

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1968

CHEMISTRY - HONOURS

FRIDAY, 21st JUNE - AFTERNOON, 2.30 to 5

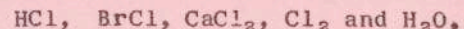
Six questions to be answered.

Gram-molecular volume = 22.4 litres.

Atomic weights: H = 1, C = 12, O = 16, Na = 23
S = 32, Cl = 35.5, K = 39, Mn = 55, Fe = 56.

1. Describe and discuss covalent, electrovalent, and metallic bonds.

Comment briefly on the bonds in each of the following:-



(66 marks)

2. Compare (i) the chemistry of nitrogen with that of phosphorus, (ii) the principal compounds of nitrogen with those of phosphorus.

(66 marks)

3. State what you understand by ionization potential and suggest a method by which it might be measured in the case of an element you select.

The first ionization potentials, in electron-volts, for the elements in the second period are as follows:-

Li	Be	B	C	N	O	F	Ne
5.4	9.3	8.3	11.3	14.5	13.6	17.4	21.6

Account for the general increase in ionization potential across the period and comment on the values for beryllium and nitrogen.

For magnesium, the first, second and third ionization potentials are as follows: 8, 15 and 80, respectively. Why is the third ionization potential so great?

(66 marks)

4. Describe briefly how you would prepare and collect (i) ethylene, (ii) diethyl ether. Illustrate the preparation by means of equations. Give an account of the principal physical and chemical properties of diethyl ether. (66 marks)

5. State what you understand by (i) isomerism, (ii) geometrical isomerism, (iii) optical isomerism.

Write down the names and structural formulae for any two simple isomers.

Name two compounds which exhibit geometrical isomerism and describe the principal physical and chemical properties of the compounds you have named.

Write the name and structural formula for any compound which exhibits optical isomerism. Describe how optical isomerism may be demonstrated.

(66 marks)

6. (a) Discuss the ionization (i) of water, (ii) of hydrogen chloride in water, (iii) of acetic acid in water.

(b) What is a normal solution of potassium permanganate? Show clearly how your answer is derived.

20 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 concentration of the ferrous sulphate solution (i) in terms of normality, (ii) in terms of grams of crystalline ferrous sulphate (FeSO₄.7H₂O) per litre.

(66 marks)

7. What do you understand by osmotic pressure? Show, with the aid of a sketch of the apparatus, how you would demonstrate the osmotic pressure of an aqueous solution of sugar.

Calculate the osmotic pressure at 17°C. of an aqueous solution of glucose, C₆H₁₂O₆, containing 3 gm. glucose per litre of solution.

An aqueous solution of sodium chloride contains 2.61 gm. of sodium chloride per litre of solution. Estimate the osmotic pressure of the solution and give reasons for your answer.

(67 marks)

8. (a) Four bottles containing solutions are labelled as follows: (i) calcium chloride, (ii) silver nitrate, (iii) aluminium sulphate, (iv) ammonium carbonate.

In the case of each of any three of these describe, using equations, several tests to confirm that the bottles are labelled correctly.

(b) What do you understand by the electronegativity of an element? Discuss some of the uses which may be made of electronegativities.

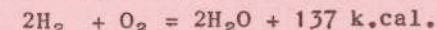
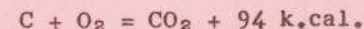
Show how electronegativities could be used to predict how the substances H₂SO₄ and NaOH ionize in aqueous solution.

(Electronegativities: H = 1.4, O = 3.5, Na = 0.9, S = 2.5.)

(67 marks)

9. State (i) the First Law of Thermodynamics, (ii) Hess's Law.

Calculate the heat of formation of acetylene from the following data:



Describe fully how you would measure the heat of combustion of a given organic compound.

(67 marks)

10. (a) Give a full account of the structure and shape of ethylene.

(b) Describe and discuss a possible reaction mechanism for the reaction between ethylene and bromine.

(c) Write a brief note on radioactive isotopes and their uses.

(67 marks)