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(Department of Education).

BRAINNSE AN MHEÁN-OIDEACHAIS.
(Secondary Education Branch).

INTERMEDIATE CERTIFICATE EXAMINATION, 1934.

FULL COURSE.

SCIENCE (Syllabus A).

FRIDAY, 15*th* *JUNE.*—Afternoon, 4 to 6 p.m.

[Not more than *six* questions to be attempted. All questions carry equal marks. Illustrate your answers wherever possible.]

1. What instrument would you use and how would you use it to find:—

    (*a*) The volume of a cobblestone.
    (*b*) The thickness of the paper used in your note-book.
    (*c*) The area of an ivy leaf.
    (*d*) The internal diameter of the neck of a bottle.
    (*e*) The length of an egg.

2. Sketch the apparatus you would use to pass some air over heated magnesium and to collect the air after it had passed over. What changes would you expect to find in the magnesium and in the air after the experiment was over? Give reasons for your answers.

3. How would you find the coefficient of linear expansion of a solid substance?

    The distance between two electric standards is 400 yards. What is the minimum difference between the winter and summer lengths of the copper cable between them, assuming that the temperature ranges from 5°F. to 95°F. and given that the co-efficient of linear expansion of copper is ·000014 on a Centigrade reckoning?

4. In what units is force measured?

How would you find experimentally the force required to:—

   (a) Lift a heavy stone.
   (b) Drag it along horizontally.
   (c) Push it up an inclined plane?

Illustrate your answers with diagrams.

5. A lever is supported at its centre of gravity by a sharp edge and is in equilibrium when an object weighing 27·4 grams is suspended on one side and a 20 gram weight on the other. If the 20 gram weight is 14 cm. from the edge how far from the edge will the object be? The 20 gram weight when put into the scale pan of a spring balance extends it by 2·2 cm. How much further will the spring extend when the object is put in with the 20 gram weight?

6. What occurs when:—

   (a) Dilute sulphuric acid is poured on zinc.
   (b) Potassium chlorate is heated.
   (c) Sodium is put into water.
   (d) Calcium chloride is left in the air.
   (e) Ammonia gas and hydrochloric acid gas are mixed.

Sketch the apparatus you would use in order to collect the product of the reaction in (a).

7. A calorimeter has a water equivalent of 8·6 grams. Its internal volume is 150 c.c. You are asked to find the specific heat of aluminium. State (a) the approximate quantity of water you will put in the calorimeter, (b) the approximate amount of aluminium you will use, (c) the form in which you will use the aluminium, (d) the nature of the graduations on the thermometer you will select, (e) the principle on which your calculations will be based, (f) the units in which your result will be given.

8. A lump of lead hangs vertically from a point A. A 10lb. weight is attached to a string, which is tied at a point B to the string supporting the lead and passes over a pulley. Equilibrium is obtained when the point B is at the same level as the top of the pulley and the string AB is 45° to the vertical.

What is the weight of the lump of lead?

How would you determine experimentally the work done by the 10lb. weight in pulling the lead from its original position to the position of equilibrium?

9. Pieces of metal whose volumes are given below are found to lose apparently the weights, also given, when weighed in turpentine.

Volumes in c.c.	9·3	17·2	22·4	29·1	34·7
Appt. losses of wt. in grams.	8·09	14·96	19·49	25·32	30·19

Draw a graph of these results and draw what conclusions you can. State the principle of Archimedes and from the graph deduce the weight of 1 c.c. of turpentine.

10. What do you understand by the Law of Reciprocal Proportions?

Illustrate your answer by any experimental evidence you have secured in the course of your work.

11. What do you understand by the statement that the solubility of nitre is 138 at 70° C.? How would you test experimentally the accuracy of the statement?

12. How would you find experimentally the coefficient of friction between the laboratory bench and a given flat piece of wood?