AN ROINN OIDEACHAIS

(Department of Education).

INTERMEDIATE CERTIFICATE EXAMINATION, 1953.

SCIENCE (Syllabus A).

TUESDAY, 16th JUNE.—EVENING, 2 TO 5.

[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 wherever possible.]

SECTION I.

1. State the law of flotation and describe an experiment to demonstrate it in the case of a liquid other than water.

Using a test-tube and lead shot, describe how you would apply the law of flotation to measure the specific gravity of a given liquid. Explain your method.

[66 marks.]

2. Describe (*a*) the kind of tube you would use in the construction of a simple mercury barometer, (*b*) how you would construct the barometer.

Explain (i) why the mercury used in the construction of a barometer must be dry, (ii) why the mercury rises in the tube when the barometer is slanted, (iii) what would be observed if the barometer were put into a vacuum, (iv) how the barometer could be used to measure the approximate height of a mountain.

[66 marks.]

3. Describe fully how you would measure the latent heat of fusion of ice.

A piece of ice, at 0°C. and weighing 12 gms., was put into a vessel containing 100 gms. of a liquid at 30°C. When all the ice had melted, the temperature of the mixture in the vessel was 12°C. If the latent heat of fusion of ice is 79 calories per gm. and if the water equivalent of the vessel is 8·5 gms., calculate the specific heat of the liquid.

[66 marks.]

4. Describe fully how you would measure the coefficient of apparent expansion of a liquid.

Explain the difference between the coefficient of apparent expansion of a liquid and its coefficient of real expansion.

The density of a liquid at 0°C. is 0·81 gm. per c.c. If the coefficient of real expansion of the liquid is 0·00112, find the density of the liquid at 40°C.

[67 marks.]

5. State the principle of moments and describe an experiment to demonstrate it.

A plank AB, weighing 100 lb., rests horizontally on two supports, one at the end A and the other at the end B. The length of the plank is 6 feet and its centre of gravity is $2\frac{1}{2}$ feet from the end A. Find the thrust on the support at the end B.

When a mass of 20 lb. is suspended from a certain point in the plank, the thrusts on the supports are equal. How far is the point of suspension of the mass from the end B ?

[67 marks.]

Section II.

6. Describe fully, with the aid of a diagram, how you would prepare and collect carbon dioxide. Give an account of its properties and describe how you would show that it contains carbon and oxygen.

[66 marks.]

7. Define : (*a*) acid, (*b*) alkali, (*c*) salt, and give one example of each of them.

Describe the preparation and properties of sulphuric acid. Give an account of how you would use the acid in preparing a reasonably pure sample of crystalline copper sulphate (bluestone) and mention one important use of that substance.

[66 marks.]

8. Describe, with the aid of diagrams, how you would investigate the action of (*a*) sodium on water, (*b*) calcium on water, (*c*) magnesium on steam. What information regarding the composition of water may be obtained from these experiments ?

[66 marks.]

9. Define chemical equivalent of an element.

Describe fully, with the aid of a diagram, how you would measure the chemical equivalent of magnesium by displacing hydrogen. Mention the precautions which should be taken and show clearly how the equivalent is calculated from the necessary measurements.

[67 marks.]

10. Describe how you would prepare and collect nitrous oxide and give an account of its properties.

Sketch an apparatus which could be used to pass nitrous oxide over hot copper. What products would you expect to obtain in that experiment and what could be deduced from them regarding the composition of nitrous oxide ?

[67 marks.]