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INTERMEDIATE CERTIFICATE EXAMINATION, 1958.

SCIENCE (Syllabus A).

TUESDAY, 17th JUNE.—EVENING, 3 TO 5.30.

[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. Describe, with the aid of diagrams, how you would measure (i) the length of a curved line, (ii) the area of Leinster, from a map, (iii) the volume of an irregular solid which is too large to be put in a graduated cylinder.

[66 marks.]

2. Describe how you would investigate by experiment the relationship between load and extension in the case of a spiral spring. Given a known weight, describe how you would use a spiral spring to find the weight of a given object.

A solid, when suspended from a spiral spring produces an extension of 5·6 cms. When the solid is immersed in water the extension produced is 3·6 cms. Calculate the density of the solid and explain your method.

[66 marks.]

3. Explain, with the aid of a diagram, how (i) a simple siphon, (ii) a common pump, works.

Calculate the greatest height in feet to which a common pump could raise water when the pressure of the atmosphere is 29·5 inches of mercury. (Specific gravity of mercury=13·6.)

[66 marks.]

4. Define (i) coefficient of linear expansion, (ii) coefficient of apparent expansion of a liquid.

Describe fully, with the aid of a sketch of the apparatus, how you would measure the coefficient of linear expansion of copper.

A copper rod measures 50·5 cms. at 12°C. Calculate the length of the rod at 92°C., given that the coefficient of linear expansion of copper is 0·0000167.

[67 marks.]

5. Define (i) latent heat of fusion, (ii) specific heat.

Describe fully an experiment to measure the latent heat of steam.

A calorimeter, suitably lagged to prevent heat losses, contains a stirrer and is about one-third full of water at 15°C. 1·1 gms. of dry ice at 0°C. are put in the calorimeter and then 14·1 gms of copper at 97°C. are added to it. The mixture is stirred until the ice has melted and it is found that the temperature of the contents of the calorimeter is 15°C. Calculate the latent heat of fusion of ice, assuming that the specific heat of copper is 0·09.

[67 marks.]

SECTION II.

6. Describe, with the aid of a diagram, how you would prepare oxygen and give an account of its properties.

Describe what may be observed and name the products formed when each of the following is burned in oxygen :—

(i) carbon, (ii) sulphur, (iii) phosphorus, (iv) magnesium.

[66 marks.]

7. Describe and give an example of each of the following processes :— (i) dissolving, (ii) decanting, (iii) evaporating, (iv) subliming.

Describe fully how you would measure the solubility of a given salt in water at 30°C. What is the effect of change of temperature on the solubility of salts in water ?

[66 marks.]

8. Describe, with the aid of a diagram, how you would prepare nitric acid.

Give an account of the properties of nitric acid and describe its action on copper.

Name any three salts of nitric acid and describe how you would prepare from nitric acid a reasonably pure sample of any one of the salts named.

[66 marks.]

9. Give an account of the preparation and properties of hydrogen.

Draw a sketch of the apparatus you would use to pass dry hydrogen over heated copper oxide and to collect the products formed. Describe, also, how you would carry out the experiment.

When dry hydrogen was passed over 1 gm. of heated copper oxide 0·8 gms of copper were obtained. Calculate (i) the chemical equivalent of copper, (ii) the volume of hydrogen at S.T.P. required in the reduction. (A litre of hydrogen at S.T.P. weighs 0·09 gms.)

[67 marks.]

10. What is the action of hydrochloric acid on chalk ?

Describe, with the aid of a diagram, how you would measure the percentage of carbon dioxide in a sample of chalk.

Calculate the volume of carbon dioxide, at 12°C. and at a pressure of 740 mm. of mercury, which could be obtained from 1·5 gms. of chalk, assuming that chalk contains 44% carbon dioxide. (A litre of carbon dioxide at S.T.P. weighs 1·98 gms.)

[67 marks.]