AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1978

PHYSICS—ORDINARY LEVEL

THURSDAY, 22 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) Give two ways in which light waves differ from sound waves.

   (b) What force is required to give a body of mass 2 kg an acceleration of 5 m s^{-2}?

   (c) Which of the following is the value of G (the gravitational constant):

   6.7×10^{-11} N m^2 kg^{-2}, 3.0×10^8 m s^{-1}, 6.0×10^{23} mol^{-1}, 3.4×10^2 m s^{-1}?

   (d) Fig. I shows a ray of light passing from medium A to medium B. Why can it be said that the velocity of the light is greater in medium B?

   (e) What is meant by diffraction?

   (f) In terms of the kinetic theory, write an expression for the pressure of a gas.

   (g) Define the unit of power i.e. the watt.

   (h) Propane boils at -42°C. What is this temperature on the Absolute(Kelvin) scale?

   (i) What property of a musical note determines its pitch?

   (j) Fig. II shows the steel bob of a pendulum (P) moving towards its rest position which is occupied by an identical stationary pendulum (Q). What will happen when P and Q collide?

   (k) Write down an expression for Coulomb's law of force between electric charges.

   (l) Which of the following is an electrolyte: mercury, common salt solution, petrol, molten copper?

   (m) What is meant by thermionic emission?

   (n) What is meant by magnetic declination?

   (o) On what does the kinetic energy of a photoelectron depend?

   (p) What particles are emitted in each of the decays (i) and (ii) as shown in the following nuclear reaction?

   $$^{238}_{92}\text{U} \xrightarrow{\text{(i)}} {}^{234}_{90}\text{Th} \xrightarrow{\text{(ii)}} {}^{234}_{91}\text{Pa}$$

Fig. I

Fig. II
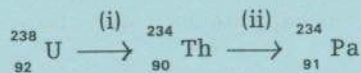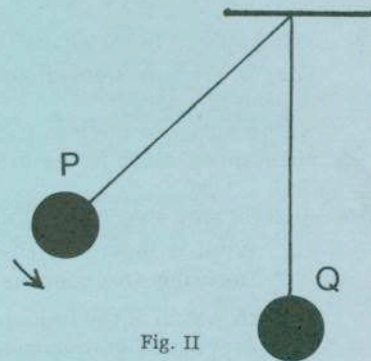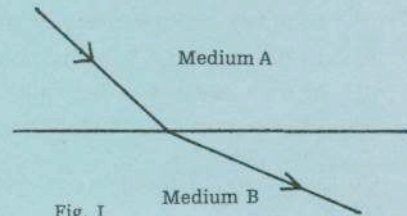
2. State the principle of conservation of energy.

   Show that for a body falling freely under gravity the loss in potential energy is equal to the gain in kinetic energy.

   A body of mass 4 kg is thrown vertically downwards with an initial velocity of 10m s^{-1} from the top of a tower 5 meters high. What is the kinetic energy of the body when it reaches the ground? What happens to this energy? (Take g = 9.8 m s^{-2})

3. What are the basic principles involved in establishing a scale of temperature?

   Describe a constant volume gas thermometer.

   Name any type of electrical thermometer. Give one of the merits and one of the limitations of the electrical thermometer you have named.

4. Describe an experiment to measure the focal length of a convex lens.
An object is placed 18 cm from a convex lens of focal length 15 cm. Find the position and magnification of the image
   Use a ray-diagram to show the formation of the final image in a compound microscope.

5. Explain the basic physical principles involved in any *four* of the following.
   (a) An electric shock can occasionally be felt by touching the handle of a door in a carpeted room.
   (b) A bubble of air rising from the bottom of a pond increases in size.
   (c) Glass prisms can sometimes function as mirrors.
   (d) The motor in a spin drier and the starter motor in a car have approximately the same power output, yet the leads carrying the current to the starter motor are very much thicker than those to the drier motor.
   (e) Some television aerials are vertical while other television aerials are horizontal.

6. *(a)* Describe an experiment to demonstrate the heating effect of an electric current.
   Calculate the heat produced in 5 minutes by the element of an electric fire of resistance 25 ohms when it is connected to a 250 V supply.

   (b) Draw a labelled diagram of a transformer and explain how it works.
   A transformer has a primary coil of 500 turns and a secondary coil of 3,000 turns. If the input voltage is 300 V, what is the output voltage?

7. Describe how you would perform any *two* of the following experiments in the laboratory:
   (a) to check the accuracy of an ammeter by electrolysis,
   (b) to measure the specific heat capacity of a liquid,
   (c) to measure the wavelength of one of the lines in the mercury spectrum,
   (d) to compare the electromotive force (e.m.f.) of two cells.

8. Outline an experiment to demonstrate that a current-carrying conductor in a magnetic field experiences a force.
Draw a labelled diagram of a moving–coil galvanometer. Indicate how the galvanometer may be converted to a voltmeter.
Why is it not strictly correct to use a moving-coil voltmeter when verifying Ohm's law?

9. What are (i) neutrons, (ii) radioactive isotopes?
Give a brief account of the process of nuclear fission. Mention *one* disadvantage of nuclear fission as a source of energy.
Name any *two* devices that are commonly used for the detection of radiations emitted from radioactive substances. Outline the principle involved in the operation of *one* of them.

10. Answer any *two* of the following.
   (a) What is meant by the interference of waves?
   Describe an experiment to demonstrate interference.
   (b) In which of the following media is the velocity of sound the greatest: air, steel, water? Give a reason in support of your answer.
   Outline a laboratory experiment to measure the velocity of sound in air.
   (c) What are X-rays?
   Draw a labelled diagram of an X-ray tube and explain how it works.
   (d) Define capacitance.
   Write an expression for the effective capacitance C when two capacitors C_1 and C_2 are connected (i) in series, (ii) in parallel.
   Derive the expression for (i) *or* (ii).