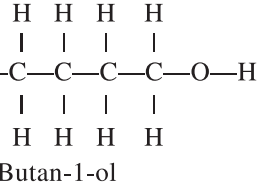
(3) 1-butene

Ans.

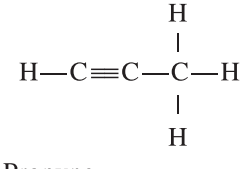


(ii) Name the following organic compounds in IUPAC system :

1.



2.



Ans. 1. Butan-1-ol 2. Propyne

SECTION B

*(Attempt **any four** questions.)*

***Question* 3**

(a) Identify the Anion present in each of the following compounds. **[2]**

(i) When Barium Chloride Solution is added to a solution of compound B, a white precipitate insoluble in dilute Hydrochloric acid is formed.

Ans. SO_4^{2-} (Sulphate ion)

(ii) When dilute Sulphuric acid is added to compound D, a gas is produced which turns lime water milky but has no effect on acidified potassium dichromate solution.

Ans. Carbonate (CO_3^{2-})

(b) Write the products and balance the equation. **[2]**

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

Ans. $S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$

(ii) $ZnS + HCl \rightarrow$

Ans. $Zns + 2HCl \rightarrow ZnCl_2 + H_2S$

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

(i) Na, K, Cl, Si, S (increasing order of electronegativity)

Ans. K, Na, Si, S, Cl

(ii) Be, Li, F, C, B, N, O (increasing order of metallic character)

Ans. F, O, N, C, B, Be, Li

(iii) Br, F, I, Cl (increasing order of atomic size)

Ans. F, Cl, Br, I

(d) Fill in the blanks selecting the appropriate word from the given choice : **[3]**

(i) In a covalent compound the bond is formed due to ..... of electrons. (sharing / transfer)

(ii) A molecule which has a single lone pair of electrons ..... . (NH_3 / H_2O)

(iii) Electrovalent compounds do not conduct electricity in their ..... state. (molten / solid)

Ans. (i) Sharing, (ii) NH_3, (iii) Solid

***Question* 4**

(a) For each of the substances given below, what is the role played in the extraction of Aluminium. **[2]**

(i) Cryolite

Ans. Cryolite – lowers melting point of alumina, increases mobility of ions.

(ii) Graphite

Ans. Graphite acts as anode.

(b) Calculate : **[2]**

(i) A gas cylinder is filled with hydrogen and it holds 5 gms of gas. The same cylinder holds 85 gms of gas X under same temperature and pressure. Calculate the vapour density of gas X.

Ans. $\text{V.D.} = \dfrac{\text{Mass of same volume of gas}}{\text{Mass of same volume of hydrogen}}$

$= \dfrac{85}{5} = 17$

V.D. = 17

(ii) Give the empirical formula of CH_3COOH.

Ans. Empirical formula CH_2O

(c) The following questions are pertaining to the laboratory preparation of Hydrogen chloride gas. **[3]**

(i) Write a balanced chemical equation for its preparation mentioning the condition required.

Ans. $NaCl + H_2SO_4 \xrightarrow{<200°C} NaHSO_4 + HCl$

(ii) Why is concentrated Nitric Acid not used in the preparation of Hydrogen Chloride gas?

Ans. Conc. HNO_3 is volatile.

(iii) How is Hydrogen Chloride gas collected?

Ans. By upward displacement of air.

(d) Explain the following : **[3]**

(i) Concentrated Nitric acid appears yellow when it is left standing in a glass bottle.

Ans. Conc nitric acid decomposes : $4HNO_3 \rightarrow 2H_2O + 4NO_2 + O_2$. Due to formation of NO_2 it appears yellow.

(ii) An inverted Funnel is used to dissolve Hydrogen Chloride gas in water.

Ans. Inverted funnel minimizes back suction of water.
It provides large surface area for absorption of HCl gas.

(iii) All apparatus made of glass is used in the laboratory preparation of Nitric acid.

Ans. Nitric acid vapour attack rubber and cork.

***Question* 5**

(a) (i) State one property of Ammonia demonstrated in the Fountain Experiment. **[2]**

Ans. High solubility.

(ii) Give the ionic equation when Ammonium Hydroxide is dissolved in water.

Ans. $NH_3 + H_2O \rightarrow NH_4OH$
$NH_4OH \rightleftharpoons NH_4^+ + OH^-$

(b) Name a probable Cation present based on the following Observations: **[2]**

(i) Reddish brown precipitate insoluble in Ammonium Hydroxide.

Ans. Fe^{3+} (Ferric ion)

(ii) Blue coloured sulphate solution.

Ans. Cu^{2+} (Copper ion)

(c) Give balanced chemical equation for the following: **[3]**

(i) Laboratory Preparation of Methane from Sodium Acetate.

Ans. $CH_3COONa + NaOH \xrightarrow[Q]{CuO} CH_4 + Na_2CO_3$

(ii) Preparation of Ethyne from 1, 2 dibromoethane.

Ans. $\begin{matrix} CH_2Br \\ | \\ CH_2Br \end{matrix} + 2KOH \rightarrow C_2H_2 + 2KBr + 2K_2O$ (alc)

(iii) Ethene reacting with Chlorine.

Ans. $C_2H_4 + Cl_2 \rightarrow C_2H_4Cl_2$

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

(i) When excess Ammonia is passed through an aqueous solution of Lead Nitrate.

Ans. White precipitate is formed which do not dissolve in excess of Ammonia.

(ii) Copper Sulphate solution is electrolysed using Copper electrodes.

Ans. Brown copper deposited at cathode.

(iii) Ammonium hydroxide is added to Ferrous Sulphate solution.

Ans. Blue precipitate is formed which dissolves in excess to give dark blue solution.

***Question* 6**

(a) Define : **[2]**

(i) Gay Lussac's law of combining volume.

Ans. **Gay Lussac's Law :** When gases react they do so in volumes which bear a simple ratio to one another and to the volume of the gaseous product, provided that all the volumes are measured at the same temperature and pressure.

(ii) Vapour Density

Ans. **Vapour Density :** The ratio between the masses of equal volumes of gas (or vapour) and hydrogen under the same condition of temperature and pressure.

(b) Solve : **[2]**

1250cc of oxygen was burnt with 300cc of ethane (C_2H_6). Calculate the volume of the unused oxygen.and the volume of the carbon dioxide formed : $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

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

2 vol of ethane react with 7 vol of O_2

300 vol of ethane react with $\frac{7}{\cancel{2}} \times \cancel{300}_{150} = 1050$

Unused $O_2 = 1250 - 1050 = 200\ cm^3$

2 volume of ethane produces 4 vol of CO_2

300 cm^3 will produce $\frac{4}{2} \times 300 = 600\ cm^3$

(c) State the conditions required for the following reactions : **[3]**

(i) Conversion of Sulphur dioxide to Sulphur trioxide.

Ans. SO_2 to SO_3

Conditions catalyst V_2O_5

Temperature 450–500°C

(ii) Conversion of Ammonia to Nitric acid

Ans. NH_3 to NO

Catalyst Pt

Temperature 700–800°C

(iii) Conversion of Nitrogen to Ammonia

Ans. N_2 to NH_3

Catalyst finely divided Fe

Promoter Molybdenum

Temperature 450–500°C

Pressure 200–900 atmosphere

(d) Choose the role played by concentrated Sulphuric acid as A, B, C which is responsible for the reactions 1 to 3. **[3]**

A. Oxidizing agent B. Non Volatile Acid C. Dehydrating agent

1. $NaNO_3 + H_2SO_4 \xrightarrow{<200°C} NaHSO_4 + HNO_3$
2. $CuSO_4 \cdot 5H_2O \xrightarrow{H_2SO_4} CuSO_4 + 5H_2O$
3. $S + 2H_2SO_4 \longrightarrow 3SO_2 + 2H_2O$

Ans. 1. B Non-volatile acid, 2. C dehydrating agent 3. A oxidizing agent

***Question* 7**

(a) Find the empirical formula and molecular formula of an organic compound from the data given below : **[2]**

C = 75·92%, H = 6·32%, N = 17·76% its vapour density is 39·5. (At.wt: C = 12, H = 1, N = 14)

Ans.

C	75·92	12	$\frac{75·92}{12}$	=	6·32
H	6·32	1	$\frac{6·32}{1}$	=	6·32
N	17·76	14	$\frac{17·76}{14}$	=	1·26

C_5H_5N M.wt. = $n \times 6$ put

$2 \times 39·5 = (60 + 5 + 14)$

$n = 1$

M.f. = C_5H_5N

(b) Identify the functional group in the following organic compounds: **[2]**

(i) HCHO (ii) C_2H_5COOH

Ans. (ii) Aldehyde (ii) Carboxylic acid

(c) During the Electrolysis of Copper II Sulphate solution using platinum as cathode and graphite as anode. **[3]**

(a) State what you observe at the cathode.

Ans. Brown copper deposit at cathode.

(b) State the change noticed in the electrolyte.

Ans. Blue colour fades.

(c) Write the reaction at the cathode.

Ans. $Cu^{2+} + 2e^- \rightarrow Cu$

(d) Choose the answer from the list which fits the description. **[3]**

[CaO, CO_2, NaOH, $Fe(OH)_3$, CO]

(a) A basic oxide.

(b) An oxide which is acidic.

(c) An Alkali.

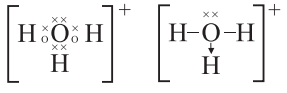
Ans. (i) CaO (ii) CO_2 (iii) NaOH

***Question* 8**

(a) Draw the electron dot structure for the following. **[2]**

(i) H_3O^+

Ans.



(ii) CH_4

Ans.

(b) Distinguish between the following as directed : **[2]**

(i) Sodium Carbonate and Sodium Sulphate by using dilute HC1

Ans. On adding dil. HCl to sodium carbonate, carbon dioxide gas is evolved. No reaction in case of sodium sulphate.

(ii) Ammonium Sulphate and Sodium Sulphate by using Calcium hydroxide.

Ans. On adding calcium hydroxide, ammonium sulphate produces ammonia gas. Sodium sulphate does not produce gas.

(c) Name the particles present in : **[3]**

(i) Strong Electrolyte

Ans. Only ions

(ii) Weak Electrolyte

Ans. Ions and molecules

(iii) Non Electrolyte

Ans. Only molecules

(d) An element X has atomic number 17. Answer the following questions. **[3]**

(i) State the period and group to which it belongs :

Ans. X_{17} 2, 8, 7. Third period and group VIIA(17)

(ii) Is it a Metal or Non Metal?

Ans. Non-metal.

(iii) Write the formula between X and Hydrogen.

Ans. HX