AN ROINN OIDEACHAIS.

M.56.

LEAVING CERTIFICATE EXAMINATION, 1962.

PHYSICS —HONOURS.

THURSDAY, 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. (a) On what factors does the pressure at a point in a liquid depend ? Describe an experiment to demonstrate that the pressure at a point in a liquid is the same in all directions.

(b) State the Principle of Archimedes.

A body of uniform density 0·9 gm./c.c. floats on a liquid of density 1·5 gm./c.c. and then the body is completely covered by a layer of oil floating on the liquid. If the density of the oil is 0·8 gm./c.c., find the ratio of the part of the body in oil to the part in the liquid.

(66 marks.)

2. Describe a method of measuring 'g', the acceleration due to gravity. Give the theory of your method.

Is the value of 'g' constant over the surface of the Earth ? Explain your answer.

(66 marks.)

3. State Newton's laws of motion. Show that the second law leads to a definition of a unit of force.

A body consists of two parts. The first part contains an engine that exerts a constant (upward) force; this part and its engine are of mass M. The second part is of mass m. When the body is ascending vertically upwards from the ground with acceleration a the mass m becomes detached and falls away. Find, in terms of a, m, and M, the resulting change in the acceleration of the mass M. [Neglect effects due to the air.]

(67 marks.)

SECTION II.

4. Describe, with the aid of a ray-diagram, how a convex lens may be used as a magnifying glass. Explain what kind of convex lens gives the best magnification.

An optical arrangement consists of two thin lenses, a concave lens of focal length 20 cms. and a convex lens of focal length 10 cms. The lenses are parallel to one another and are 5 cms. apart. An object stands erect on the axis of the arrangement in front of the concave lens and at a distance of 15 cms. from it. Find the position of the final image and also the total magnification.

(66 marks.)

5. Give an account of the spectrum of sunlight making special reference to the invisible part of the spectrum.

(66 marks.)

6. Describe an experiment to find the value of J, the mechanical equivalent of heat.

In drilling a hole in a block of iron power is supplied at the rate of 0·8 horsepower for $2\frac{1}{2}$ minutes. How much heat is produced ? Assuming that three-quarters of the heat goes into the iron and that the mass of the iron is 500 gms., find the rise in temperature.

[One horsepower = 746×10^7 ergs; J = $4{\cdot}2 \times 10^7$ ergs/calorie; specific heat of iron = 0·12.]

(67 marks.)

SECTION III.

7. Define (a) the capacity of a condenser (b) the specific inductive capacity of a medium.

Give a clearly-labelled sketch of the Leyden jar condenser. Explain how it may be made highly charged and show by a diagram the distribution of charges.

Establish the formula for the resultant capacity of three condensers, of capacity C_1, C_2, C_3, respectively, (i) when they are connected in series. (ii) when they are connected in parallel.

(66 marks.)

8. Establish an expression for the strength, at a point P, of the magnetic field due to a bar-magnet in either one of the following two cases: (a) when P is on the perpendicular bisector of the axis of the magnet, (b) when P is on the axis produced.

A bar-magnet of equivalent length 6 cm. is fixed on a horizontal table with its axis in the magnetic meridian. Another bar-magnet of the same equivalent length but of different pole-strength is laid exactly on top of it: if the like poles of the two magnets are together the neutral points are 14 cm. apart in the magnetic meridian; if the unlike poles are together the neutral points are 8 cm. apart in a line perpendicular to the meridian. Find the ratio between the moments of the two magnets. [Equivalent length is the distance between the poles.]

(66 marks.)

9. Describe the working of a simple dynamo, giv the theory on which it is based.

Describe with the aid of a diagram an induct coil and explain how it works.

Explain briefly why transformers are used in the transmission of electricity. (67 marks.)

10. Explain the Wheatstone Bridge method of comparing resistances.

Four points A, B, C, D are connected so as to form a Wheatstone Bridge, a current of 1 ampere entering at A and leaving at C and a galvonometer of resistance 20 ohms being connected across BD. The resistances of AB, BC, DC are 10, 5, 10 ohms, respectively, and AD is a variable resistance R. (i) For what value of R does no current flow through the galvonometer ? (ii) Find what current flows through the galvonometer when R is 10 ohms.

(67 marks.)