CERTIFICATE EXAMINATIONS
for
DAY VOCATIONAL COURSES, 1963.

MECHANICS AND HEAT.

WEDNESDAY, 19th JUNE — 2.30 to 4.30 p.m.

INSTRUCTIONS.

Not more than <u>four</u> questions to be attempted.

1. What is meant by conduction of heat?
    Give a labelled diagram of the apparatus you would use to show that copper and iron conduct heat at different rates.
    Explain why, on a cold day, the metal handlebars of a bicycle feel cold while the rubber hand grips do not.

2. Describe an experiment to determine the latent heat of fusion of ice. Give a diagram of the apparatus used and mention the precautions necessary to obtain an accurate result.
    15 grams of dry ice were added to 150 grams of water at 25°C. contained in a copper calorimeter of mass 20 grams. After the ice had melted completely, the mixture reached a steady temperature of 16°C. Calculate the latent heat of fusion of ice.

    (Specific heat of copper = 0·1)

3. In the case of any four of the following, say whether the statement is correct or incorrect, and give reasons for your answers:-

    (i) The boiling point of water rises as the altitude above sea level increases.

    (ii) The atmospheric pressure rises in dry weather.

    (iii) A body weighs less when immersed in oil than it does when immersed in water.

    (iv) Heat from the sun is transferred to the earth by radiation only.

    (v) The maximum suction height through which a pump can raise water is approximately 34 feet.

4. Describe an experiment to determine the position of the centre of gravity of a sheet of cardboard which has uniform thickness but irregular shape.
    Give examples to show that you understand the meaning of the terms "stable", "unstable" and "neutral" equilibrium.

5. Draw a diagram of the wheel and axle and show how to calculate its velocity ratio, if the diameter of the wheel is D, and that of the axle is d.
    Find the effort required to raise a load of 60 lb. if the diameter of the wheel is 20 in., that of the axle is 4 in. and the efficiency of the arrangement is 75 per cent.

6. Explain clearly why a spring balance measures the weight of a body whereas a lever balance measures its mass.
    A spiral spring has an unstretched length of 12·5 cm. Its length becomes 16·25 cm. when a mass of 600 gm. is hung on its lower end. What load would cause it to extend to a length of 17·5 cm.? What assumption is made in your calculation?