AN ROINN OIDEACHAIS

(Department of Education).

LEAVING CERTIFICATE EXAMINATION, 1958.

PHYSICS.—HONOURS.

FRIDAY, 20th 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. If three forces acting in one plane upon a rigid body keep it in equilibrium, show that their lines of action must either meet in a point or be parallel.

The end A of a uniform rod AB, 8 *feet* long, rests against a smooth vertical wall and the rod is supported by a light string attached to a nail at D on the wall vertically above A and to a point C on the rod *two feet* from B. The rod is inclined at an angle of 60° to the wall. Find the length of AD.

If the rod weighs 3 lb., find the reaction at A.

[66 marks.]

2. Describe, in full, an experiment to show that the acceleration produced in a given mass is proportional to the accelerating force.

A body of mass 4 lb. is suspended by a light string from a lift which is descending with a uniform velocity of 2 ft./sec. If the tension in the string cannot exceed 4·5 lb. wt., find the shortest distance in which the lift can be brought to rest so that the string will not break.

[66 marks.]

3. Select two named elements, excluding hydrogen, and in the case of each give an account of the structure of its atom, referring in particular to the nature of the particles of which atoms are composed.

[67 marks.]

SECTION II.

4. (*a*) Describe an experiment to show that the vapour pressure of a liquid at its boiling point is equal to the atmospheric pressure.

Describe also, in brief, an experiment to measure the boiling-point of water at a pressure of, say, 10 cms. of mercury above atmospheric pressure.

(*b*) Calculate the density of the air at a pressure of 80 cms. of mercury and at a temperature of 17°C.

[The density of the air at N.T.P. is $1{\cdot}29 \times 10^{-3}$ gm./cm^3.]

[66 marks.]

5. Establish a formula, using the usual notation, for the focal length of a concave mirror.

Describe fully a method of measuring the focal length of a concave lens, using a concave mirror.

A needle is laid along the axis of a concave mirror of focal length 10 cms., so that one end of the needle is 15 cms. and the other end is 20 cms., from the pole of the mirror. Find the length of the image.

[66 marks.]

6. It is required to set up a simple form of compound microscope using two lenses. What type of lenses should be selected for this purpose and how should they be arranged ?

Illustrate by means of a ray-diagram how the eye on looking through the microscope sees the final image.

The focal length of one of the lenses of a compound microscope is 1 cm., the focal length of the other is 5 cms. and the lenses are 30 cms. apart. An object 1·04 cms. from the object-glass is viewed through the microscope. Find the position of the final image.

[67 marks.]

Section III.

7. Give an account of the earth's magnetism.

Describe in detail, explaining the necessary precautions, how you would measure the angle of dip.

[66 marks.]

8. Describe a laboratory experiment, to show (*a*) that like charges repel one another, (*b*) that unlike charges attract one another.

Discuss the factors which determine the magnitude of the force of repulsion or attraction between charged bodies.

Three small charged bodies are placed one at each of the angular points of an equilateral triangle ABC of side 20 cms. In electrostatic units, the charge on the body at A is -5 and the charge on each of the bodies at B and C is $+10$. Find the resultant force on the charged body at A.

[66 marks.]

9. Define *specific resistance* of a material.

Describe an experiment to measure the resistance of a given length of wire using the Wheatstone Bridge method and give the underlying theory.

Describe any further work that should be done to measure the specific resistance of the material of the wire.

What length of wire of specific resistance 42×10^{-6} ohms and diameter 0·5 mm. is required to make a resistance of 2 ohms ?

[67 marks.]

10. State the factors on which depend the energy produced in a wire carrying an electric current. Describe essential experiments in support of your answer.

A current traverses the filament of a 220-volt lamp of 800 ohms resistance. Find (*a*) the current, (*b*) the energy generated and also the heat produced, per minute. [4·2 joules=1 calorie.]

[67 marks.]