LEAVING CERTIFICATE EXAMINATION, 1954.

CHEMISTRY.—HONOURS.

WEDNESDAY, 16th 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 :—C=12, Cl=35·5, Na=23, O=16, K=39, S=32.

1. Give an account, with the aid of a sketch, of how you would prepare and collect reasonably pure dry sulphuretted hydrogen.

Describe how you would investigate the action of sulphuretted hydrogen on the following substances and write equations to illustrate the reactions :—(a) chlorine, (b) sulphur dioxide, (c) sulphuric acid, (d) potassium permanganate, (e) ferric chloride.

[66 marks.]

2. Describe an industrial method for the production of (a) caustic soda, (b) soap, and in each case mention the sources of the raw materials used.

Show by means of equations how both those substances act in softening water.

[66 marks.]

3. Describe fully, with the aid of a diagram, how you would measure the vapour density of a liquid, using Victor Meyer's apparatus.

The chloride of an element has a vapour density of 81 and contains 34·45% of the element. The specific heat of the element is 0·116. Calculate the exact atomic weight of the element and write down the formula for the chloride. Explain your method.

[66 marks.]

4. Outline two different methods for measuring the chemical equivalent of zinc and describe one of them in detail.

A solution was made by dissolving 0·520 gms. of the chloride of a divalent metal in water. When excess of sulphuric acid was added to the solution, a precipitate was formed which weighed, when dry, 0·582 gms. Calculate the chemical equivalent of the metal.

[66 marks.]

5. Explain the following terms and in each case name a substance to illustrate your explanation and write its structural formula :— (a) hydrocarbon, (b) alcohol, (c) aldehyde, (d) carbohydrate.

Explain, briefly, how (i) glucose, (ii) an alcohol, (iii) a hydrocarbon, may be obtained from starch.

How would you distinguish between dilute solutions in water of glucose and beet sugar ?

[66 marks.]

6. Describe fully how you would (a) show that ammonia contains nitrogen and hydrogen, (b) measure the volume composition of ammonia.

When electric sparks are passed through a mixture of 50 c.c. hydrogen and 15 c.c. nitrogen, the volume of the mixture is reduced to 61 c.c. Assuming that all volumes are measured at atmospheric temperature and pressure, find the composition, by volume, of the remaining mixture.

[66 marks.]

7. Write the structural formulae for (a) acetic acid, (b) oxalic acid, and state the evidence on which the structural formula for acetic acid is based.

Describe the physical properties of those acids and give an account of the action, if any, of potassium permanganate on them.

[67 marks.]

8. Give a brief account of how elements are classified in accordance with the Periodic Law and state the position in the Periodic Table occupied by calcium and by magnesium. What properties of those elements justify their occupying the positions you have stated ?

[67 marks.]

9. Give an account of the sources and properties of copper.

Describe how you would prepare from copper samples of its oxides and chlorides.

Give three chemical tests for detecting copper in aqueous solutions of its salts.

[67 marks.]

10. Describe how you would prepare a $\frac{N}{10}$ solution of sodium carbonate and how you would use it to find the strength, in grams, per litre, of a sample of *concentrated* sulphuric acid.

A solution in water of a mixture composed of pure potassium carbonate and pure sodium carbonate contains 5·7 gms. of the mixture per litre. It is found that 20 c.c. of $\frac{N}{10}$ sulphuric acid (factor=1·25) are required to neutralize 25 c.c. of that solution. Calculate the percentage composition of the mixture.

[67 marks.]