

Not more than six questions may be attempted.

Atomic weights: H = 1, O = 16, Na = 23, P = 31,  
S = 32, Cl = 35.5, Ca = 40, Ba = 137.

1. Describe fully what you understand by (i) a covalent bond, (ii) an electrovalent bond, (iii) a metallic bond. In each case give one example and justify your choice of examples.

(66 marks.)

2. Outline the Kinetic Theory of Gases, indicating the principal assumptions on which it is based.

Select any two of the gas laws and show how the Kinetic Theory may be used to explain them.

(66 marks.)

OR

2. Describe how you would prepare and collect carbon monoxide and give an account of its properties.

Outline briefly any other method by which carbon monoxide may be prepared.

Illustrate, by means of a chemical equation, the use of carbon monoxide as a reducing agent.

(66 marks.)

3. Give a brief account of the chemistry of either copper or zinc. Refer in your answer to three important compounds of the element.

How would you find the chemical equivalent of copper or zinc?

(66 marks.)

4. (i) What is a normal solution of sodium hydroxide?

22.5 c.c. of hydrochloric acid solution were required to neutralise 20 c.c. of normal sodium hydroxide. Express the strength of the acid solution (i) in terms of normality, (ii) in grams per litre. Describe how you would carry out the above titration.

(ii) When a given sodium sulphate solution was treated with excess barium chloride solution a precipitate weighing 0.466 gm. was obtained. What weight of sodium sulphate did the given solution contain?

(66 marks.)

OR

4. Write the names and formulae for the phosphoric acids.

Starting from phosphorus, describe how any one of these acids may be prepared and give an account of its properties.

Calculate the percentage of phosphorus in calcium phosphate,  $\text{Ca}_3(\text{PO}_4)_2$ .

(66 marks.)

5. Write down, in tabular form, the names, symbols and valencies of the first ten elements in the periodic table.

Show, by means of diagrams, the atomic structure of any four of these elements.

(66 marks.)

6. (i) What are isotopes? Show, by means of diagrams, the atomic structure of two isotopes of any element you name.

(ii) An organic compound, of vapour density 39, has the following gravimetric composition:- carbon 92.31%, hydrogen 7.69%. Name the compound and give an account of its principal properties.

(66 marks.)

OR

6. Describe how you would prepare and collect nitrous oxide.

Give an account of the properties of nitrous oxide and compare them with those of oxygen.

(66 marks.)

7. Write the structural formula for each of any four of the following compounds:- (i) ethylene, (ii) ethyl alcohol, (iii) acetylene, (iv) acetaldehyde, (v) acetic acid, (vi) nitrobenzene.

Describe the preparation and properties of any one of the above compounds.

(67 marks.)

8. Discuss the preparation of the halogens and tabulate their physical and chemical properties.

(67 marks.)

OR

8. Describe, with the aid of a sketch of the apparatus, how you would prepare and collect dry chlorine. Give an account of its properties.

Use equations to illustrate the action of chlorine on (i) hydrogen sulphide, (ii) ammonia, (iii) phosphorus.

(67 marks.)

9. Write an account of any one of the following:- (i) electronegativity, (ii) modern concepts of acid-base reactions, (iii) modern concepts of oxidation-reduction processes.

(67 marks.)

OR

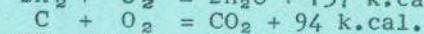
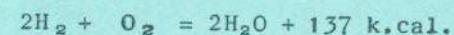
9. State what you understand by (i) atomic weight, (ii) molecular weight.

Describe fully any method for measuring the molecular weight of a compound.

(67 marks.)

10. (i) What do you understand by the heat of formation of a compound? How may the heat of formation of carbon monoxide be measured?

(ii) Find the heat of formation of methane from the following data:-



(67 marks.)

OR

10. Describe the chemical changes which take place when (i) lead nitrate is heated, (ii) quicklime is exposed to the atmosphere for some time, (iii) steam is passed over heated magnesium, (iv) sodium hydrogen carbonate is heated, (v) sulphur dioxide is passed into a solution of ferric chloride, (vi) a copper sulphate solution is treated with a solution of ammonia.

Use chemical equations to illustrate the reactions and name the products formed.

(67 marks.)