A/R I

OXFORD LOCAL EXAMINATIONS

GENERAL CERTIFICATE OF EDUCATION

Summer Examination, 1951

Advanced and Scholarship Level

CHEMISTRY, PAPER I

FRIDAY, JUNE 22. TIME ALLOWED—3 HOURS

[Write the number of the paper, R I, on the left at the head of each sheet of your answers in the space provided.

Answer SIX questions, selecting at least ONE but not more than TWO from each of the Sections B and C.]

SECTION A

1. Describe the preparation of ozonized oxygen. How does ozone react with (*a*) potassium iodide; (*b*) lead sulphide; (*c*) hydrogen peroxide?

State **two** distinctive tests for ozone.

Give an account of **one** method of establishing the formula of ozone.

2. Describe how you would prepare and isolate specimens of (*a*) sodium bicarbonate from washing soda; (*b*) sodium hydrogen sulphite from sodium hydroxide; (*c*) potassium nitrate from sodium nitrate; (*d*) ferrous ammonium sulphate from iron filings, ammonium hydroxide, and dilute sulphuric acid.

3. Draw a diagram of the apparatus you would set up to prepare phosphorus trichloride. Briefly describe what you would do to obtain this compound. How does it react with (*a*) water; (*b*) ethyl alcohol; (*c*) acetic acid; (*d*) chlorine?

Why does carbon tetrachloride not react with cold water?

4. Give details of **one** method in **each** case of making carbon monoxide (*a*) in the laboratory, (*b*) on a large scale.

What do you know of the use of carbon monoxide in (i) the extraction of a metal, (ii) the production of an organic compound?

Explain why it is dangerous to run the engine of a car in a closed garage.

Section B

5. What do you understand by the following terms: *endothermic reaction*; *heat of combustion*; *heat of formation*?

State Hess's Law and calculate the heat of formation of ethyl alcohol from the following data:

$$C + O_2 = CO_2 + 97{\cdot}6 \text{ Cal.}$$
$$H_2 + \tfrac{1}{2}O_2 = H_2O + 68{\cdot}4 \text{ Cal.}$$
$$C_2H_6O + 3O_2 = 2CO_2 + 3H_2O + 341{\cdot}2 \text{ Cal.}$$

Explain why the solubility of a substance with a negative heat of solution increases with a rise in temperature.

6. What is a colloidal solution? State exactly how you would prepare colloidal solutions of **three** different substances.

Give an account of the general properties of colloidal solutions.

7. Distinguish between strong and weak electrolytes. Define the terms *specific conductivity* and *equivalent conductivity* of a solution of an electrolyte, and state how they are related. In the case of solutions of a weak electrolyte, state and explain the effect of dilution on the *equivalent* conductivity.

What do you understand by the degree of ionization of a weak electrolyte, and how is this quantity obtained from equivalent conductivity measurements?

Section C

8. Describe how you would prepare a pure specimen of chloroform. Selecting **one** alkyl halide, state **five** of its reactions, representing each by an equation. Name the organic product in each case. How would you detect the element chlorine in chloroform?

9. A pungent-smelling liquid **A**, containing 47·06 per cent. carbon, 5·88 per cent. hydrogen, and no other detectable element, has a vapour density of 51. What is the molecular formula of **A**? Write its structural formula.

Briefly describe how **A** is prepared in the laboratory. How does **A** react with (*a*) water; (*b*) methyl alcohol; (*c*) aniline?

[H = 1; C = 12]

10. Name the main classes of substances which contain the following groupings:

(*a*) $>C=C<$; (*b*) $-CH_2OH$; (*c*) $-CONH_2$.

Give an account of the reactions which you associate with grouping (*a*) and **either** grouping (*b*) **or** grouping (*c*).