M. 55.

AN ROINN OIDEACHAIS.

LEAVING CERTIFICATE EXAMINATION, 1964.

PHYSICS — PASS

WEDNESDAY, JUNE 10 — Afternoon, 3 to 5.30.

Not more than six questions to be attempted.

1. Explain the terms (i) constant velocity, (ii) constant acceleration, (iii) mass. Give an account of Newton's first and second laws of motion and use them to explain (a) what is meant by a force, (b) the relation between force and acceleration.

(66 marks.)

OR

1. Define the terms 'work' and 'energy'.

Show that the kinetic energy of a body of mass m moving with velocity v is $\frac{1}{2}mv^2$.

A body of mass 5 kilograms falls from a height of 100 metres. Calculate its kinetic energy on striking the ground, given g = 980 cm. per sec^2.

(66 marks.)

2. Outline the essential features of the Kinetic Theory of Gases. Indicate how the pressure of a gas is explained by the Kinetic Theory. Show that the mean kinetic energy of the molecules of a gas is proportional to the absolute temperature.

(66 marks.)

OR

2. Explain what is meant by (i) calorie, (ii) specific heat.

'The mechanical equivalent of heat is 4·2 joules (or $4{\cdot}2 \times 10^7$ ergs) per calorie'. Explain this statement.

A lead bullet, of specific heat 0·03, travelling at 120 metres per sec. strikes a block of wood and becomes embedded in it. Assuming that three-fourths of the heat developed is absorbed by the bullet, calculate the rise in temperature of the bullet.

(66 marks.)

3. Write a note on Newton's Law of Gravitation.

Calculate the gravitational attraction between two lead spheres, one of mass 1 kilogram, the other of mass 200 kilograms, the centres of which are separated by a distance of 30 cm.

($G = 6{\cdot}67 \times 10^{-8}$ C.G.S. units or $6{\cdot}67 \times 10^{-11}$ M.K.S. units.)

(66 marks.)

4. What do you understand by (i) longitudinal wave-motion, (ii) transverse wave-motion ? Give one example of waves of each type.

Show, with the aid of diagrams, how interference and diffraction patterns may be demonstrated in the laboratory.

(66 marks.)

OR

4. State the (i) laws of reflection, (ii) laws of refraction, of light.

Describe an experiment to show that the image is as far behind a plane mirror as the object is in front of it.

Outline a method for measuring the refractive index of water.

(66 marks.)

5. Give an account of the propagation of sound.

What do you understand by resonance ?

Given a tuning fork of known frequency, describe how you would measure the velocity of propagation of sound in air.

(66 marks.)

6. Describe how the wavelength of sodium light may be measured by an interference or diffraction method.

(66 marks.)

OR

6. Describe an experiment to measure the focal length of a convex lens.

What is meant by magnification ?

Find the position, nature and size of the image formed by a convex lens of focal length 15 cm. when an object 6 cm. in height is placed vertically on the axis of the lens and at a distance of 5 cm. from its centre. Illustrate your answer by means of a ray-diagram.

(66 marks.)

7. Define (i) magnetic meridian, (ii) declination, (iii) angle of dip.

Describe a dip circle and explain fully how it may be used to measure the angle of dip.

(67 marks.)

8. Give an account of the production of X-rays and mention their chief properties.

Write a note on the ionization of gases by X-rays.

(67 marks.)

OR

8. Define electrical resistance.

Derive an expression for the resistance, R, of two resistances r_1 and r_2, connected in parallel.

Two resistances, 6 ohms and 3 ohms, respectively, are connected in parallel across the terminals of a cell of E.M.F. 1·5 volts and internal resistance 2 ohms. Calculate the current flowing (i) in the circuit, (ii) through the 6 ohm resistance.

(67 marks.)

9. (a) Write a brief note on (i) electrons, (ii) protons, (iii) neutrons.

Show, diagramatically, the atomic structure of any two named elements.

(b) Name the three principal radiations emitted from radioactive substances and describe their chief properties.

(67 marks.)

OR

9. State Faraday's laws of electrolysis. Define the electrochemical equivalent of an element.

Describe what happens when an electric current is passed through a solution of copper sulphate using copper electrodes. Hence, show how you would measure the electrochemical equivalent of copper.

(67 marks.)

10. Explain, with the aid of diagrams, the principles underlying the operation of any two of the following:-

(a) a simple alternating current generator,

(b) a moving-coil type of ammeter,

(c) a thermionic diode,

(d) a photoelectric cell.

(67 marks.)