AN ROINN OIDEACHAIS

(Department of Education).

INTERMEDIATE CERTIFICATE EXAMINATION, 1961.

SCIENCE (Syllabus A).

WEDNESDAY, 14th JUNE.—EVENING, 3 TO 5.30.

[Not more than *six* questions are to be attempted, of which *three* must be taken from Section I, and *three* from Section II. Illustrate your answers by means of diagrams wherever possible.]

SECTION I.

1. Define (i) density, (ii) specific gravity.

Describe how you would measure any *two* of the following :— (*a*) the density of a given liquid, (*b*) the density of a solid soluble in water, (*c*) the density of the air. [66 marks.]

2. Describe how you would construct a mercury barometer and how you would use it to measure the pressure of the atmosphere.

Describe and explain the effect of introducing a few drops of water into the barometer.

Calculate the greatest height to which a common pump could raise water when the pressure of the atmosphere is 29 inches of mercury. (Specific gravity of mercury=13·6).

[66 marks.]

3. Define (i) coefficient of linear expansion of a solid, (ii) coefficient of apparent expansion of a liquid.

Describe fully how you would measure the coefficient of linear expansion of copper.

Calculate the coefficient of apparent expansion of a liquid from the following data :—

Weight of bottle	=	15 gm.
Weight of bottle full of liquid at 12°C. ..	=	41·5 gm.
Weight of bottle full of liquid at 52°C. ..	=	40 gm.

[66 marks.]

4. State (i) Boyle's Law, (ii) Charles' Law.

Describe, with the aid of a diagram, an experiment to demonstrate Boyle's Law.

A given mass of a gas has a volume of 546 c.c. at S.T.P. What volume will it have at 27°C., assuming that the pressure remains constant ? What pressure should be applied to it at 27°C. so that its volume would again be 546 c.c.?

[67 marks.]

5. Define (i) specific heat, (ii) latent heat.

Describe fully how you would measure the latent heat of steam.

A calorimeter, of water equivalent 5·56 gm., contains 40 gm. of turpentine at 25°C. 2 gm. of ice at 0°C. are added and the mixture is stirred until all the ice has melted. Calculate the temperature of mixture. (The latent heat of fusion of ice=80 cals. per gm. and the specific heat of turpentine=0·411 cals. per gm.)

[67 marks.]

Section II.

6. Describe, with the aid of a diagram, how you would prepare (i) a few gas-jars of hydrochloric acid gas, (ii) a solution of hydrochloric acid.

Describe fully how you would prepare a reasonably pure sample of common salt, given a solution of sodium hydroxide and a solution of hydrochloric acid.

[66 marks.]

7. Describe any *six* of the following substances with regard to appearance, effect of water (if any), effect of heat:—(i) ammonium nitrate, (ii) ammonium nitrite, (iii) ammonium chloride, (iv) calcium carbonate, (v) crystalline copper sulphate, (vi) mercuric oxide, (vii) potassium chlorate, (viii) sodium bicarbonate.

[66 marks.]

8. Give an account of an experiment in which the conditions under which rusting takes place are examined.

Describe an experiment to show the similarity between burning and rusting.

Describe and explain *two* methods by which rusting may be prevented.

[66 marks.]

9. Describe, with the aid of a sketch of the apparatus, how you would measure the percentage of carbon dioxide in a sample of chalk by using an acid to displace the carbon dioxide.

If chalk contains 44% by weight of carbon dioxide and if a litre of carbon dioxide, at S.T.P., weighs 1·98 gm., calculate the volume of carbon dioxide, at S.T.P., which could be obtained from 5·94 gm. of chalk.

Give an account of the properties of carbon dioxide.

[67 marks.]

10. Give an account of the preparation and properties of hydrogen.

Describe, with the aid of a diagram, how you would measure the chemical equivalent of copper by reduction of copper oxide.

When 2·79 gm. of a certain oxide were reduced 2·59 gm. of the metal were obtained. Calculate the equivalent of the metal.

[67 marks.]