

AN ROINN OIDEACHAIS

(Department of Education).

LEAVING CERTIFICATE EXAMINATION, 1952.

CHEMISTRY.—HONOURS.

WEDNESDAY, 18th JUNE.—AFTERNOON, 3 TO 5.

Not more than *six* questions to be answered.

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

(Atomic Weights: N=14; O=16; S=32; Cl=35.5.)

The gram-molecular volume=22.4 litres.

1. Describe an experiment to show that sulphur dioxide contains its own volume of oxygen.

From the following data how would you prove the formula of sulphur dioxide:

- (a) sulphur dioxide contains its own volume of oxygen,
- (b) weight of one litre of sulphur dioxide at N.T.P.=2.88 gm.,
- (c) weight of one litre of oxygen at N.T.P.=1.44 gm.,
- (d) Atomic weights: oxygen=16; sulphur=32?

[66 marks.]

2. What causes (a) temporary, (b) permanent hardness in water? Describe chemical methods for the removal of permanent hardness giving equations for the changes involved.

Describe a quantitative experiment to prove that permanently hard water had been softened by one of the methods described.

[66 marks.]

3. Define (a) normal solution, (b) standard solution.

One gram of pure ammonium chloride was boiled with 20 c.c. of a caustic soda solution until the evolution of ammonia had ceased. The remaining solution required 3.2 c.c. of a normal hydrochloric acid solution for neutralisation.

Calculate (a) the normality of the caustic soda solution, (b) the volume of ammonia evolved at N.T.P.

[66 marks.]

4. When hydrochloric acid was added to two salt solutions A and B, a white precipitate formed in A and no change was observed in B. When hydrogen sulphide was passed into B after the addition of hydrochloric acid, a brown precipitate appeared.

What basic radicals would you suspect might be present and what further tests would you make in order to identify them exactly?

[66 marks.]

5. Outline four methods for determining the equivalent weight of metals.

When 1.91 gm. of the sulphide of a bivalent metal were converted into the oxide of the metal, 1.59 gm. of the oxide were obtained. Calculate the atomic weight of the metal. [66 marks.]

6. Describe, with a diagram of the apparatus, a method for the preparation and collection of nitric oxide in the laboratory.

Describe the properties of the gas.

Explain how nitric oxide is formed in the atmosphere and the reactions involved in its subsequent conversion to nitrate in the soil. [66 marks.]

7. What are the principal chemical properties of iron? Starting from iron how would you prepare (a) ferrous sulphate, (b) ferric sulphate, (c) ferric oxide?

Give two tests for distinguishing ferrous from ferric salts. [66 marks.]

8. Describe an electrolytic method for the manufacture of sodium hydroxide and explain the reactions involved.

Describe the action of the following on an aqueous solution of sodium hydroxide: (a) hydrogen sulphide, (b) sulphur dioxide, (c) chlorine. [66 marks.]

9. Write formulae for ethane, ethylene and acetylene. Discuss the differences in the properties of these compounds. [67 marks.]

10. Indicate by means of formulae the relationship between starch and glucose.

How may starch be converted to glucose?

What tests would indicate that the conversion was taking place? [67 marks.]

11. Give an account of the periodic classification of the elements, explaining particularly the meaning of the terms: group, period, short period, long period and atomic number. [67 marks.]

12. Describe briefly the principal contributions to chemistry of three of the following:—Priestley, Davy, Lavoisier, Kekule, William Higgins. [67 marks.]