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.

[P.T.O.]
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.