

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1972

CHEMISTRY - ORDINARY LEVEL

WEDNESDAY, 21st JUNE - MORNING, 9.30 to 12

Six questions to be answered

1. Compare the charge, mass and position within the atom of protons, electrons, neutrons.
Distinguish between atomic number and mass number.
What are isotopes? Refer to ${}_{17}^{35}\text{Cl}$ and ${}_{17}^{37}\text{Cl}$ and state the number of protons, electrons and neutrons in each. Name two isotopes of hydrogen and show how they differ. (66 marks)
2. Discuss briefly the nature of the metallic bond. Mention some properties of metals which may be accounted for in terms of this type of bonding.
Illustrate the main differences in structure and properties between crystals of sodium chloride, diamond, iodine. (66 marks)
3. In the case of each of the following compounds,
sodium monoxide (Na_2O), carbon dioxide,
potassium chloride, hydrogen chloride,
describe (i) the physical appearance, (ii) the behaviour of the compound in water, giving equations where appropriate, (iii) whether the solution formed is acidic, basic or neutral, (iv) how the behaviour in water is related to the type of bonding.
Explain what you mean by a polar covalent molecule, using the water molecule as an example. (66 marks)
4. What do you understand by an orbital? Distinguish between an s and a p orbital.
Why are there three p orbitals?
Write the s, p configurations for lithium, fluorine, sodium, chlorine and argon.
Suggest a reason why (i) sodium is more reactive than lithium, (ii) fluorine is more reactive than chlorine, (iii) argon is unreactive. (66 marks)
5. Write the structural formula of (i) ethylene, (ii) ethanol, (iii) diethyl ether, (iv) acetic acid.
Show by an equation how sodium reacts with ethanol and name the products.
Describe briefly how each of the following may be obtained from ethanol: (i) diethyl ether, (ii) ethylene, (iii) acetic acid. Draw a labelled sketch of the apparatus you would use to prepare any one of these compounds and mention the principal properties of that compound. (66 marks)
6. Describe, with the aid of a labelled sketch, how you would prepare and collect a sample of hydrogen sulphide gas. Give an equation for the reaction.
Describe, with the help of equations, how hydrogen sulphide gas reacts with (i) water, (ii) sodium hydroxide solution, (iii) copper sulphate solution.
Discuss the shape of the hydrogen sulphide molecule and compare it with the shapes of the water and beryllium hydride molecules. (66 marks)
7. (a) If the Avogadro Number (N) = 6×10^{23} , how many molecules are there in (i) 4.4 grams of carbon dioxide gas, (ii) 1 gram of hydrogen gas?
(b) In what way do aromatic compounds differ from aliphatic compounds? Write the name and formula of an aliphatic acid and of an aromatic acid.
(c) An organic compound was found to consist of 50% oxygen, 37.5% carbon and 12.5% hydrogen by weight. What is the simplest possible formula of the compound. If the molecular weight of the compound is 32 give its structural formula. Name the compound. ($H = 1, C = 12, O = 16$) (67 marks)

8. What do you understand by (i) a strong acid, (ii) a weak acid? Give one example of each, showing how it behaves in aqueous solution.
Explain what you understand by the term (H^+) in the expression $(H^+) = 1 \times 10^{-6}$.
Define pH of a solution. What is the pH of a solution in which $(H^+) = 1 \times 10^{-6}$?
Calculate the pH of (i) a solution containing 3.65 grams of hydrogen chloride per litre (1000 cm^3), (ii) a 0.01 molar (0.01 normal) solution of sodium hydroxide.
(H = 1, Cl = 35.5)

(67 marks)

9. Illustrate the difference between substitution and addition by referring to a reaction of chlorine with methane and chlorine with ethylene. Name the product or products in each case.

Give the name and structural formula of the second member of (i) the alkane series, (ii) the alkene series.

Give the name and structural formula of the mono-substitution product formed when benzene reacts with (i) bromine, (ii) a mixture of concentrated nitric and sulphuric acids.

What is polymerisation? Name two organic polymers in everyday use, giving one important use of each.

(67 marks)

10. (a) Oxalic acid is a dibasic acid which reacts with sodium hydroxide according to the equation



25 cm^3 of a solution of oxalic acid was neutralised by 20 cm^3 of 0.125 molar (0.125 normal) sodium hydroxide solution. Express the concentration of the oxalic acid in terms of (i) molarity (or normality), (ii) grams of anhydrous oxalic acid ($H_2C_2O_4$) per litre (1000 cm^3). (H = 1, C = 12, O = 16)

Describe how you would carry out the titration and name a suitable indicator.

(b) Describe one test in each case by which you would confirm the presence of (i) chloride ions, (ii) sulphate ions, in a solution.

(67 marks)