

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1983

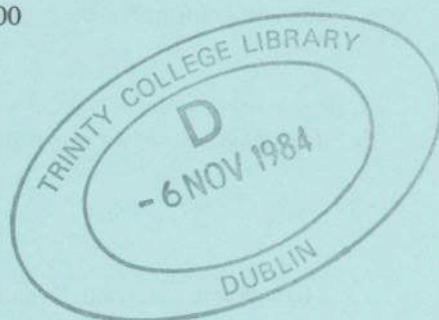
CHEMISTRY—ORDINARY LEVEL

TUESDAY, 21 JUNE—AFTERNOON 2.00 to 5.00

Six questions to be answered.

All questions carry the same marks.

Relative atomic masses (atomic weights): H = 1, C = 12, O = 16, S = 32
 Molar volume at S.T.P. = 22.4 litres (dm³)



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

- How many electrons are present in an ion of (i) Ca²⁺ (atomic number of Ca = 20), (ii) Cl⁻ (atomic number of Cl = 17)?
- What is meant by a mole of a substance?
- Write down the electronic configuration (s, p) of phosphorus (atomic number = 15).
- Name the process used to separate alcohol from water.
- What are allotropes? Name an element which occurs in allotropic forms.
- Complete the following equation: Zn + 2HCl =
(dilute)
- What volume would 1.7 g of hydrogen sulphide occupy at S.T.P.?
- Name the chemicals which may be used to prepare a sample of hydrogen peroxide.
- Give an example of an ionic crystal.
- State Pauli's exclusion principle.
- What is meant by a metallic bond?
- Give an equation to illustrate an addition reaction of acetylene (ethyne).
- What is ionisation energy?
- Write the structural formula for benzoic acid.
- Name either a radioactive isotope *or* an organic polymer, and state *one* of its uses.

2. Compare electrons, protons and neutrons under the following headings:

- mass, (ii) charge, (iii) location in the atom.

Describe, using an example in each case, the formation of (a) an ionic (electrovalent) bond, (b) a covalent bond.

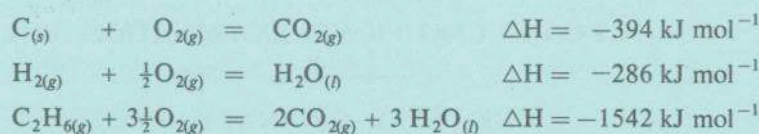
What is meant by electronegativity? Indicate how electronegativity values may be used to predict the type of bond formed when two elements combine. Support your answer by means of *two* examples.

(Refer to Mathematics Tables p. 46)

3. In a titration 25 cm³ of 0.09 M sodium hydroxide solution neutralised 20 cm³ of sulphuric acid solution.

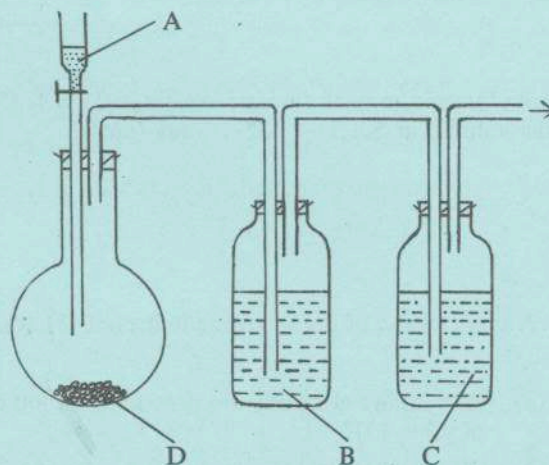
- Write the balanced equation for the reaction.
- Name the substances formed in the reaction.
- Calculate the concentration of the sulphuric acid (a) in moles per litre (dm³), (b) in grams per litre (dm³).
- Name a suitable indicator for the titration.
- Describe in detail how you would carry out the titration.

4. State Hess's law. Define heat of formation.
Find the heat of formation of ethane from the following data:



What is meant by a homologous series? The fourth member of the alkane series is butane. Write two possible structural formulae for butane.

5. The diagram shows apparatus which may be used to prepare dry chlorine.



- Name the solid D and give its formula.
 - Name the liquids A, B and C.
 - What is the purpose of liquid B and liquid C?
 - Does the reaction flask require heating in this preparation?
 - State how the gas should be collected.
 - Write equations for the reaction of chlorine with (a) hydrogen, (b) sodium, (c) phosphorus.
 - Why can chlorine be used to bleach dyes?
6. (a) An organic compound was found to consist of 40% carbon, 6.66% hydrogen, and 53.33% oxygen, by weight. If the compound has a vapour density of 30 find its molecular formula. Write a possible structural formula for the compound and name it.
- (b) Describe chemical tests (one in each case) to show the presence in aqueous solution of each of the following anions:
(i) chloride, (ii) sulphate, (iii) nitrate, (iv) carbonate.

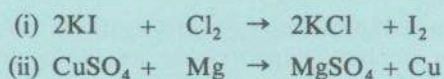
7. Write the formula for an oxide of each of the following elements:

Na, Mg, Al, P, S

Compare these oxides under the headings: (i) physical appearance at S.T.P., (ii) reaction (if any) with water. What general conclusion may be made regarding the acidic, basic, etc. character of the oxides across a period e.g. Na to S, of the Periodic Table?

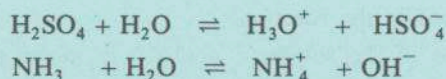
Outline a laboratory preparation of sulphur dioxide.

8. (a) Define oxidation and reduction in terms of electron transfer.
In the case of each of the following reactions indicate the substance oxidised and the substance reduced:



What information does reaction (ii) give about the relative positions of copper and magnesium in the electrochemical series?

- (b) What is (i) an acid, (ii) a base, on the basis of the Bronsted-Lowry theory?
With regard to each of the following reactions indicate the acids, bases and conjugate pairs:



9. The formulae for five organic compounds are given below.

- A C_2H_4
- B C_2H_5OH
- C CH_3CHO
- D C_6H_6
- E C_6H_5Br

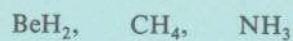
- (i) Name and write the structural formula for each of the compounds **A**, **B**, and **C**.
- (ii) Indicate how compound **B** may be converted to compound **A**.
- (iii) Name and write the chemical formula for the organic product obtained when **C** is treated with phenylhydrazine ($C_6H_5NHNH_2$).
- (iv) Name and write the structural formula for compound **D** and for compound **E**.
- (v) How may compound **D** be converted to compound **E**?

10. Answer any *two* of the following.

- (a) Define pH. What is meant by the pH scale?

Calculate the pH of (i) 0.01 M HCl solution, (ii) 0.1 M NaOH solution.

- (b) Give a brief account of the electron pair repulsion theory and show how it may be used in assigning shapes to each of the following molecules:



- (c) Find the volume of propane gas which is burned for every 10 cm³ of oxygen used in the reaction



What mass of water vapour is added to the atmosphere by the combustion of 1 kg of propane?

- (d) Describe, with the aid of a diagram, an experiment to show the electrolysis of acidulated water using inert electrodes.

What deduction is made from this experiment?