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(Department of Education).

LEAVING CERTIFICATE EXAMINATION, 1956.

CHEMISTRY.—HONOURS.

TUESDAY, 12th JUNE.—AFTERNOON, 3 TO 5.30.

Not more than *six* questions to be answered.

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

Atomic Weights :—C=12 ; O=16 ; Na=23 ; S=32.

1. Describe, with the aid of a sketch of the apparatus, how you would prepare and collect a reasonably pure sample of chlorine.
State the conditions under which chlorine reacts with the following, and illustrate the reactions by means of chemical equations :—(*a*) water, (*b*) hydrogen sulphide, (*c*) sodium hydroxide, (*d*) methane, (*e*) ethylene.

[66 marks.]

2. State the positions occupied by sodium and potassium in the Periodic Table.
Compare and contrast the chemistry of these two elements and give a brief account of the structure of the atom of one of them.
Give *two* tests to distinguish sodium salts from potassium salts.

[66 marks.]

3. Describe, with the aid of a sketch of the apparatus, how a reasonably pure sample of carbon monoxide may be prepared in the laboratory.
Give an account of its physical properties and describe, with chemical equations, *two* examples of its action as a reducing agent.
State the experimental evidence on which the molecular formula for carbon monoxide is based.

[66 marks.]

4. State the relationship between the atomic weight of an element and its equivalent weight.
Sketch the apparatus you would use, and describe how you would use it, to measure the volume of hydrogen which would be displaced from dilute sulphuric acid by a given mass of zinc.
When 0·30 gm. of zinc is added to a solution of copper sulphate in water, 0·29 gm. of copper is displaced and when the same mass of zinc is added to dilute sulphuric acid, 116 c.c. of hydrogen measured at 15°C. and at a pressure of 720 mm. of mercury are displaced. Calculate to three significant figures the atomic weight of copper, assuming that its specific heat is 0·095 and that 1 litre of hydrogen at S.T.P. weighs 0·089 gm.

[66 marks.]

5. Write an explanatory note on each of the following :—(*a*) gram-molecular weight, (*b*) gram-molecular volume, (*c*) Avogadro's hypothesis, (*d*) Gay Lussac's law of volumes.

Show clearly how each of the following may be established :—(i) the relationship between the relative density of a gas and its molecular weight, (ii) the relationship between the atomic weight of oxygen and its molecular weight.

[66 marks.]

6. Give an account of the properties of the two chief allotropes of phosphorus.

Give the names and formulae of the phosphoric acids and describe, with equations, how they may be prepared from phosphorus.

[66 marks.]

7. Describe an industrial method for the production of nitric acid.

Write equations to show the action of nitric acid on the following, and in each case state the conditions under which the action takes place :—(*a*) sulphur, (*b*) copper, (*c*) ferrous sulphate.

[67 marks.]

8. Describe fully how you would prepare a normal solution of each of the following :—(*a*) sodium carbonate, (*b*) sulphuric acid.

When the reaction resulting from the addition of 0·2 gm. of magnesium to 25 c.c. of normal sulphuric acid has ceased, it is found that 8·4 c.c. of a normal solution of sodium carbonate are required to neutralize the excess acid. Calculate, giving your answer correct to two significant figures, the equivalent of magnesium and, also, the mass of any two of the compounds formed during the experiment.

[67 marks.]

9. Name one compound from each of the following classes of compounds and give its structural formula :—(*a*) saturated hydrocarbons, (*b*) unsaturated hydrocarbons, (*c*) carbohydrates, (*d*) organic acids, (*e*) aldehydes, (*f*) fats.

Give an account of the characteristic chemical reactions of (i) aldehydes, (ii) unsaturated hydrocarbons.

[67 marks.]

10. Describe fully how a sample of ethyl alcohol may be prepared by a fermentation method.

Write the structural formula for ethyl alcohol and give an account of the evidence on which it is based.

Give *two* chemical tests to distinguish methyl alcohol from ethyl alcohol.

[67 marks.]