AN ROINN OIDEACHAIS

BRAINSE AN GHAIRMOIDEACHAIS

CERTIFICATE EXAMINATIONS FOR DAY VOCATIONAL COURSES, 1967

MECHANICS AND HEAT

THURSDAY, 15th JUNE – 2.30 to 4.30 p.m.

INSTRUCTIONS

Four questions to be attempted. All questions carry equal marks. Sketches should be neat and clear.

1. Define Specific Heat.
   A copper calorimeter of weight 120 gm. contains 130 gm. of methylated spirits at 12°C. An aluminium block of weight 65 gm., at a temperature of 90°C, is dropped into the calorimeter. The final temperature of the mixture is 22°C. Calculate the specific heat of methylated spirits. (sp. ht. of copper = 0·1; sp. ht. of aluminium = 0·21)

2. (a) Describe any experiment which clearly shows that metals are good conductors and non-metals bad conductors of heat; draw a diagram and explain what happens.

   (b) Describe an experiment which shows that all metals do not expand by equal amounts when heated through the same range of temperature. Name a practical application of this principle and explain how it works.

3. Answer each of the following:
   (i) What is the essential difference between conduction , convection and radiation of heat ?

   (ii) Describe how you would mark the "upper fixed point" on a thermometer.

   (iii) Define "Resultant Force".

   (iv) State Boyle's Law.

   (v) Name the instrument used to determine directly the specific gravity of a liquid and describe briefly how it is used.

4. State Archimedes Principle.
   (i) A glass stopper weighs 27 gm. in air, 18 gm. in methylated spirits and 16 gm. in water. Find (a) the volume of the stopper (b) the specific gravity of glass (c) the specific gravity of methylated spirits.

   (ii) Describe how you would use Achimedes Principle to find the specific gravity of a cork.

5. Define (a) Mechanical Advantage (b) Velocity Ratio (c) Efficiency of a machine.
   Show that Efficiency $= \dfrac{M.A.}{V.R.}$
   A wheel and axle have diameters of 30" and 6" respectively. If the efficiency is 80% calculate the effort required to raise a load of 60 lbs.

6. (a) Describe an experiment to show that the air exerts a considerable pressure.

   (b) Calculate the atmospheric pressure when a mercury barometer reads 29·2", given that the density of mercury is 0·49 lbs. per cb. in.

   (c) Draw a sketch of a siphon and explain how it works.

7. Define Centre of Gravity. Describe how you would determine the centre of gravity of a thin irregular shaped sheet of cardboard.
   A uniform beam of wood 8 feet long balances horizontally when it is supported 2' 6" from one end and carries a load of 12 lbs. at the end nearest the support. Calculate the weight of the beam.