

## AN ROINN OIDEACHAIS

## LEAVING CERTIFICATE EXAMINATION, 1976

## PHYSICS—ORDINARY LEVEL

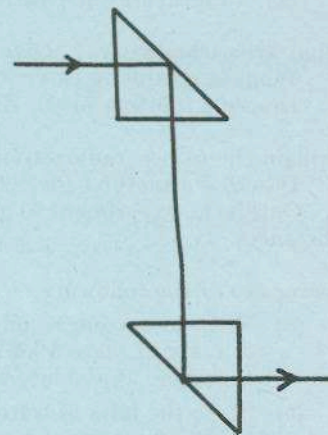
WEDNESDAY, 23 JUNE—MORNING, 9.30 to 12.15

Any **six** questions to be answered.

All the questions carry the same marks.

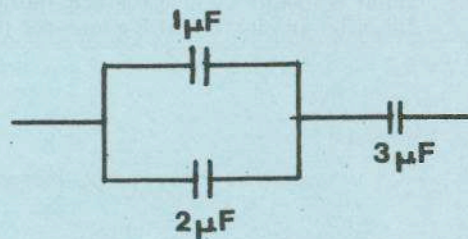
1. Answer *eleven* of the following items (a), (b), (c), . . . etc. All the items carry the same marks. *Keep your answers short.*

- (a) Define the unit of force i.e. the newton.  
 (b) If an object travelling at  $10 \text{ m s}^{-1}$  is brought uniformly to rest in 5 seconds calculate the retardation (deceleration).  
 (c) What is meant by potential energy?  
 (d) Complete the statement: "Equal volumes of different gases under the same conditions of temperature and pressure have the same number of \_\_\_\_\_."  
 (e) State Charles' law.  
 (f) Write down the values of  $0^\circ\text{C}$  and  $100^\circ\text{C}$  on the Absolute scale.



- (g) What phenomenon is taking place at the hypotenuse of the prisms in the diagram?  
 (h) What is meant by dispersion of white light?  
 (i) Give two reasons why a convex, rather than a concave mirror, is usually used as a driving mirror in cars.  
 (j) What occurs when two musical notes of almost equal frequency are produced together?

- (k) What is the effective capacitance of the three capacitors in the diagram?



- (l) What is the difference between a solenoid and an electro-magnet?  
 (m) What is the basic principle of moving-coil meters?  
 (n) Which of the following are alpha particles:  
 (i) hydrogen atoms, (ii) electrons, (iii) protons, (iv) helium nuclei, (v) photons?  
 (o) Complete the statement: "Isotopes are atoms with the same ..... but different ....."?  
 (p) What is meant by saying that the half-life of radioactive carbon is 5,700 years?

2. State Newton's law of gravitation.

Hence find a relationship between  $g$ , the acceleration due to gravity, and  $G$ , the universal constant of gravitation.

Find the acceleration due to gravity on the surface of the moon, given that the acceleration due to gravity on the surface of the earth is  $9.8 \text{ m s}^{-2}$ , the mass of the earth is 80 times that of the moon and the radius of the earth is 4 times that of the moon.

3. What is meant by specific heat capacity?

Outline a mechanical or electrical method for measuring the specific heat capacity of copper or water.

An immersion heater raises the temperature of  $0.1 \text{ kg}$  of water by  $22 \text{ K}$  ( $22^\circ\text{C}$ ) in two minutes, and that of  $0.44 \text{ kg}$  of oil by  $10 \text{ K}$  ( $10^\circ\text{C}$ ) in the same time; calculate the specific heat capacity of oil. (Specific heat capacity of water =  $4.2 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$ ).

4. Distinguish between transverse and longitudinal waves.

Explain what is meant by interference of light, polarisation of light. Describe experiments, one in each case, to demonstrate these phenomena.

5. Explain the basic physical principles involved in *four* of the following.
- Fine net curtains may produce many images of a distant street lamp.
  - A thermos flask can be used to keep ice from melting for a long time.
  - Wiping a long-playing record with a dry clean cloth causes the record to attract dust.
  - Beams of light can be used to trigger off burglar alarms.
  - The use of a 12 V car battery to produce a spark to ignite the fuel mixture.
6. Describe a primary cell, e.g. Daniell or Leclanché cell, and indicate how polarisation is minimised in the cell you select.  
Describe an experiment to compare the electromotive force (e.m.f.) of two cells.  
Three cells make up a battery, each cell having an electromotive force of 1.5 V. The internal resistance of each cell is 1 ohm. Calculate the current in two resistors of 4 ohms and 3 ohms, respectively, connected in series with the battery.
7. Describe how you would perform *two* of the following laboratory experiments:
- to demonstrate the parallelogram of forces,
  - to show that the resistance of a wire varies with the temperature,
  - to measure the horizontal component of the earth's magnetic field (flux density),
  - to measure the electrochemical equivalent of copper.
8. What are cathode rays? Give their principal properties.  
What is meant by thermionic emission?  
Describe the thermionic diode. Mention one practical use of the diode.
9. Explain the terms: radioactivity, ionisation.  
Describe a method for detecting radioactivity and indicate briefly the principle involved.  
Outline an experiment to investigate the relative ionising ability of the radiations emitted from radioactive substances.
10. Answer *two* of the following.
- Why does a gun recoil when a bullet is fired from it?  
A body of mass 3 kg moving at  $8 \text{ m s}^{-1}$  strikes a mass of 5 kg at rest and then they move on together. Calculate the common velocity and the kinetic energy lost in the collision.
  - State the laws of refraction of light.  
Show by means of a diagram how the final image of an object is formed in a telescope.
  - Which of the following is the velocity of sound in air:  
(i)  $3.3 \times 10^2 \text{ m s}^{-1}$ , (ii)  $3.0 \times 10^8 \text{ m s}^{-1}$ , (iii)  $4.0 \times 10^3 \text{ m s}^{-1}$ .  
Describe a laboratory experiment to find the velocity of sound in air.
  - What is meant by electrostatic induction?  
Describe an electrostatic generator (e.g. Van de Graaff generator) and explain how it works.