

Not more than six questions may be attempted.

Chemical reactions should be expressed by equations as well as in words.

Atomic weights: H = 1, C = 12, O = 16, Na = 23,  
S = 32, Cl = 35.5, Ag = 108.

1. Write notes on (i) electrons, (ii) protons, (iii) neutrons.

Select three of the following elements and show by means of a diagram the structure of an atom of each:- (a) lithium, (b) carbon, (c) fluorine, (d) neon.

(66 marks)

OR

1. Describe a method for measuring the molecular weight of a volatile liquid.

Show that the molecular weight is twice the vapour density.

In an experiment to find the molecular weight, 0.077 gm. of a volatile liquid displaced 38 c.c. of air at a pressure of 770 mm. of mercury and at 10°C. Find the molecular weight of the liquid. (Gram-molecular volume = 22.4 litres)

(66 marks)

2. Describe the electronic structure of (i) an atom of sodium, (ii) an atom of chlorine.

Give an account of how you would prepare a reasonably pure sample of sodium chloride.

Describe the structure of sodium chloride.

(66 marks)

3. What do you understand by (i) a covalent bond, (ii) an electrovalent bond, (iii) electronegativity? The following table shows the electro-negativities of some elements:-

H							He
2.1							-
Li	Be	B	C	N	O	F	Ne
1.0	1.5	2.0	2.5	3.0	3.5	4.0	-
Na	Mg	Al	Si	P	S	Cl	Ar
0.9	1.2	1.5	1.8	2.1	2.5	3.0	-

Show, by reference to the table, how predictions may be made as to whether a given bond is likely to be electrovalent or covalent. List the general physical properties of covalent compounds. Suggest a reason why the inert gases are not given any values in the above table.

(66 marks)

4. What do you understand by osmotic pressure? Describe, with the aid of a sketch of the apparatus, how you would measure the osmotic pressure of a given solution.

Calculate the osmotic pressure at 0°C. of an aqueous solution which contains 1.71 gm. of cane sugar ( $C_{12}H_{22}O_{11}$ ) per litre. (A solution which contains one gram-molecule of a sugar dissolved in 22.4 litres has an osmotic pressure of one atmosphere at 0°C.)

(66 marks)

OR

4. Show diagrammatically the structure of an atom of nitrogen and an atom of phosphorus. Compare and contrast these two elements with regard to their properties and the properties of their compounds.

(66 marks)

5. (a) When 25 c.c. of a given sodium hydroxide solution were titrated with a sulphuric acid solution 20 c.c. of the acid solution were required for neutralisation. The acid solution contained 5.6 gm. of sulphuric acid per litre. Express the concentration of the sodium hydroxide solution in terms of (i) normality, (ii) grams of sodium hydroxide per litre.

Describe how you would carry out the above titration.

(b) When all the chloride in 50 c.c. of a given sodium chloride solution had been precipitated as silver chloride, the precipitate weighed 0.1435 gm. Express the concentration of the sodium chloride solution in grams of sodium chloride per litre.

(66 marks)

6. What is the electrochemical series? Arrange the following elements according to their order in the electrochemical series:- magnesium, sodium, lead, zinc.

Discuss these elements with regard to their reactivity towards (i) oxygen, (ii) water, (iii) dilute acids.

(66 marks)

7. A gaseous organic compound has the following gravimetric composition:- carbon 75%, hydrogen 25%. One litre of the compound at S.T.P. weighs 0.716 gm. Name the compound and give an account of its properties. Mention how the compound may be prepared. (Gram-molecular volume = 22.4 litres.)

(67 marks)

OR

7. Describe how you would prepare and collect carbon dioxide and give an account of its properties. Illustrate the action of carbon dioxide on lime water by means of equations.

(67 marks)

8. In the case of the following compounds, write the structural formulae for any three of them, give an account of the properties of any two of them and describe how any one of them may be prepared:- (a) ethylene, (b) acetylene, (c) acetaldehyde, (d) acetic acid, (e) benzene.

(67 marks)

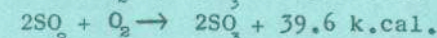
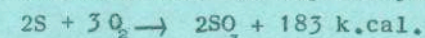
OR

8. Describe, with the aid of a diagram, how you would prepare and collect hydrogen sulphide. Give an account of the properties of hydrogen sulphide and use equations to illustrate its action on (i) chlorine, (ii) a solution of ferric chloride.

(67 marks)

9. Explain what you understand by each of the following:- (i) an exothermic reaction, (ii) heat of formation.

Find the heat of formation of sulphur dioxide from the following data and explain your method:-



(67 marks)

10. Write an account of modern concepts of acid-base reactions.

OR

(67 marks)

10. In the case of copper or iron, outline the chief physical and chemical properties of the element, write the name and formula for each of any three of its compounds and mention the principal properties of these compounds.

(67 marks)