

AN ROINN OIDEACHAIS

(Department of Education.)

BRAINNSE AN MHEADHON-OIDEACHAIS

(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1941.

HONOURS.

PHYSICS.

SATURDAY, 21st JUNE.—AFTERNOON 1.30 TO 3.30 P.M.

Not more than *six* questions in all may be attempted, and not more than *four* of these should be taken in any one Section.

All questions are of equal value.

Section I.

1. A shell of mass 56 lbs. is fired with a velocity of 1500 ft. per second from a gun of mass 20 tons. The recoil is resisted by a constant force equal to a weight of 10 tons. How far will the gun recoil?

Compare the initial kinetic energies of the shell and gun.

2. Describe briefly how Atwoods machine may be used for finding the acceleration due to gravity.

What are the chief causes of inaccuracy in the result?

3. A smooth plane is inclined to the horizon at an angle of 30° . A mass of 5 pounds is placed on the plane and is connected by a light inextensible string, which passes over a smooth pulley at the top of the plane, to a mass of 3 pounds. The three-pound mass hangs vertically.

Find :

- (i) the common acceleration,
- (ii) the tension of the string,
- (iii) the space described in two secs.
- (iv) the velocity after two secs.

4. Describe how you would find the focal length of a convex lens by a parallax method.

Show how a convex lens can be used as a magnifying glass and deduce a formula for its magnifying power.

The focal length of a convex lens is 5 ins. Calculate the magnifying power when the minimum distance of distinct vision is 10 ins.

5. A ray of light travels from water into air. Illustrate by diagrams the paths of the ray as the angle of incidence varies.

Describe in detail how you would find the index of refraction of water. Justify any formula that you use.

6. What is meant by the angle of minimum deviation of a prism ?

Establish a relationship between the angle of the prism, the angle of minimum deviation, and the index of refraction.

7. Describe the construction of the compound microscope and show by a diagram how a magnified image is formed.

Show how to find an approximate value for the magnifying power of the microscope.

Section II.

8. Describe the construction of the tangent galvanometer. What do you understand by the "reduction factor" of the galvanometer ?

A deflection of 30° is observed when a battery of resistance 10 ohms is connected in series with a tangent galvanometer of 40 ohms resistance and having 100 turns of wire. What would be the deflection if only 50 turns of the wire were connected in series with the battery ?

9. Describe the construction of a moving coil galvanometer and explain how it works. What advantages has this type of galvanometer over the tangent galvanometer ?

10. Describe the construction of a Daniell cell and explain how it works. What advantages has it over the simple voltaic cell ?

The difference in potential between the poles of a cell when no current is flowing is 1.1 volt. The poles are now joined by a wire whose resistance is 1.5 ohms and the potential difference becomes .8 volt. Find the internal resistance of the cell.

11. Describe an experiment to show the heating effect of an electric current.

Upon what factors does the heat produced depend ?

An electric current is sent through two resistance coils each of 2 ohms resistance by a cell which maintains a constant potential difference of 2.3 volts between its terminals. Find the ratio of the quantities of heat produced by the current :

(i) when the coils are in series,

(ii) when the coils are in parallel.

12. Find the intensity of the magnetic field due to a bar magnet at a point which is at a given distance from the magnet and which lies (i) on the production of the axis, (ii) on the line which bisects the axis at right angles.

What is the approximate relation between the intensities in these two cases when the magnet is short ?

How may this relation be illustrated experimentally ?