

**AN ROINN OIDEACHAIS.**  
(Department of Education).

**BRAINNSE AN MHEADHON-OIDEACHAIS**  
(Secondary Education Branch).

**LEAVING CERTIFICATE EXAMINATION, 1938.**

**FULL COURSE.**

**PHYSICS.**

*FRIDAY, 24th JUNE.*—AFTERNOON 1 P.M. TO 3 P.M.

Not more than *six* questions may be attempted.

All questions are of equal value.

1. Describe any method of finding the focal length of a convex mirror.

An object, 2 cms. in height, is placed on the axis of a convex mirror, 30 cms. from the mirror. The radius of curvature of the mirror is 40 cms. Find the position, nature and size of the image. [If algebraic signs are used, it must be made clear when a length is considered negative.]

2. A ray of light travels from water into air. Describe the path of the ray as the angle of incidence is varied from  $0^\circ$  to  $90^\circ$ . What angles give total reflection? Find the value of the critical angle for light travelling from water to air.

[Refractive index of water,  $\mu = 1.33$ .]

3. Describe the astronomical telescope and draw a diagram to show the paths of rays by which the eye sees the image of a point on the object. Find an expression for the magnifying power of the telescope.

4. Give a short account of the spectrometer and show how it is used to measure the angle of minimum deviation for light travelling through a prism. Explain the method of adjusting the spectrometer and the reasons why this is necessary.

5. A horse draws a cart up a hill which rises one foot for every 15 ft. of roadway. The cart and horse weigh 1,350 lbs., and the friction is equivalent to a retarding force of 110 lbs. weight. If the horse is travelling  $1\frac{1}{2}$  miles per hour, what force is he exerting and what is his rate of working in horse-power?

[1 horse-power = 550 ft. lbs. /sec.  $g = 32$  ft. /sec. /sec.]

6. Describe how you would determine the value of "g", the acceleration due to gravity. Explain the precautions necessary to obtain an accurate result. How can it be shown that "g" has the same value for different substances?

7. Give an account of one method of determining accurately the value of J, the mechanical equivalent of heat.

A piece of copper falls to the ground from a height of 100 metres. One-half of the heat produced is expended in heating the copper. What will be the increase in temperature of the copper?

[ $J = 4.19 \times 10^7$  erg/cal. Specific heat of copper = 0.094  
"g" = 981 cm./sec./sec.]

8. Explain carefully how you would find the moment of a magnet, if the value of H, the horizontal component of the earth's magnetic field were known. If you use an equation, prove it.

9. Explain what is meant by (i) "the capacity of a condenser", (ii) "the difference of potential between its plates", (iii) "the charge on a plate" and show the connection between them. Find the capacity of two condensers connected (a) in series, (b) in parallel, if  $C_1$  and  $C_2$  are the capacities of the two condensers. What analogy is there between these values and the values of the resistance of two resistances connected (1) in series, (2) in parallel?

10. Describe the tangent galvanometer and show how it is used to measure an electric current.

There are 30 turns on the coil of a tangent galvanometer and the radius of the turns is 15 cms. How many amperes are required to give a deflection of  $45^\circ$ , if 0.18 dyne/unit pole is the value of H, the horizontal component of the earth's magnetic field.

11. Describe the method of measuring resistance known as the Wheatstone Bridge method. Prove the equation used. Illustrate the method by showing how you would find an accurate value of the specific resistance of a substance in the form of a metallic wire.

12. Describe briefly some experiments illustrating the laws of the production of a current by electro-magnetic induction. Describe a simple dynamo for producing direct current and show how these laws are applied to it.