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(Department of Education).

BRAINNSE AN MHEADHON-OIDEACHAIS

(Secondary Education Branch).

INTERMEDIATE CERTIFICATE EXAMINATION, 1941.

SCIENCE (Syllabus A)

THURSDAY, 19th JUNE.—AFTERNOON, 4 TO 6 P.M.

[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 the experiments you would perform to determine each of the following with reasonable accuracy:—

- (a) the capacity of a small bottle;
- (b) the length of a river, in miles, from a map;
- (c) the area, in acres, of the county in which you live, from a map.

2. What do you understand by relative density?

Using the Principle of Archimedes describe how you would determine the relative density of a given liquid. When a stone is weighed in a liquid of relative density $\cdot 82$ it appears to lose 2 gm. in weight. Calculate the volume of the stone. If it appears to lose 2.80 gm. when weighed in another liquid, calculate the relative density of that liquid.

3. Describe carefully how you would construct a mercury barometer and show, by means of a diagram, how you would use it to measure the pressure of the atmosphere. If the barometer reads 29.2", calculate the pressure of the atmosphere in lbs. wt. per square inch.

[A cubic foot of water weighs 62.3 lb., Sp. gr. of mercury = 13.6.]

4. Explain the following terms:—(a) unit of heat; (b) capacity for heat.

Describe fully how you would determine the specific heat of a given metal and mention the precautions which would be necessary to ensure a reasonably accurate result.

When 11.20 gms. of a certain metal at 100°C . are added to 49.13 gms. of alcohol the temperature of the alcohol is raised from 15°C . to 18°C . Compare the specific heats of alcohol and metal.

5. What is meant by the boiling point of a liquid? How is the boiling point of a liquid affected by changes of pressure?

Describe, with the aid of diagrams, the experimental work you would do to demonstrate the truth of your answer. If you were given the boiling point of a liquid how would you find out the name of the liquid?

6. What is meant by the coefficient of apparent expansion of a liquid?

Describe an experiment you would perform to find the coefficient of apparent expansion of turpentine between room temperature and 70°C .

The coefficient of apparent expansion of a given liquid with respect to glass is .0009 and the coefficient of linear expansion of glass is .000009. Calculate the true coefficient of expansion of the liquid.

SECTION II.

7. What do you understand by the solubility of a substance in water?

Describe fully how you would determine the solubility of a given salt in water at 40°C .

How is the solubility of substances in water affected by changes in temperature?

8. What are the most important points of difference between:

(a) elements and compounds;

(b) compounds and mixtures;

(c) acids and alkalis;

(d) physical and chemical changes;

(e) deliquescent and hygroscopic substances?

Give an example in each case to illustrate your answer.

9. Describe, with the aid of a diagram, how carbon dioxide may be prepared and collected in the laboratory. Write down its properties and mention some of its commercial uses. What are the main points of difference between quicklime and chalk?

Describe how (a) chalk may be converted into quicklime; (b) quicklime into chalk.

10. What is meant by centre of gravity?

Describe fully how you would find the centre of gravity of an irregular piece of cardboard. Explain your method. A piece of cardboard of uniform thickness is in the form of a square of side 12 inches. The middle points of the opposite sides are joined and one of the four small squares thus formed is cut away. Calculate the position of the centre of gravity of the remaining piece.

11. State the laws of friction.

A wooden block weighing 10 lb. and resting on a horizontal plane begins to move when a force of 6 lb. weight acts on it parallel to the plane. What is the coefficient of friction?

If the plane were inclined at an angle of 30° to the horizontal, what is the least force parallel to the plane which would move the block down the plane?

12. State the triangle of forces.

Describe fully how you would verify it experimentally.

A picture frame of mass 40 lb. is suspended from a nail by means of a piece of string, the ends of which are attached to the ends of the top rail of the frame. If the frame hangs vertically and the string and the top rail form an equilateral triangle, find the tension of the string.