

# S 42

## OXFORD LOCAL EXAMINATIONS SCHOOL CERTIFICATE

MONDAY, JULY 11, 1949

TIME ALLOWED— $1\frac{3}{4}$  HOURS

### Theoretical Chemistry I

[Write THEORETICAL CHEMISTRY I at the head of each sheet of your answers.

Answer Question 1 and any FOUR others. All questions carry the same number of marks. Illustrate your answers by clear diagrams, and give equations wherever possible.]

1. (a) What do you understand by the equivalent weight of (i) an acid, (ii) a base, and (iii) a salt? What relation do the equivalent weights of these substances bear to their molecular weights?

State the valencies of the elements (other than oxygen) and of the acid radicals (anions) in the compounds  $P_2O_5$ ,  $Al_2(SO_4)_3$ ,  $Ca_3(PO_4)_2$ .

(b) What do you understand by (i) an exothermic, (ii) an endothermic reaction? Give **one** example of each.

(c) What do you understand by an unstable compound? Give **one** example.

(d) State the *Law of Definite Proportions*, and find the equivalent weight of an element the oxide of which contains 40 per cent. of oxygen.

[O = 16.]

2. State clearly the conditions that a substance must fulfil to be regarded as a catalyst for a particular reaction. Mention (without further description) **three** catalysts in use either in the laboratory or in industry, and for each one name a reaction for which it is employed.

3. What is meant by *electrolysis*?

What explanation is usually given of the conduction of electricity by the solution of a salt?

Draw a labelled diagram of the circuit you would set up to find by an electrolytic method the equivalent weight of copper, without using any electrical measuring instruments or a stop-watch. Indicate **briefly** the measurements you would have to make.

4. What is meant by *reduction*? Indicate briefly, without experimental detail, how you would reduce—

(a) red lead to lead;

(b) nitric acid to nitric oxide;

× (c) ferric chloride to ferrous chloride;

(d) chlorine to hydrochloric acid solution.

5. The salvage of bones is regarded as very important. Why is this? Name **two** products that are obtained from bones, and state the chief uses of each. Indicate very briefly (by equations only, if you can) how **one** of them is obtained.

6. What are the chief salts of potassium which occur in nature? For what are they used?

Describe, with necessary detail, how you would prepare in a dry, crystalline state, from solid potassium hydroxide, **either** potassium nitrate **or** potassium chlorate.

7. Describe, with a sketch of the apparatus you would set up, and with essential detail, how you would find the composition of water by weight.

8. Name **two** important solids that can be obtained by the evaporation of sea-water. For what are these substances chiefly used?

What is sodium hypochlorite, and for what is it used? Indicate briefly how you could get a solution of this substance from sea-water.