AN ROINN OIDEACHAIS

(Department of Education.)

LEAVING CERTIFICATE EXAMINATION, 1942.

PHYSICS.—HONOURS.

FRIDAY, 19*th JUNE*.—AFTERNOON, 1.30 TO 3.30.

Six questions may be attempted of which at least *two* must be taken from Section II.

SECTION I.

1. Describe Fletcher's Trolley.
Describe and explain fully how you would use it to demonstrate how the acceleration of a body is related to the force applied to it.

2. Establish the formula $v^2=u^2+2fs$ for the motion of a body in a straight line with constant acceleration.
A stone is projected vertically upward from an elevated point P. At a distance h below P the velocity of the stone is double what it was at a distance h above P. Show that the greatest height attained by the stone is $\frac{5}{3}h$.

3. The mass of a train including its engine is 300 tons. The train travels at a speed of 40 miles per hour on the level. If the resistance to motion is equivalent to a force of 20 lbs. weight per ton calculate the H.P. of the engine.
At what speed would the train travel up an incline of 1 in 30 if the force resisting motion (apart from the weight of the train and its engine) is still the same.

4. Explain what is meant by "intensity of illumination" and by "illuminating power".
Show how the illuminating power of two lamps may be compared experimentally.
A certain intensity of illumination is produced by a lamp at a screen, when it is placed at a distance of 85 cm. from the screen. On placing a sheet of glass between the lamp and the screen, it is found that the lamp must be moved 5 cms. nearer the screen to produce the same intensity of illumination as before. What percentage of light is stopped by the glass ?

5. What are the essentials for the formation of a pure spectrum, using a source of white light ? Indicate by a diagram how a pencil of light traverses the system.
Explain what is observed when strips of white, black, blue and red ribbon are successively passed over the spectrum. When an object is viewed in daylight and then in gas light a slight change in colour is sometimes noticed. Explain this.

6. Draw diagrams to show how (*a*) a real diminished image, (*b*) a real enlarged image, (*c*) a virtual image can be formed by use of a concave mirror.

Describe fully how the index of refraction of a liquid may be determined by using a concave mirror.

7. Describe (*a*) an astronomical, (*b*) a non-astronomical method for determining the velocity of light.

8. Establish the formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ for a convex lens.

A convex lens of focal length 12 cm. is placed in contact with a concave lens of focal length 18 cm. An object 2 cm. in height is placed on the axis of the combination and at a distance of 45 cm. from it. Find the position and size of the final image.

SECTION II.

9. State the laws which relate to the production of heat in a conductor due to the passage of a current of electricity.

A coil of 10 ohms resistance is immersed in 300 grams of a certain liquid in a flask. When a current of 1·8 amps is passed through the coil it is observed that the temperature of the liquid rises 3° C. per minute. Assuming that the water equivalent of the flask is 20 grms., find the specific heat of the liquid.

[J = $4{\cdot}2 \times 10^7$ ergs/calorie.

10. Describe any type of cell and state the chemical reactions which occur while the cell is working.

The internal resistance of a cell is 3 ohms, and its E.M.F. is 1·5 volts. The terminals of the cell are joined by two conductors in parallel having resistance 30 ohms and 20 ohms respectively. Find the potential difference between the terminals, and the current in each conductor.

11. State fully Faraday's laws of electrolysis. Describe an experiment you would perform to determine the electro-chemical equivalent of either silver or copper.

12. State the laws of electro-magnetic induction and show how they may be demonstrated experimentally.

Describe the working of an induction coil to illustrate the phenomenon of electro-magnetic induction.