

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1979

CHEMISTRY—ORDINARY LEVEL

WEDNESDAY, 20 JUNE—AFTERNOON, 2 to 5

Six questions to be answered
All questions carry the same marks.

Relative atomic masses (atomic weights): H = 1, C = 12, O = 16, Na = 23, S = 32, Cl = 35.5, Ca = 40.

Molar volume at S.T.P. = 22.4 litres

Avogadro's constant (number) = 6×10^{23}

1. Answer *eleven* of the following items (a), (b), (c), etc. All items carry the same marks. *Keep your answers short.*

- (a) Give a use for the electronegativity values of the elements.
- (b) Write the structural formula for toluene (methylbenzene).
- (c) What are allotropes? Give an example of an element which exists in allotropic forms.
- (d) How many electrons are there in the ${}^{60}_{27}\text{Co}^{2+}$ ion?
- (e) What is meant by a homologous series? Name two members of the same homologous series.
- (f) What is meant by a metallic bond?
- (g) What are hydrides? Give an example of a hydride of a metal.
- (h) Give the name and the chemical formula of the compound omitted from the following reaction:

$$\text{CaC}_2 + 2\text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2 +$$
 - (i) What is the percentage of calcium in calcium carbonate?
 - (j) Name a polymer which may be produced from an alkene.
 - (k) What does n represent in the general gas equation $PV = nRT$?
 - (l) Name a radioactive isotope and state one of its uses.
 - (m) Write a balanced chemical equation for the laboratory preparation of hydrogen sulphide.
 - (n) Define the pH of a solution. What is the pH scale?
 - (o) How many moles are there in 8 g of methanol?

2. (a) What do you understand by (i) atomic orbital, (ii) mass number, (iii) the ground state of an atom?

- (i) Sketch the shapes of s and p orbitals.
 - (ii) What is the Pauli exclusion principle?
 - (iii) Write down the electronic structure (s, p) of the element of atomic number 19.
- (c) Explain the origin of spectra in terms of atomic structure.

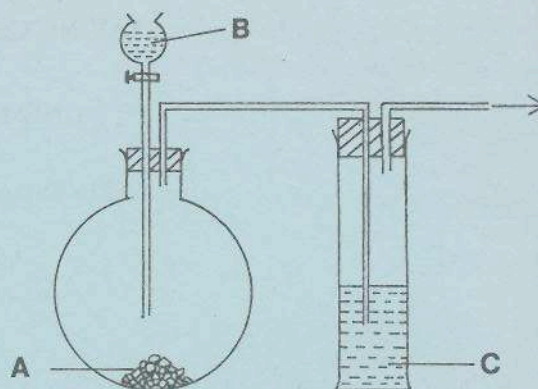
3. (a) Describe (i) the physical appearance,
(ii) bond type,
(iii) reaction (if any) with water,

of *three* of the following compounds: hydrogen peroxide, sodium oxide, nitrogen dioxide, phosphorus trichloride, magnesium chloride.

- (b) Outline a method for the preparation of hydrogen peroxide *or* nitrogen dioxide in the laboratory, giving the appropriate chemical equation.

4. The diagram shows an apparatus used for the preparation of dry sulphur dioxide.

- Name the solid A and the liquids B and C.
- What is the function of liquid C?
- What method should be used to collect the gas?
- Give a balanced equation for the above preparation of sulphur dioxide.
- What type of oxide is sulphur dioxide? Give an equation for its reaction with water.
- State how sulphur dioxide is converted to sulphur trioxide.
- Outline how you would test for the presence of sulphate ions in an aqueous solution of sodium sulphate. Give an equation for the reaction.



5. State Hess's Law.

- Define (i) the heat of formation of a compound,
(ii) the heat of neutralisation of an acid.

Describe briefly how you would measure the heat of neutralisation of an acid.

Given that



calculate the heat of formation of hydrogen sulphide.

6. (a) "Saturated hydrocarbons undergo substitution reactions whereas unsaturated hydrocarbons undergo addition reactions"

Explain the underlined terms giving an example in each case and an equation where appropriate.

(b) An organic compound contains 26.1% carbon, 69.6% oxygen and 4.3% hydrogen, by weight. The empirical formula of the compound and its molecular formula are the same. Name the compound and write its structural formula.

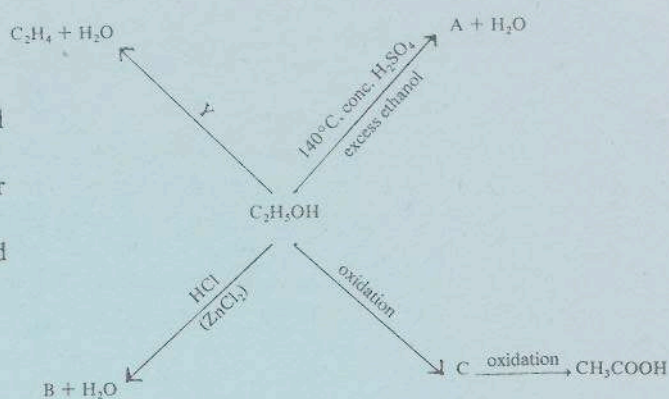
- What volume of 0.1 M solution of hydrochloric acid would exactly neutralise 50 cm³ of a sodium carbonate solution containing 5.3 g of the anhydrous salt per litre?
- Describe how you would carry out the titration.
- Name a suitable indicator for a strong acid-weak base titration and explain briefly how an indicator works.
- Hydrochloric acid is a strong acid while sodium carbonate is a weak base. Explain the underlined terms.

8. What is an electrolyte?

Mention two factors that determine which ions are the first to be discharged during the electrolysis of a solution. With the aid of a diagram describe and explain the changes taking place in the solution and at the electrodes during the electrolysis of copper sulphate (i) using copper electrodes, (ii) using inert electrodes. Suggest an industrial or commercial use for electrolysis.

9. Ethanol (C_2H_5OH) undergoes the following reactions:

- Name the compounds A, B and C. Give the structural formula for each.
- Suggest a name for Y and give suitable conditions for the formation of ethylene (ethene), C_2H_4 .
- Using a labelled diagram show how the compound CH_3COOH may be prepared in the laboratory.



10. Answer any *two* of the following.

- (a) What is ionization energy?
 "The properties of elements depend on atomic number". Show how the trends in (i) atomic radius, (ii) ionization energy, in groups 1A and 7A, and in period 2 (Li to Ne), support this statement.

(Refer to Mathematics Tables p. 44, 45.)

- (b) Choose *four* of the following: BF_3 , BeH_2 , CH_4 , NH_3 , H_2S , H_2O , and in the case of each molecule chosen
- discuss the influence of electron pairs on the shapes of these molecules,
 - sketch and name the shapes of each of the four molecules.
- (c) The equations for two oxidation-reduction (redox) reactions are given as follows:
- $Mg + 2AgNO_3 \longrightarrow 2Ag + Mg(NO_3)_2$
 - $Cl_2 + 2KI \longrightarrow 2KCl + I_2$

Rewrite each of the above as ionic equations.

Show how these reactions illustrate oxidation and reduction in terms of electron transfer.

- (d) Define (i) acid, (ii) conjugate base, in terms of the Brønsted-Lowry theory.

Indicate the acid-base pairs in the following equations:

