

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1966

CHEMISTRY - HONOURS

FRIDAY, 17th 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.

Gram-molecular volume = 22.4 litres.

Atomic weights: H = 1, C = 12, O = 16, S = 32,
K = 39, Mn = 55, Fe = 56, Br = 80.

1. State clearly what you understand by (i) an ionic bond, (ii) a covalent bond, (iii) the electronegativity of an element.

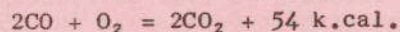
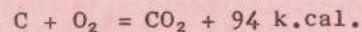
Where in a period would you expect to find atoms having greatest electronegativity? Where in a group would you expect to find atoms having the greatest electronegativity? Give reasons for your answers.

How are values for a scale of electronegativities arrived at? Outline any one use which may be made of a knowledge of electronegativities. (66 marks)

OR

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

Calculate the heat of formation of carbon monoxide from the following data:



Calculate, also, the mass of carbon dioxide formed by the combustion of a litre of carbon monoxide at S.T.P. (66 marks)

2. With regard to atomic orbitals, what is meant by (i) principal quantum number, (ii) energy levels, (iii) the Pauli exclusion principle, (iv) Hund's rule of maximum multiplicity?

Show in tabular form how the elements in the periodic table from sodium (11) to scandium (21) inclusively, are built up.

Suggest a reason for the relative stability of nitrogen and comment of the electronic configuration of scandium. (66 marks)

3. Discuss a possible reaction mechanism in the case of any two of the following reactions: (i) chlorine and hydrogen, (ii) chlorine and methane, (iii) bromine and ethylene. (66 marks)

OR

3. Give an account of the element copper, referring to its occurrence and preparation, and to its physical and chemical properties. Refer to the preparation and properties of cuprous and cupric compounds. (66 marks)

4. Write the name and structural formula of one of each of the following types of organic compound: (i) an alcohol, (ii) an ester, (iii) an ether, (iv) a ketone, (v) an aldehyde, (vi) a carbohydrate.

Describe the preparation of any one of the compounds you have named and describe the properties of any two of them. (66 marks)

OR

4. Give an account of the chief properties of each of the following compounds and describe in outline how any two of them may be prepared: (i) chloroform, (ii) formic acid, (iii) glycerol. (66 marks)

5. What do you understand by isomerism? Name a compound which exhibits optical isomerism and describe its structure. Explain clearly what you mean by optical isomerism.

Name two organic acids which exhibit geometrical isomerism and write the structural formulae of each of them. Describe any three properties in which these acids differ from each other and show how the action of heat on the acids gives evidence in support of the formulae you have assigned to them. (66 marks)

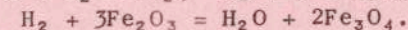
6. Write a concise note on the structure of the atom.

What are isotopes? Chlorine has two naturally occurring isotopes of mass 35 and 37 respectively. If you assume that the atomic weight of chlorine is 35.5, calculate the relative abundance of Cl^{35} and Cl^{37} in chlorine.

What are radioactive isotopes? Mention the various types of radiation they may emit. Outline the uses of radioactive isotopes. (66 marks)

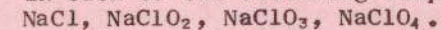
7. With regard to acid/base reactions, describe in outline the theories of (i) Arrhenius, (ii) Bronsted, (iii) Lewis. (67 marks)

8. (a) Show how the following reactions may be regarded as similar in type:

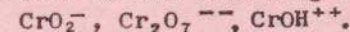


(b) What are oxidation numbers? Write rules governing oxidation numbers, referring especially to (i) elements in the free state, (ii) elements in simple ions, (iii) oxygen in most compounds containing oxygen, (iv) hydrogen in most compounds containing hydrogen. Discuss some exceptions to the normal values of the oxidation numbers for oxygen and hydrogen.

Write the oxidation numbers for chlorine in each of the following compounds:



Write the oxidation numbers for chromium in each of the following ions:



(67 marks)

OR

8. Give an account of the preparation and properties of bromine. Describe, with the aid of a diagram, how you would measure its vapour density.

What mass of bromine would displace 56 c.c. of air at S.T.P.? (67 marks)

9. (a) Describe how you would prepare and standardise a decinormal solution of potassium permanganate.

18 c.c. of 0.1N potassium permanganate solution were required to oxidise 25 c.c. of a solution of ferrous sulphate, which contained 22 gm. of crystalline ferrous sulphate per litre. Calculate the percentage water in crystalline ferrous sulphate.

(b) Show, by means of equations, two tests for each of the following radicals: (i) zinc, (ii) lead, (iii) chloride, (iv) nitrate. (67 marks)

10. Write concise notes on each of any two of the following: (i) the hydrolysis of salts, (ii) the polymerisation of ethylene, (iii) catalysis. (67 marks)