AN ROINN OIDEACHAIS.

AN BHRAINSE GHAIRM-OIDEACHAIS.

CERTIFICATE EXAMINATIONS

for

DAY VOCATIONAL COURSES, 1948.

MECHANICS & HEAT.

Wednesday, June 30th—2 to 3.30 p.m.

(i) Not more than *four* questions may be attempted.

(ii) Question 1 must be attempted by all candidates.

1. Answer each of the following:—

(*a*) Define Centre of Gravity.

(*b*) State the Principle of the Spiral Spring.

(*c*) On what does the time of swing of a simple pendulum depend?

(*d*) State the Triangle of Forces.

(*e*) Define Coefficient of Linear Expansion.

(*f*) A brass cube of edge 2 centimetres weighs 68 grams. Find the density of brass.

(*g*) Give in °C and °F (*a*) the melting point of ice, and (*b*) the boiling point of water at normal pressure.

(*h*) Calculate the mechanical advantage and velocity ratio of a machine in which an effort of 40 lbs. acting through a distance of 12 feet raises a load of 200 lbs. through a vertical height of 2 feet.

2. State the *Principle of Archimedes.*

A solid glass stopper weighs 50 grams in air, 30 grams in water and 34 grams in paraffin oil. Calculate (*a*) the volume of the stopper; (*b*) the specific gravity of the glass; (*c*) the specific gravity of the oil.

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3. Describe, with the aid of sketches, three simple experiments to show that the atmosphere exerts a pressure.

Name the instrument used to measure the pressure of the atmosphere. What reading would you expect on this instrument on a normally fine day?

4. State and define the units in which (*a*) *work* and (*b*) *power* are commonly expressed.

How much work is done in pumping 1,200 gallons of water to a height 90 feet above its original level? What horse-power must be available to do this work in half-an-hour? (A gallon of water weighs 10 lbs.)

5. If you were given a metre rule, a 100 gram weight, an object of unknown weight and some string, describe how you would determine (*a*) the weight of the object; (*b*) the weight of the metre rule.

Assume any necessary figures to show how you would work out the results.

6. What is meant by *water-equivalent*?

120 grams of water at 40° C. are added to 100 grams of water at 10° C. contained in a calorimeter. The temperature after mixing is 26° C. Calculate the water-equivalent of the calorimeter.

7. Explain the terms *conduction, convection* and *radiation,* giving a practical illustration in each case.

State briefly how heat losses from these causes are prevented in an ordinary thermos flask.