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INTERMEDIATE CERTIFICATE EXAMINATION, 1942.

SCIENCE (Syllabus A)

FRIDAY, 12th JUNE.—AFTERNOON, 4 TO 6.

[Not more than *six* questions 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. Describe carefully how you would use (a) parallel blocks to determine the diameter of a sphere, (b) a graduated cylinder to determine the volume of a stone, (c) a burette to measure out 30 c.c. of a given liquid. State the precautions which should be taken in each case, and show how errors would arise through neglect of these precautions.

2. State the Principle of Archimedes, and show how the Law of Flotation may be deduced from it.

A graduated cylinder contains 50 c.c. of water. A piece of wood which floats is put into the cylinder and the reading is now 65 c.c. When the wood is pushed down with a piece of wire until it is totally immersed the reading is 85 c.c. Calculate the density of the piece of wood.

3. Show how you would (a) set up a simple pendulum, (b) measure its length, and (c) find its period of oscillation. How would you determine the relationship between the length of the pendulum and its period of oscillation? The period of oscillation of a pendulum of length 99.3 cm. is 2 secs. Calculate the length of a pendulum whose period of oscillation is 1.3 secs.

4. What is meant by coefficient of linear expansion?
Make a list of the measurements which must be made in order to determine the coefficient of expansion of an iron rod, and show how the coefficient may be calculated. Sketch the apparatus you would use and describe how you would use it.

5. What is meant by (a) calorie, (b) specific heat?
25.40 grms. of a given metal at 99°C . were dropped into 53.00 grms. of water in a copper calorimeter of weight 52.00 grms. and the temperature of the water was raised from 15°C . to 18°C . If the sp. heat of copper is .1, calculate the sp. heat of the given metal. What is the water equivalent of the calorimeter used?

6. Describe with the aid of diagrams how you would determine (a) the boiling point of a given liquid, (b) the melting point of a given substance. How do changes of pressure affect (a) the boiling point of water, (b) the melting point of ice?

SECTION II.

7. Describe, with the aid of diagrams, how you would determine what happens when (a) zinc is added to dilute sulphuric acid, (b) steam is passed over heated iron. Name all the products obtained in each case. How would (i) Cavendish, (ii) Lavoisier explain the reactions which take place in each case?

8. How may hydrochloric acid gas be prepared and collected in the laboratory? Sketch the apparatus, and describe the properties of the gas. Give one test to distinguish a solution of the gas in water from dilute sulphuric acid.

9. Sketch, and explain how to use, an apparatus for passing air slowly over heated copper and collecting the products formed. What happens the copper in this experiment, and how may it be recovered?

10. State the following theorems:—(a) The Parallelogram of Forces, (b) the Triangle of Forces.

Two pieces of cord of length 9 cm. and 12 cm. respectively are tied to a point in an object weighing 100 gm. The free ends of the cords are tied to two nails which are 15 cm. apart and in the same horizontal line. If the object hangs freely, calculate the tension in each cord.

11. What is meant by the moment of a force?

If you were supplied with a known wt., a piece of thread, and a stick, describe how you would find the wt. of the stick.

An iron bar AB of length 40 inches hangs horizontally when suspended at a point 15 inches from B. When wts. of 5 lbs., 7 lbs., and 9 lbs. are suspended from it at A, B, and its middle point, respectively, it is found to balance at a point 17 inches from B. Calculate the wt. of the bar.

12. In what units is work measured?

A block of wood weighing 100 lbs. is dragged a distance of 30 inches along a horizontal board by a force of 12 lbs. parallel to the board. Calculate the work done.

If the board were inclined at an angle of 60° to the ground, find the least force parallel to the board required to drag the block up it and the work done by that force if the block is thus raised to a vertical height of 4 ft.