AN ROINN OIDEACHAIS

(Department of Education).

LEAVING CERTIFICATE EXAMINATION, 1956.

PHYSICS.—HONOURS.

FRIDAY, 15th JUNE—MORNING, 10 TO 12.30.

Not more than *six* questions to be answered.

***One* question *at least* must be answered from each section.**

SECTION I.

1. Describe with the aid of a diagram a standard mercury barometer [Fortin's]. What factors must be taken into account when comparing barometric readings taken at different places ?

A standard barometer is faulty owing to the presence of air in the space above the mercury. When a true barometer gives a reading of 30 inches, the faulty barometer gives a reading of 29·5 inches and the level of the mercury in it is then 3 inches from the top of the tube. What reading will a true barometer give when this faulty barometer gives a reading of 27·5 inches ?

[66 marks.]

2. Define the terms :—acceleration, force, momentum.

State Newton's laws of motion.

A small body, of mass 2 ounces, is suspended from the ceiling by means of a light string so that it is 4 feet above the ground. Another small body of mass 1 ounce and moving horizontally with a velocity of v feet per second strikes the first and coalesces with it. If the combined masses swing in a vertical plane (as in the case of a simple pendulum) and reach a maximum height of 4 feet 9 inches above the ground, calculate the value of v.

[66 marks.]

3. Distinguish between potential energy and kinetic energy. Define horse-power.

Show that when a body falls freely under gravity the sum of its potential and kinetic energies is constant during the fall.

The turbines of a hydroelectric power plant develop 17×10^5 horse-power from water which falls 170 feet. If the efficiency of the turbines is 80%, calculate in tons the mass of water that enters them per second.

[67 marks.]

Section II.

4. State the inverse square law as applied to light and explain how it may be derived.

Describe and explain a method of comparing the illuminating powers of two sources of light.

A 16 candle-power lamp placed 40 cm. from a screen produces the same intensity of illumination as a second lamp placed 50 cm. from the same screen.

What is the candle-power of the second lamp ? [66 marks.]

5. Describe a terrestrial method of measuring the velocity of light. [66 marks.]

6. Describe a method of measuring the focal length of a concave lens.

A pin 4 cm. long stands erect on the axis of a concave lens of focal length 20 cm. and at a distance of 25 cm. from the lens. A convex lens of focal length 10 cm. is placed on the other side of the concave lens at a distance of 5 cm. from it and having its axis coincident with the axis of the concave lens. Find the position and length of the final image formed by this arrangement and show by a ray-diagram how this image is formed. [67 marks.]

Section III.

7. Describe the construction of a tangent galvanometer.

Starting with the definition of the absolute unit of current and using the usual notation, establish the formula $C = \frac{10Hr}{2\pi n} \tan\theta$ for a tangent galvanometer.

Discuss the factors which determine the sensitivity of a tangent galvanometer and explain how its sensitivity may be increased without altering its construction. [66 marks.]

8. Mention the factors on which depend the heat produced in a thin wire carrying an electric current and describe an experiment to test the truth of your answer in the case of any one of the factors mentioned.

Describe fully an electrical method of measuring J, the mechanical equivalent of heat. [66 marks.]

9. State Faraday's laws of electrolysis and describe how these laws may be tested by experiment. [67 marks.]

10. What do you understand by each of the following terms :— nucleus, electron, proton ?

Write a note on the structure of the atom. In your note refer to the structure of the atoms of any two named elements. [67 marks.]