AN ROINN OIDEACHAIS
(Department of Education.)

LEAVING CERTIFICATE EXAMINATION, 1945.

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

PHYSICS.—HONOURS.

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. State Archimedes' Principle.

Describe carefully an experiment by means of which the principle may be verified. How would you justify the principle on theoretical grounds ?

2. Describe Atwood's machine.

Explain how it may be used to measure the acceleration due to gravity. Mention sources of error.

3. State the principle of Conservation of Energy.

A body is placed at the top of a smooth inclined plane of angle 30°. The length of the slope is one metre. Using this principle, determine the velocity of the body at the bottom of the plane, and deduce the acceleration of the body along the plane. Show that the same value for the acceleration may be obtained by resolution of forces.

4. Describe fully one method of determining the mechanical equivalent of heat. What precautions should be taken in order to obtain an accurate result ?

SECTION II.

5. Establish the formula relating to the passage through a prism of light at minimum deviation

$$\mu=\frac{\sin\frac{1}{2}(A+D)}{\sin\frac{1}{2}A}$$

μ=refractive index, A=refracting angle of prism, D=angle of minimum deviation. How would you determine the value of A by experiment ?

6. A thin lens is placed 20 cms. from a small bright object and a sharp image is produced on a screen which is found by measurement to be also 20 cms. from the lens. A second thin lens is now placed in contact with the first and, the object remaining fixed, it is found necessary to move the screen to a new position 30 cms. from the combination again to produce a sharp image. Determine the nature and focal length of each lens.

7. Describe carefully any method of determining the velocity of propagation of light.

8. Sketch an experimental arrangement for producing a pure spectrum on a screen. In what respects do the spectra of the following sources of light differ ? (*a*) An electric arc, (*b*) a sodium flame, (*c*) the sun. What effect will be found in the spectrum of an arc-lamp, when the following are placed in turn in front of the lamp (*d*) a red glass, (*e*) a red and a blue glass, (*f*) a sodium flame ?

Section III.

9. Quote an expression for the capacity of a condenser consisting of two parallel plates each of area A placed a distance d apart in vacuo.

How would you use a gold-leaf electroscope to demonstrate (1) how the capacity of such a condenser depends on the distance apart of the plates, (2) how the capacity is altered if sheets of various materials are introduced between the plates.

10. Explain fully how you would determine the specific resistance of a sample of copper wire of uniform cross-section.

11. A bar-magnet of length 2 cms. and pole-strength 40 units is placed in the magnetic meridian with its N-pole facing south. The earth's magnetic field is uniform and the null points are $\sqrt{101}$ cms. from the centre of the magnet. Indicate the directions of the null points from the centre of the magnet, and deduce the value of the component of the earth's magnetic field in the direction of the axis of the magnet.

12. State the laws of electromagnetic induction. Show how the working either of a simple dynamo, or of an induction coil depends upon these laws.