AN ROINN OIDEACHAIS

(Department of Education).

LEAVING CERTIFICATE EXAMINATION, 1950.

CHEMISTRY.—HONOURS.

THURSDAY, 15th JUNE.—MORNING, 10 TO 12.

Not more than *six* questions to be answered. All the questions have the same value.

Chemical changes should be expressed by equations as well as in words.

Atomic weights—C=12 ; O=16 ; K=39 ; Mn=55.

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1. State Avogadro's law, and describe an experiment to ascertain the volume composition of steam. What deductions can be drawn from the result of this experiment as to the number of atoms in the oxygen molecule ?

What other evidence would be required to deduce that the atomic weight of oxygen is 16 ?

2. Explain the chemical tests which you would apply to differentiate between the substances in each of the following groups :—

(*a*) sodium nitrate and sodium nitrite,

(*b*) sodium sulphate and sodium sulphite,

(*c*) lead nitrate and aluminium nitrate.

3. Describe the preparation and properties of nitric oxide, and show how its formula has been derived.

4. State Dulong and Petit's law, and explain how it is used to find the atomic weight of an element.

The specific heats of two elements, A and B, are 0·11 and 0·028 respectively, and their equivalent weights are 18·6 and 59·5 respectively. Write formulae for their chlorides and oxides.

5. Describe, with a sketch of the apparatus, a method for the preparation and collection of sulphur dioxide in the laboratory.

Describe the action of sulphur dioxide on solutions of (*a*) sodium hydroxide, (*b*) hydrogen sulphide, (*c*) ferric sulphate, (*d*) chlorine.

6. What is an ion ? What ions are present in aqueous solutions of the following : (*a*) hydrogen chloride, (*b*) ammonia, (*c*) ferric chloride, (*d*) ammonium carbonate ?

Use the Ionic Theory to explain :

(i) the neutralization of an acid by a base,

(ii) why a solution of ferric chloride is acidic, and a solution of ammonium carbonate is alkaline,

(iii) how indicators work in distinguishing between acidic and basic solutions.

7. Explain the method of classification of the elements according to the periodic law.

Mention any chemical properties which justify the inclusion of carbon, tin and lead in the same group of elements.

8. Explain fully what is meant by a decinormal solution of an oxidising agent. What are the products of the oxidation of oxalic acid by potassium permanganate in dilute sulphuric acid solution ? 20 c.c. of a decinormal solution of potassium permanganate were required to oxidise 18 c.c. of an oxalic acid solution. Calculate the weight of oxalic acid in a litre of the solution.

9. Write the structural formula for any fat. Describe the manufacture of soap, and show by means of an equation the chief reaction which takes place in the process.

10. Show by means of structural formulae the difference in composition of beet sugar and glucose.

What are the principal differences in their properties ?

11. Write structural formulae for ethyl alcohol and acetic acid, and indicate the relationship between these substances.

Describe the properties of one of them and give the evidence on which its structural formula is based.

12. Give an historical account of the discovery of the composition of the air.