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(Department of Education).

LEAVING CERTIFICATE EXAMINATION, 1949.

CHEMISTRY.—HONOURS.

FRIDAY, 17th 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.

The gram-molecular volume = 22·4 litres.

Atomic weights, C = 12; O = 16.

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1. Define "vapour density" and "molecular weight" and deduce the relationship that exists between them. Describe a method for determining the vapour density of a volatile liquid.

2. Describe, with a sketch of the apparatus, a method for the preparation and collection of hydrogen sulphide.

Describe and explain the action of hydrogen sulphide on aqueous solutions of (*a*) copper sulphate, (*b*) ferric chloride, (*c*) chlorine, (*d*) zinc sulphate.

3. How would you prepare dry chlorine from sodium chloride in the laboratory?

What happens when chlorine is passed into

(*a*) cold dilute caustic potash solution,

(*b*) hot concentrated caustic potash solution,

(*c*) a solution of magnesium bromide in water,

(*d*) a gas jar inverted in water and half full of ethylene?

4. Describe a process for the manufacture of washing soda.

How would you (*a*) distinguish sodium carbonate from sodium bicarbonate, (*b*) convert sodium carbonate to sodium bicarbonate, (*c*) explain why a solution of sodium carbonate in water turns red litmus blue?

5. Define the term "equivalent" as applied to acids and bases.

20 c.c. of an acid solution containing 12·25 gm. of the acid per litre, were treated with excess zinc carbonate. The carbon dioxide evolved measured 62·3 c.c. at 15° C. and 720 mm. Find the equivalent weight of the acid.

6. How would you show that nitric acid contains nitrogen, oxygen and hydrogen? Name two other acids containing nitrogen and describe a test for one of them.

7. Describe the properties of tin and indicate how stannous chloride and stannic chloride may be prepared from the metal.

Describe and explain what may be observed when (*a*) caustic potash solution is added to solutions of both these chlorides, (*b*) zinc is added to a solution of stannic chloride, (*c*) mercuric chloride is added to a solution of stannous chloride.

8. Define "atomic weight", "valency", "equivalent", and show that there is a relationship between them.

If you knew that the equivalent weight of zinc was 32·5, how would you determine the equivalent weight of copper?

State briefly what further work would be necessary in order to find the valency of copper.

9. State Graham's Law of Diffusion, and describe an experiment to show that gases diffuse at different rates.

10 c.c. of a gas took 5 minutes to diffuse out of a vessel. 37·2 c.c. of hydrogen diffused in 5 minutes under the same conditions. What is the density of the gas compared with hydrogen?

10. Describe and explain what happens when an electric current is passed through an aqueous solution of sodium chloride. State what you know about the Laws of Electrolysis.

11. Give the name and structural formula of

(*a*) an unsaturated hydrocarbon,

(*b*) an organic dibasic acid.

Describe their properties, and explain how they react with a solution of potassium permanganate containing sulphuric acid.

12. Describe the properties and reactions of formaldehyde. Show by means of structural formulæ its relationship to formic acid, methyl alcohol and acetaldehyde.