

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

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**LEAVING CERTIFICATE EXAMINATION, 1960.**

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**PHYSICS.—HONOURS.**

*WEDNESDAY, 15th JUNE.—AFTERNOON, 3 TO 5.30.*

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Not more than *six* questions to be answered.

*One* question at least must be answered from each section.

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SECTION I.

1. Describe, using a U-tube, an experiment to compare the specific gravities of two liquids which do not mix. Give the theory of the method.

A long U-tube containing water stands erect. Oil of specific gravity 0.8 is poured into the left hand limb of the U-tube and it floats on the water to a height of 10 cms. What height of liquid, specific gravity 0.5, which does not mix with the water should be poured into the right hand limb so that the levels in both limbs will be the same ?

[66 marks.]

2. Describe fully a method of measuring the value of  $g$ , the acceleration due to gravity.

From a point P above ground level a particle is projected vertically upwards. If the velocity of the particle at a distance  $d$  above P is one-third of the velocity at a distance  $d$  below P and if  $h$  is the greatest height to which the particle rises above P, show that  $h = \frac{5}{4}d$ .

[66 marks.]

3. Define (i) work, (ii) energy.

A railway truck when moving along a straight horizontal track at 10 m.p.h. strikes another truck at rest and after coalescing both trucks move onwards together along the track. If each of the trucks weighs 20 tons and if the forces resisting motion are equivalent to 40 lbs. weight per ton, find (i) the initial common velocity, (ii) the loss, in foot lbs., of kinetic energy on impact, (iii) the work done in bringing the trucks to rest, (iv) the distance the trucks travel before coming to rest.

[67 marks.]

## SECTION II.

4. Using the usual notation derive a formula for the focal length of a convex lens.

Describe a method of measuring the focal length of a convex lens with the aid of a plane mirror.

An object and a screen are fixed at a distance apart of 80 cms. and a convex lens forms a real image of the object on the screen. When the lens is moved along its axis a distance of 16 cms. a real image of the object is again formed on the screen. Find the focal length of the lens. Find also the magnification in each case.

[66 marks.]

5. Describe and explain how a pure spectrum of sunlight may be obtained. Give an account of the visible part of this spectrum.

Mention any conclusion that can be come to about the sun as a result of examining the spectrum of sunlight. Give reasons for your answer.

[66 marks.]

6. (a) State Boyle's law and also Charles' law and, using the usual notation, apply these laws to derive the formula  $\frac{P.V}{T} = k$ .

(b) Write a note on the transmission of heat by radiation. Describe any laboratory experiment in support of your answer.

[67 marks.]

## SECTION III.

7. (a) Describe a method of comparing the magnetic moments of two bar magnets using the magnetometer. Derive any formula you use.

(b) A magnetic needle of magnetic moment 4,000 units is free to rotate in a horizontal plane about a pivot at its centre. The needle is kept inclined at an angle of  $30^\circ$  to the magnetic meridian by a horizontal force of  $10^3$  dynes acting perpendicular to the needle. How far from the pivot is this force acting ?

(Assume that the horizontal component of the earth's magnetic field = 0.25 oersted.)

[66 marks.]

8. State the laws of electromagnetic induction and describe how they may be tested experimentally.

Describe how the working of a simple dynamo depends on these laws.

[66 marks.]

9. Give an account of the structure of the atom under the following headings : nucleus, electrons, nuclear charge, atomic number. Illustrate your answer by reference to the atoms of named elements.

[67 marks.]

10. (a) Describe the Wheatstone bridge method of comparing resistances and give the theory of the method.

(b) What is a shunt ?

A cell of E.M.F. 1.1 volt and internal resistance 1.5 ohm is connected in series to a galvanometer of resistance 60 ohm. The terminals of the galvanometer are connected by a shunt of resistance 3 ohms. Calculate the current through the galvanometer.

[67 marks.]