

## LEAVING CERTIFICATE EXAMINATION, 1969

## CHEMISTRY - HONOURS

FRIDAY, 20th JUNE - AFTERNOON, 2 to 4.30

Six questions to be answered.

Gram-molecular volume = 22.4 litres.

Atomic weights: H = 1, C = 12, N = 14, O = 16, Na = 23, Cl = 35.5, K = 39, Ag = 108.  
Periodic Table may be obtained from the Superintendent.

1. State clearly what you understand by (i) a linear molecule, (ii) a planar molecule, (iii) a tetrahedral molecule, and classify each of the following as linear, planar or tetrahedral:  $\text{Cl}_2$ ,  $\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{NH}_3$ ,  $\text{CH}_4$ ,  $\text{C}_2\text{H}_4$ . Justify your classification and comment on the bonds in each molecule.

(66 marks)

2. State fully what you understand by (i) atomic orbitals, (ii) energy levels. In your answer refer to the type of orbital associated with each of the first four energy levels and to the filling in of the electrons in each orbital.

Name the elements represented by the following:

(i)  $1s^2, 2s^2, 2p^3$ , (ii)  $1s^2, 2s^2, 2p^6, 3s^2$ , (iii)  $1s^2, 2s^2, 2p^6, 3s^2, 3p^5$ .

Write the s, p, d, configurations for carbon, oxygen, argon.

(66 marks)

3. (a) Discuss a possible mechanism for the reaction (i) chlorine and methane, (ii) sodium hydroxide and ethyl bromide.

(b) Show clearly, with the aid of examples, what you understand by a Bronsted acid, a Bronsted base, a conjugate acid, a conjugate base.

(66 marks)

4. Find the empirical formula for a compound which has the following gravimetric composition: carbon 54.54%, hydrogen 9.09%, oxygen 36.36%.

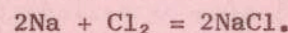
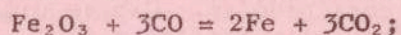
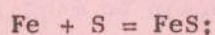
Name a compound with the above empirical formula which is readily hydrolysed by hot alkaline solution. Name the products formed. Mention any three properties of the compound.

Name any other compound which has the same gravimetric composition as the above.

(66 marks)

5. Explain fully each of the following terms: (i) oxidation, (ii) reduction, (iii) oxidizing agent, (iv) reducing agent, (v) oxidation number, (vi) valence.

In the case of each of the following reactions show (i) which substances are oxidised and which are reduced, (ii) which substances are oxidising agents and which are reducing agents:



Write the rules for oxidation numbers. What is the oxidation number for manganese in (i) manganese dioxide, (ii) potassium permanganate?

(66 marks)

6. Describe, with the aid of a sketch, how you would measure the vapour density of bromine using Victor Meyer's method.

If 0.3 gm of bromine displaces 45.2 c.c. of air at  $17^\circ\text{C}$ . and at a pressure of 750 mm. of mercury, calculate the molecular weight of bromine.

Describe briefly how you would prepare and collect bromine and mention its principal properties.

(66 marks)

7. Describe how you would prepare a decinormal solution of silver nitrate and how you would store it.

If 22 c.c. of decinormal solution of silver nitrate were required to completely precipitate the chloride in 25 c.c. of potassium chloride, find the concentration of the potassium chloride solution in terms of (i) normality, (ii) grams of potassium chloride per litre.

Potassium chromate is used as an indicator for the estimation of chlorides in neutral solution, as in the above titration. Explain how it works.

(67 marks)

8. Describe, with the aid of a sketch of the apparatus, how you would prepare and collect sulphur dioxide, and give a full account of its properties.

Use equations to show the action of sulphur dioxide on each of the following:

(i) potassium dichromate, (ii) potassium iodate, (iii) potassium permanganate. Refer to the conditions under which the reactions take place.

(67 marks)

9. Describe, with the aid of a sketch of the apparatus, how you would prepare and collect ethylene in the laboratory.

Give an account of the properties of ethylene and discuss the  $sp^2$  hybridisation in it.

Describe and discuss the polymerisation of ethylene.

(67 marks)

10. Select any three groups in the periodic table and show the relation between electronic configuration and membership of the group. Comment on the physical and chemical similarities and differences within each of the groups you selected.

(67 marks)