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INTERMEDIATE CERTIFICATE EXAMINATION, 1945.

SCIENCE (Syllabus A.)

TUESDAY, 19*th 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. Describe, with the aid of a diagram, a laboratory balance, and give a list of the precautions you would take to use it in the proper manner. What factors determine the sensitivity of a laboratory balance?

2. Given a liquid, describe how you would find its specific gravity using (*a*) a density bottle, (*b*) a test-tube and some lead shot, and in each case explain your method fully.

3. Describe the type of tube you would use and how you would use it to construct a mercury barometer. Why is mercury used in preference to other liquids? What would be the effect on the level of the mercury in a barometer constructed in the laboratory if

   (*a*) the tube were slanted,

   (*b*) more mercury were poured into the trough,

   (*c*) a small hole were bored in the top of the tube,

   (*d*) a small drop of water were put into the tube above the mercury?

Give reasons for your answers.

4. What do you understand by latent heat of fusion? Describe fully how you would find the latent heat of fusion of ice by experiment, giving a list of the necessary measurements and showing clearly how the latent heat may be calculated from them.

5. How is the volume of a mass of gas related to (*a*) its pressure, (*b*) its temperature? By what scientists were these properties first investigated?

The density of oxygen at 0°C and under a pressure of 760mm. of mercury is 1·43 grms. per litre. A cylinder, the capacity of which is 2·5 litres, contains a certain mass of oxygen under a pressure of 830mm. of mercury and at a temperature of 24°C. Find the mass of oxygen in the cylinder.

SECTION II.

6. What do you understand by (*a*) chemical change, (*b*) reduction, (*c*) catalytic agent, (*d*) sublimation, (*e*) efflorescence? Give one example in each case to illustrate your answer.

7. Define:—element, compound. Of what elements is each of the following substances composed:—(*a*) limestone, (*b*) quicklime, (*c*) carbon dioxide? How may quicklime and carbon dioxide be obtained from limestone and how may a sample of chalk be prepared from them?

8. Describe fully how you would find the percentage increase in weight when magnesium is burned in air. When magnesium is burned in air its weight increases by 66%. Find (*a*) the equivalent weight of magnesium, and (*b*) the volume of hydrogen (at S.T.P.) that would be displaced from a suitable acid by 2·34 grams of magnesium. [1 litre of hydrogen at S.T.P. weighs 0·09 grams.]

9. Define:—(*a*) force, (*b*) fulcrum, (*c*) centre of gravity.

An iron bar, weighing 40 lbs. and 4 ft. long, is supported at its centre of gravity which is at a distance of 5 inches from one end so that it is free to turn about the point of support. An object suspended from the end of the bar nearest the centre of gravity is balanced by a mass of 10 lbs. suspended from the other end. Find the mass of the object.

If the point of support is now moved 4 inches further away from the object, where must an additional mass of 20lbs. be suspended from the bar so as to restore equilibrium?

10. State the theorem known as the Triangle of Forces and tell how you would test its truth by experiment.

An object weighing 100 lbs. rests on a smooth plank inclined at an angle of 50° to the horizontal and is kept from slipping by a force acting parallel to the plank.

What forces are acting on the object, and in what directions are they acting?

Use the Triangle of Forces to find their magnitudes as accurately as you can.