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(Department of Education.)

LEAVING CERTIFICATE EXAMINATION, 1944.

PHYSICS.—HONOURS.

FRIDAY, 23rd JUNE.—AFTERNOON, 1.30 TO 3.30.

Not more than *six* questions to be attempted of which one at least must be selected from each Section. All questions are of equal value.

SECTION I.

1. Explain, giving examples (1) conservation of energy; (2) conservation of momentum. A simple pendulum of length 100 cms. having a bob of mass 5 grams is drawn aside through an angle of 30° from the position of rest and is then released. Calculate (*a*) the velocity of the bob; (*b*) the tension in the cord, when the bob is passing through the position of rest.

2. Define velocity, speed, acceleration, and mention the C.G.S. units in terms of which it is customary to measure them. A train starts from a station and moves with a uniform acceleration. After two minutes it has reached a level crossing, and one minute later a point 1,000 yards beyond the crossing. Find the acceleration and the distance of the crossing from the station.

3. Explain briefly how forces may be resolved. A picture weighing 5 pounds is hung from a nail so that each half of the cord makes an angle of 75° with the vertical. Calculate the tension in either half of the cord. How would you verify your answer experimentally?

4. How is it that balloons may be made to carry heavy loads? A model balloon is made of rubber of negligible thickness and is filled with 10 litres of helium under certain conditions of temperature and pressure. Attached to it by a very thin thread is a piece of wood such that the whole neither rises or falls in air. Calculate the volume of wood if its specific gravity is 0·50 and the densities of air and helium relevant to the experiment are respectively 1·3 and 0·20 grams per litre. The fabric of the balloon and thread weigh one gram.

SECTION II.

5. A convex lens of 5 cms. focal length is placed 4·5 cms from a small object. Draw a diagram to show the formation of the image. Deduce by calculation the magnifying power of the lens. Minimum distance of distinct vision 25 cms.

6. Being given a sample of colourless liquid describe how you would determine the index of refraction. Give the theory of the method used proving any formulæ involved.

7. State the laws of reflection and refraction of light. Light is incident normally on one face of an isosceles right-angled prism and is totally reflected at another face. Prove that the index of refraction of the material of the prism cannot be less than $\sqrt{2}$.

8. Mention two types of telescope and give the theory of one of them. On what factors depends the angular size of the final image ?

Section III.

9. Define (1) unit magnetic pole ; (2) magnetic field strength at a point ; (3) magnetic moment of a magnet. Describe an experiment for comparing the values at different places of the horizontal component of the magnetic field.

10. Describe the principle of the potentiometer and explain how you would use it to compare the E.M.F's of two given cells.

11. The heating element of an electric kettle has a resistance of 22 ohms and is plugged into a supply line at 220 volts. The kettle contains 2·8 litres of water and has a water equivalent 200 grams. The initial temperature is 10°C. Calculate (*a*) the time required to reach boiling point ; (*b*) the cost, if electricity is charged at 5d. per unit.

Mechanical Equivalent of Heat = $4{\cdot}2 \times 10^7$ erg/calorie.

1 unit = 1 Kilowatt Hour.

12. State the laws of electrolysis. Describe an experiment based on these laws for verifying the accuracy of calibration of a given ammeter.