# 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 with the correct choice given in brackets. [5]

(i) In an ionic compound, the bond is formed due to _____ of electrons. [*sharing / transfer*]

(ii) Zinc is _____ reactive than aluminum. [*less / more*]

(iii) The chemical reaction in which heat is absorbed is known as _____ reaction. [*endothermic / exothermic*]

(iv) The molecular formula of ammonium sulphate is _____. [$NH_4SO_4$ / $(NH_4)_2SO_4$]

(v) If an element has two electrons in its outermost shell, then it is likely to be _____. [*Metallic / Non-metallic*]

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

(i) The gas that causes the greenhouse effect:

A. Oxygen

B. Ammonia

C. Methane

D. Hydrogen Sulphide

(ii) According to the modern periodic law, the properties of elements are a periodic function of their:

A. Atomic volume

B. Atomic number

C. Atomic weight

D. Mass number

(iii) Which of the following has water of crystallization?

A. Potassium chloride

B. Sodium chloride

C. Sodium nitrate

D. Washing soda crystals

(iv) The gas which has a rotten egg smell is:

A. Hydrogen sulphide

B. Ammonia

C. Sulphur dioxide

D. Hydrogen chloride

(v) The temperature of $0^{o}$ Celcius on the Kelvin scale is equal to:

A. –273 K

B. 273 K

C. 0 K

D. 100 K

(c) Name the gas evolved in each of the following cases: [5]

(i) Copper carbonate is heated strongly.

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

(iii) Nitrogen combines with hydrogen.

(iv) Action of dilute sulphuric acid on sodium carbonate.

(v) Addition of sodium to cold water.

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

(i) Noble gases do not combine with other elements to form molecules.

(ii) Dilute nitric acid cannot be used in the preparation of hydrogen.

(iii) Hydrogen although lighter than air, is not collected by the downward displacement of air.

(iv) Anhydrous calcium chloride turns into a colourless solution when exposed to air.

(v) Metals form positive ions.

(e) What do you observe when: [5]

(i) Iodine crystals are heated in a test tube?

(ii) Iron nails are added to copper sulphate solution?

(iii) Lead nitrate crystals are heated strongly?

(iv) Ferric chloride crystals are exposed to atmosphere for some time?

(v) Blue copper sulphate crystals are heated?

(f) (i) State Boyle's law. [5]

(ii) What is standard temperature and pressure?

(iii) Calculate the percentage of nitrogen in ammonium nitrate. [$NH_4NO_3$]

[ N = 14, H = 1, O = 16]

(g) (i) Balance each of the chemical equations given below: [5]

1. $FeCl_3 + NH_4OH \rightarrow NH_4Cl + Fe(OH)_3$
2. $KI + Cl_2 \rightarrow KCl + I_2$

(ii) Identify the substance which matches the description given below:

1. White crystalline substance which sublimes on heating.
2. The gas which turns lime water milky but has no effect on potassium dichromate paper.
3. The metal that cannot displace hydrogen from dilute hydrochloric acid.

(h) Match Column A with Column B. [5]

| Column A | Column B |
|---|---|
| (i) Causes hardness in water | A. Calcium oxide |
| (ii) Causes ozone depletion | B. Concentrated sulphuric acid |
| (iii) Dehydrating agent | C. Magnesium bicarbonate |
| (iv) Causes acid rain | D. Chlorofluorocarbon |
| (v) Drying agent | E. Nitrogen dioxide |

**SECTION II (40 Marks)**

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

**Question 2**

(a) The formula of the chloride of a metal 'M' is $MCl_2$. State the formula of its: [3]

(i) Carbonate

(ii) Nitrate

(iii) Hydroxide

(b) Write balanced chemical equations for each of the following: [3]

(i) Reaction of iron with chlorine.

(ii) Addition of silver nitrate solution to sodium chloride solution.

(iii) Addition of zinc to sodium hydroxide solution.

(c) Draw the orbit structure for each of the following compounds: [4]

(i) Methane [H = 1, C = 6]

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

**Question 3**

(a) (i) Name the industrial method for the production of hydrogen gas. [3]

(ii) Name the catalyst used in the above process.

(iii) Write the balanced chemical equation for the production of water gas.

(b) (i) What is meant by 'Group' in the Periodic Table? [3]

(ii) Explain why the elements of the same group exhibit the same chemical behaviour.

(iii) In which Group are the inert gases placed in the Periodic Table?

(c) A part of the periodic table is shown below with one element missing: [4]

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| H | | | | | | | He |
| Li | Be | B | C | N | O | F | Ne |
| Na | Mg | Al | Si | – | S | Cl | Ar |
| K | Ca | | | | | | |

Based on the above table, answer the following questions:

(i) Name the element that has duplet structure.

(ii) Name the lightest alkali metal.

(iii) Name the halogen of period 2.

(iv) Identify the missing element.

**Question 4**

(a) Calculate the volume of gas X at S.T.P. if it occupies 380 litres at 300 K and 70 cm of mercury. [3]

(b) A gas occupies 70 litres at 27$^{o}$C. [3]

What volume will it occupy at 273$^{o}$C, pressure remaining constant?

(c) Calculate the relative molecular mass of each of the following: [4]

(i) Ammonium dichromate [$(NH_4)_2Cr_2O_7$]

(ii) Hydrated Copper Sulphate [$CuSO_4.5H_2O$]

[H = 1, N = 14, O = 16, S = 32, Cr = 52, Cu = 64]

**Question 5**

(a) (i) What do you understand by the term isotopes? [3]

(ii) Why do isotopes of an element possess identical chemical properties?

(iii) Name the isotope of hydrogen which does not have a neutron in it.

(b) State the type of covalent bonding in the following molecules: [3]

(i) Chlorine

(ii) Nitrogen

(iii) Oxygen

(c) How would you distinguish between the following pairs of substances on the basis of the chemical tests given in brackets? [4]

(i) Sodium Chloride and Potassium Chloride (flame test)

(ii) Zinc Carbonate and Lead Carbonate (dry heating)

**Question 6**

(a) State if the solubility increases, decreases or remains the same with rise in temperature for each of the following compounds: [3]

(i) Calcium sulphate

(ii) Potassium nitrate

(iii) Sodium chloride

(b) (i) What is the difference between temporary hard water and permanent hard water? [3]

(ii) Write a balanced chemical equation for the removal of:

1. Permanent hardness

2. Temporary hardness

(c) Classify each of the following reactions as combination, decomposition, displacement or double displacement: [4]

(i) $2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$

(ii) $2KClO_3 \rightarrow 2KCl + 3O_2$

(iii) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

(iv) $CaO + H_2O \rightarrow Ca(OH)_2$

**Question 7**

(a) Complete the following table: [6]

| Element | Mass Number | Atomic Number | Number of Electrons | Number of Protons | Number of Neutrons |
|---|---|---|---|---|---|
| Phosphorous | 31 | 15 | | | |
| Potassium | | | 19 | | 20 |

(b) Write the electronic configuration of the following: [2]

(i) $^{40}_{20}Ca$

(ii) $^{32}_{16}S$

(c) State the valency of the element having: [2]

(i) 6 electrons in the valence shell.

(ii) the electronic configuration of : 2, 3