

AN ROINN OIDEACHAIS

(Department of Education).

LEAVING CERTIFICATE EXAMINATION, 1961.

PHYSICS.—HONOURS.

WEDNESDAY, 14th JUNE.—AFTERNOON, 3 TO 5.30.

Not more than *six* questions to be answered.

One question at least must be answered from each section.

SECTION I.

1. Give an account of the common balance. What is meant by the "sensitivity" of a balance?

Discuss the factors on which the sensitivity of a balance depend and give the theory on which your answer is based.

[66 marks.]

2. Describe an experiment, using Fletcher's Trolley, to demonstrate that the acceleration produced in a given mass is proportional to the accelerating force.

A boy weighing 100 lbs. stands on the floor of a lift. Find, in lbs. wt., the thrust on the floor when the lift is moving (a) *upwards* with a uniform acceleration of 2 ft./sec.², (b) *downwards* with a uniform acceleration of 2 ft./sec.², (c) with uniform velocity.

[66 marks.]

3. A small mass of 3 lbs. is suspended from a fixed support by a light string 8 ft. long. A mass of 2 ozs. moving horizontally with a velocity of 200 ft./sec. strikes the suspended mass and coalesces with it, and the combined masses swing without rotation in a vertical plane. Find (i) the initial velocity of the combined masses, (ii) the loss, in ft. lbs., of kinetic energy on impact, (iii) the greatest angle to the vertical through which the combined masses swing.

[67 marks.]

SECTION II.

4. (a) Describe a method of measuring the focal length of a given concave lens using a concave mirror.

(b) Describe an optical method for examining small objects and show by means of a ray diagram how the final image is seen.

[66 marks.]

5. What is meant by (i) total reflection of light, (ii) critical angle, (iii) index of refraction of a medium?

Describe an experiment to measure the critical angle of the glass of a given rectangular slab of glass.

"The apparent altitude of a heavenly body is generally not the true altitude." Give reasons in support of this statement and illustrate your answer by means of a diagram.

[66 marks.]

6. (a) Describe an experiment to show that the vapour pressure of a liquid at its boiling point is equal to the atmospheric pressure.
- (b) Find the least velocity with which a leaden bullet at a temperature of 27°C . should strike a target in order that the bullet may melt, assuming that all the kinetic energy of the bullet is converted into heat in the lead.
- [Melting point of lead : 327°C . ; specific heat of lead : 0.03 ; latent heat of fusion of lead : 5.4 cal./gram ; mechanical equivalent of heat : 4.2×10^7 ergs/calorie.]
- [67 marks.]

SECTION III.

7. What do you understand by the following : magnetic intensity at a point in a magnetic field, unit magnetic pole, magnetic moment of a bar magnet.

Describe a method of measuring the magnetic moment of a given bar magnet knowing the value of the horizontal component of the earth's magnetic field. Derive any formula you use.

[66 marks.]

8. (a) Describe an experiment to show that when a glass rod is rubbed with silk the glass and the silk acquire equal and opposite charges.
- (b) Prove that the capacity of a parallel plate condenser in air is $\frac{A}{4\pi t}$ where A is the area of the insulated plate and t is the distance between the plates.
- (c) Write a note on "electrons" giving about five informative points.

[66 marks.]

9. Using the potentiometer, describe how you would (i) compare the electromotive forces of two cells, (ii) measure the internal resistance of a cell.

Give the underlying theory in (i) or in (ii).

A resistance of 10 ohms is connected to three cells which are (a) in series, (b) in parallel. The E.M.F. of each cell is 1.5 volt and the internal resistance of each cell is 0.3 ohm. Find the current through the resistance in each case.

[67 marks.]

10. Give an explanation of what takes place when an electric current is passed through a solution of copper sulphate using (a) platinum electrodes, (b) copper electrodes.

State Faraday's laws of electrolysis and describe how one of these laws may be tested by experiment.

A thin metal plate is in the form of a square of side 5 cms. How long would it take to deposit by electrolysis a layer of copper 0.1 m.m. thick on both surfaces of the plate, if the current is 1.5 ampere ?

[Electrochemical equivalent of copper : 33×10^{-5} gm./coulomb ; density of copper : 8.9 gm./c.c.]

[67 marks.]