

INTERMEDIATE CERTIFICATE EXAMINATION, 1967

SCIENCE (Syllabus A)

THURSDAY, 15th JUNE - Morning, 10 to 12.30

(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 by means of diagrams wherever possible.)

SECTION I

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

A solid cylinder, 9 cm. in length, floats vertically in water with 6 cm. of its length beneath the surface. It floats vertically in a given liquid with 7 cm. of its length beneath the surface. Find (i) the density of the cylinder, (ii) the density of the given liquid.

Describe, with the aid of a diagram, a hydrometer and explain how you would use it to measure the density of a given liquid. (66 marks)

2. With regard to each of any three of the following describe an experiment

(i) to show the relation between the length of a simple pendulum and its period of oscillation,

(ii) to find the centre of gravity of a piece of cardboard of irregular shape,

(iii) to show the density of water at various temperatures,

(iv) to measure the boiling point of a given liquid. (66 marks)

3. Describe how a mercury thermometer may be constructed and graduated to read from -5°C . to 105°C . Compare and contrast mercury and alcohol as thermometric fluids. Describe how you would measure the melting point of a substance such as beeswax. (66 marks)

4. (a) With regard to heat, explain what you understand by (i) conduction, (ii) convection, (iii) radiation. Give an example in each case.

(b) What do you understand by (i) the coefficient of apparent expansion of a liquid, (ii) the coefficient of absolute expansion of a liquid?

If the specific gravity of a given liquid at 0°C . is 0.800 and at 30°C . is 0.775, find its coefficient of absolute expansion, correct to four places of decimals. (67 marks)

5. State (i) Boyle's Law, (ii) Charles' Law, and describe an experiment to demonstrate one or other of these Laws.

A given mass of gas at standard pressure and at a temperature of 27°C . has a volume of 100 c.c. At what temperature will its volume be 110 c.c., assuming the pressure remains constant? (67 marks)

SECTION II

6. State what you understand by (i) an acid, (ii) an alkali, (iii) a salt. Give two examples in each case.

Describe how you would prepare and collect one of the acids you have named and give an account of its properties. (66 marks)

7. Give an account of the allotropes of sulphur and describe fully how they may be prepared. Name two allotropes of carbon. (66 marks)

8. Describe, with the aid of a diagram, how you would prepare and collect oxygen.

State the physical properties of oxygen. Describe what may be observed when each of the following is burned in oxygen, name the product formed and mention the effect, if any, of the product on moist litmus:- (a) magnesium, (b) phosphorus, (c) sulphur, (d) iron. (66 marks)

9. Describe how you would prepare and collect carbon dioxide.

Give an account of the properties of carbon dioxide and describe how you would measure its density.

How would you show experimentally that the atmosphere contains a small amount of carbon dioxide? (67 marks)

10. What do you understand by the chemical equivalent of an element? Describe, with the aid of a diagram, how you would measure the chemical equivalent of magnesium by displacement of hydrogen.

If 1 gm. of calcium reacted with water to give 555 c.c. of hydrogen at S.T.P., calculate the chemical equivalent of calcium assuming that a litre of hydrogen at S.T.P. weighs 0.09 gm. (67 marks)