

AN ROINN OIDEACHAIS

(Department of Education.)

LEAVING CERTIFICATE EXAMINATION, 1945.

PHYSICS.—PASS.

FRIDAY, 22nd JUNE.—AFTERNOON, 1.30 TO 3.30.

Candidates must answer one question at least out of each Section, and not more than *six* questions in all.

All questions are of equal value.

SECTION I.

1. Define work, power. An engine working at 3000 H.P. draws a train along a level track at constant speed. The total weight of the train and engine is 300 tons. The motion of the train is resisted by a force of 200 pounds weight per ton, and this force may be taken to be independent of the speed. Find the speed of the train.

(1 H.P.=550 foot lbs. per second.)

2. Describe an experiment based on Archimedes' Principle for comparing the densities of two liquids. Mention the chief sources of error.

3. Explain what is meant by centre of gravity. What is the position of the centre of gravity of a triangular plate of uniform thickness. How would you determine its position by experiment?

4. Explain how you would construct and set up a mercury barometer using a long glass tube, mercury, etc., and how you would use it to obtain a value of the atmospheric pressure. If a little water is introduced into the tube so that it rests on top of the mercury column, how will the reading of the barometer be affected? What will happen if the temperature of the tube and its contents be then gradually raised to the boiling point of water?

SECTION II.

5. Explain the meaning of mechanical equivalent of heat. A meteor enters the earth's atmosphere with a velocity of 2 kilometers per second and is retarded by the friction of the air. If 80% of the heat produced be dissipated and the specific heat of the material of which it is composed be 0.1, calculate the rise in temperature of the meteor when its velocity has been reduced to 1 kilometre per second.

(Mechanical equivalent of heat, 4.2×10^7 , ergs/calorie.)

6. Define 'specific heat,' 'latent heat of fusion.' Describe carefully how you would determine the latent heat of fusion of ice. Mention the chief sources of inaccuracy.

7. State the laws of refraction of light.

How would you determine the index of refraction of a sample of transparent liquid. Explain the theory of the method.

8. Explain the working of an astronomical telescope, showing the path of the rays of light, and how the final image is formed.

SECTION III.

9. A flat piece of cork floats in a dilute solution of sulphuric acid. Two rods, one of copper, the other of zinc are passed through it so that their ends project into the liquid. The upper ends are joined by a circular coil consisting of several turns of wire mounted in a vertical plane. If the whole be slightly rotated what will occur? What is the explanation of this?

10. Describe the magnetometer. Explain how you would use it to compare the magnetic moments of two bar-magnets.

11. State Ohm's Law.

Use it to find an expression for the effective resistance of a number of conductors, the individual resistances of which are known, connected (1) in series, (2) in parallel. Five resistances each of one ohm are connected in parallel across the terminals of a cell of E.M.F. one volt, and internal resistance 1 ohm. What will be the difference of potential between the terminals of the cell?

12. Describe the potentiometer. Show how you would use it to compare the electromotive forces of two cells. Mention sources of error.