A N   R O I N N   O I D E A C H A I S

LEAVING CERTIFICATE EXAMINATION, 1964.

CHEMISTRY – HONOURS

THURSDAY, 11th JUNE – AFTERNOON, 2.30 to 5.

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, S = 32, K = 39, Mn = 55, Fe = 56.

---

1. Describe as fully as you can what you understand by (i) a covalent bond, (ii) an electrovalent bond, (iii) a metallic bond, (iv) a polar bond. In each case give two examples of the bond and justify your choice.

(66 marks.)

OR

1. Describe, with the aid of a sketch of the apparatus, how you would prepare and collect dry ammonia. Give an account of the properties of ammonia and describe fully how you would measure its volume composition.

(66 marks.)

2. Name (i) a linear molecule, (ii) a planar molecule, (iii) a tetrahedral molecule. Describe and discuss the shape of each of the molecules you have named.

Write a short note on hybridised orbitals.

(66 marks.)

OR

2. Write an account of (i) Avogadro's Hypothesis, (ii) Dulong and Petit's Law, (iii) Graham's Law of diffusion.

Discuss the application of these laws in finding molecular and atomic weights. (66 marks.)

3. What do you understand by electron energy levels in atoms ? Show how the limitation of the number of electrons in a given energy level can be used to account for the periodic recurrence of properties in the elements.

Give the name and atomic number of the elements represented by the following electronic configurations:– (i) $1s^2$, $2s^2$, $2p^1$,
(ii) $1s^2$, $2s^2$, $2p^4$, (iii) $1s^2$, $2s^2$, $2p^6$, $3s^2$,
(iv) $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^5$.

(66 marks.)

4. Write a note on the law of mass action.

Discuss the hydrolysis (i) of a salt formed from a strong acid and a strong base, (ii) of a salt formed from a strong acid and a weak base.

(66 marks.)

OR

4. Discuss the chemistry of magnesium and calcium and their principal compounds.

(66 marks.)

5. Write the structural formula for each of any four of the following compounds:– (i) acetone, (ii) aniline, (iii) diethyl ether, (iv) formic acid, (v) glycerol, (vi) chloroform.

Outline the principal chemical properties of any two of the above compounds and describe the preparation of any one of them.

(66 marks.)

6. Discuss a possible reaction mechanism in the case of any three of the following reactions:–
(i) chlorine and hydrogen, (ii) chlorine and methane, (iii) bromine and ethylene, (iv) sodium hydroxide and ethyl bromide.

OR

6. Outline the principal methods available for finding the equivalent weight of metals. Describe two of these methods in detail.

(66 marks.)

7. (a) Describe the polymerisation of ethylene.

(b) State what you understand by geometrical isomerism and give the names and structural formulae for any two compounds which exhibit this phenomenon.

(c) Write a note on oxidation and reduction as electron transfer.

(67 marks.)

8. (a) A given solution contains either ferrous sulphate or ferric chloride. Describe the tests you would perform in order to ascertain which of these two salts is present and any further tests which would confirm your result.

(b) 22 c.c. of N potassium permanganate were required to oxidise 25 c.c. of a given ferrous sulphate solution which had been acidified with sulphuric acid. Calculate the strength of the ferrous sulphate solution (i) in grams of crystalline ferrous sulphate ($FeSO_4 . 7H_2O$) per litre, (ii) in terms of normality.

(67 marks.)

9. An organic compound with a pleasant odour has the following gravimetric composition:– carbon 54·54%, hydrogen 9·09%, oxygen 36·36%. Its vapour density is 44. Write the empirical formula for the compound and also its structural formula. Name the compound, give its principal properties and describe how it may be prepared.

(67 marks.)

OR

9. Draw a sketch of Victor Meyer's apparatus for measuring vapour density and describe fully how you would use it to measure the vapour density of a given liquid.

A compound of vapour density 22 has the following gravimetric composition:– carbon 54·54%, hydrogen 9·09%, oxygen 36·36%. Find its molecular formula and its structural formula. Name the compound and describe its principal properties. Justify the structural formula you have assigned to the compound.

(67 marks.)

10. Discuss the preparation and characteristic properties of (i) the halogens, (ii) the halogen hydrides.

(67 marks.)

OR

10. Compare the chemistry of phosphorus with that of nitrogen.

Explain the fact that (i) there are several phosphoric acids, (ii) that solutions of sodium phosphate are basic and solutions of sodium dihydrogen phosphate are acidic.

(67 marks.)