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(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS.  
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LEAVING CERTIFICATE EXAMINATION, 1933.

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HONOURS.

CHEMISTRY.

MONDAY, 19th JUNE.—AFTERNOON, 4 P.M. TO 6 P.M.

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(a) Not more than *six* questions to be answered. All questions are of equal value.

(b) Chemical reactions should be expressed in words and represented by chemical equations.

(c) Answers should be illustrated by sketches wherever possible.

1. State Gay Lussac's Law of Combining Volumes and Avogadro's Hypothesis.

Give a diagram illustrating the apparatus used by Gay Lussac to determine the volume composition of *steam*. (You need not describe the actual experiment.)

Assuming Gay Lussac's result and Avogadro's Hypothesis show that the molecule of oxygen contains at least two atoms.

2. 50 c.c. of a solution containing sulphuric and hydrochloric acids required 45 c.c. of 1.1 normal sodium hydroxide solution for neutralization.

50 c.c. of the solution of acids gave with excess of barium chloride a precipitate weighing 0.594 gram.

Find the quantity of each acid present in a litre of the original solution.

H=1; O=16; Na=23; S=32; Cl=35.5; Ba=137.

3. How is sulphuretted hydrogen usually prepared in the laboratory? What impurity is commonly present in it?

Describe a method for preparing pure dry sulphuretted hydrogen.

4. Describe a laboratory method for the preparation of nitric acid.

Under what conditions may the following products be formed by the interaction of nitric acid and certain metals—(a) hydrogen, (b) nitric oxide, (c) nitrous oxide, (d) ammonia.

5. How would you prepare pure carbon monoxide? If you were given a gaseous mixture containing hydrogen, carbon dioxide and carbon monoxide, how would you ascertain approximately the percentage volume of each gas in the mixture?

6. What is soap? Explain the nature of the change which takes place when soap is added to a hard water. How may the total hardness of a water be determined?

7. How would you purify the following:—

(a) Hydrogen, containing traces of sulphuretted hydrogen and moisture.

(b) Nitrous oxide, containing traces of chlorine and nitric oxide.

(c) Ammonia, containing traces of moisture.

(d) Iodine, containing traces of chlorine.

(e) Ethylene, containing traces of sulphur dioxide.

8. A flask, of volume 263 c.c., when filled with air at  $17^{\circ}$  C. and 765 mm. pressure weighs 45.258 gram; filled with hydrogen chloride under the same conditions the weight is 45.342 grams. Find the relative density of hydrogen chloride.

1 litre each of air and of hydrogen at S.T.P. weigh 1.293 gram and 0.09 gram respectively.

*Indicate* what additional experiments would be necessary to determine the volume composition of hydrogen chloride.

9. Describe a continuous process for the liquefaction of air. Give a diagram illustrating the plant employed and explain the principle upon which the process depends.

10. Explain the meaning of the term "basicity of acids." Illustrate your answer by reference to nitric, acetic, sulphuric and orthophosphoric acids.

Give a summary of Graham's work on the basicity of the phosphoric acids.