AN ROINN OIDEACHAIS

(Department of Education.)

INTERMEDIATE CERTIFICATE EXAMINATION, 1946.

SCIENCE (Syllabus A).

WEDNESDAY, 19th JUNE.—MORNING, 10 TO 12.

[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. All questions are of equal value.]

SECTION I.

1. What is the relationship between the area of a circle and the area of the square on its diameter ?

Describe fully how you would establish this relationship by experiment, using (*a*) squared paper, (*b*) a balance and a piece of cardboard of uniform thickness.

2. On what factors does the pressure exerted by a column of liquid depend ?

Describe fully with the aid of a diagram how you would use Hare's apparatus to find the specific gravity of a liquid.

Is it necessary that the limbs of the apparatus should be (*a*) vertical (*b*) of the same cross-section ? Explain your answers fully.

3. What do you understand by the water equivalent of a calorimeter ?

Given a calorimeter of unknown material, describe fully how you would find by experiment its water equivalent.

When 156 calories of heat are given to a calorimeter, its temperature is raised from 12° C. to 18·5° C. Find the water equivalent of the vessel.

Find, also, the specific heat of the vessel if it weighs 130 gms.

4. Describe with the aid of a diagram the experiment you would perform to obtain data for the plotting of a graph to show the relationship between the volume of a certain mass of air and its temperature.

Show clearly (*a*) the shape of the graph, and (*b*) how you would use it to verify Charles' Law.

A mass of air at 15° C. has a volume of 500 c.c. What would be its volume at 0° C., the pressure remaining constant ?

5. What do you understand by (*a*) calorie, (*b*) latent heat of fusion of ice, (*c*) latent heat of steam.

When 3 grms. of steam at 100°C are passed into 78 grms. of water at 12°C the temperature is raised to 35°C. Calculate the latent heat of steam.

If 1 ton of steam at 100° C. is capable of melting 8 tons of ice at 0°C., calculate the latent heat of fusion of ice.

Section II.

6. Describe fully how you would prepare a sample of each of the following substances from its elements: (*a*) carbon dioxide, (*b*) calcium oxide, (*c*) chalk.

Write down the properties of carbon dioxide.

7. Explain what is meant by the following terms and in each case give one example to illustrate your answer: (*a*) solvent, (*b*) solubility, (*c*) distillation, (*d*) saturated solution, (*e*) super-saturated solution.

Describe fully how you would find by experiment the percentage weight of each of the constituents in a mixture of common salt and sand.

8. Describe in detail how you would estimate by experiment the percentage weight of carbon dioxide in chalk.

If chalk contains 44% by weight of carbon dioxide, what volume of carbon dioxide at 0° C. and 720 mm. could be obtained from 1 grm. of chalk?

[One litre of carbon dioxide at S.T.P. weighs 1·98 grms.]

9. What do you understand by (*a*) friction, (*b*) coefficient of friction?

Describe how you would find experimentally the coefficient of friction in the case of a wooden block moving on a horizontal board.

A wooden block weighing 112 lbs. rests on a horizontal board. If the coefficient of friction be $\frac{1}{4}$, find the least force (*a*) acting horizontally, (*b*) making an angle of 30° with the horizontal, which would be required to keep the block in motion along the board.

10. What do you understand by (*a*) centre of gravity, (*b*) the principle of moments?

A thin piece of cardboard is in the form of a square of side 1 foot. Show with the aid of diagrams how would you suspend the piece of cardboard in (*a*) stable, (*b*) unstable, (*c*) neutral equilibrium?

If a triangular piece is removed from the square by cutting along a line joining the middle points of two adjacent sides, find by calculation the position of the centre of gravity of the remaining piece.