AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1975


PHYSICS—ORDINARY LEVEL

TUESDAY, 24 JUNE—MORNING, 9.30 to 12.15


Any **six** questions to be answered.

All the questions carry the same marks.

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

   (a) What is the kinetic energy of a body of mass 2 kg travelling with a velocity of 3 m s^{-1}?

   (b) Write down an expression for Newton's law of gravitation.

   (c) Two forces act at right angles to each other. Draw a diagram to show their resultant.

   (d) Write down an equation to show the relationship between the pressure, volume and temperature of a gas.

   (e) What is meant by the specific heat capacity of a substance?

   (f) Complete the statement: Sound is an example of ———— waves.

   (g) The following diagrams represent waves entering (a) a narrow slit, (b) a wide slit, (e.g., as in a ripple tank). Does greater diffraction occur in (a) or in (b) and why?
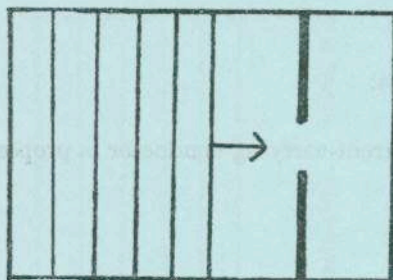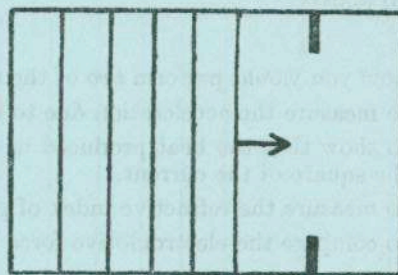

   (a)   (b)

   (h) In what way does the object lens of a telescope differ from that of a microscope?

   (i) What is a coulomb of electricity?

   (j) Show by means of a diagram how a galvanometer can be converted to an ammeter.

   (k) What are Fraunhofer lines?

   (l) A 100 watt bulb is lighting for five hours; how much does it cost at 3p per kilowatt-hour?

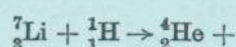   (m) How many turns are in the secondary circuit of the transformer in the diagram?

   220 V   600 turns   11 V
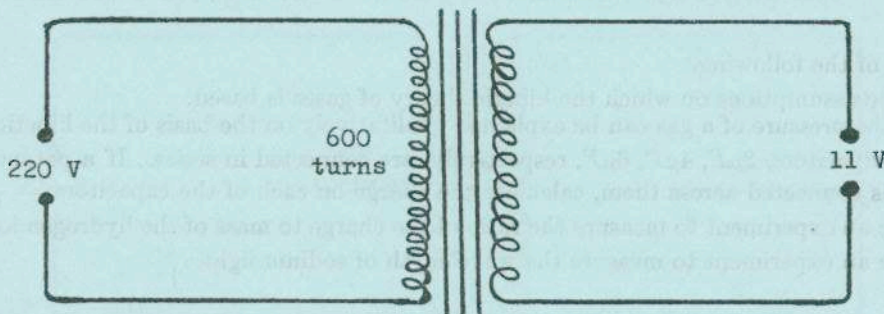
   (n) Complete the equation for the photoelectric effect:

$$h\nu = \phi +$$

   where h is Planck's constant, ν the frequency of the incident radiation, and ϕ the work function.

   (o) What is magnetic dip?

   (p) Complete the nuclear reaction

$$^{7}_{3}\text{Li} + {}^{1}_{1}\text{H} \rightarrow {}^{4}_{2}\text{He} +$$

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2. State Newton's second law of motion.

What is a vector? Which of the following are vectors: momentum, mass, time, force, acceleration?

A body of mass 10 kg starts from rest with uniform acceleration 2 m s⁻². What force is acting on the body? What is its velocity after 6 seconds? If it then travels with this velocity for a further 10 seconds, find the total distance it travels.

3. Indicate how you would measure temperature using *either* (a) a resistance thermometer *or* (b) a constant volume gas thermometer.

Give two advantages of the resistance thermometer over the gas thermometer.

Mention any other type of electrical thermometer.

4. Show by means of a ray diagram how a real image of an object occurs with (i) a concave mirror, (ii) a convex lens.

Describe an experiment to measure the focal length of a convex lens.

An object is placed 60 cm from a concave mirror. If the magnification of the image is $\frac{1}{5}$, find the focal length of the mirror.

5. Explain the basic physical principles involved in any *four* of the following.

(a) In a head-on collision between two cars the passengers are often injured as a result of being thrown against the windscreen.

(b) Covering the holes on a tin whistle causes it to give different notes.

(c) Glass prisms can sometimes function as mirrors.

(d) Colours can be seen on a long-playing record when it reflects white light.

(e) Large amounts of energy can be obtained from small quantities of fuel in a nuclear reactor.

6. Describe an experiment (i) to show that a current-carrying conductor experiences a force in a magnetic field, (ii) to show electromagnetic induction.

Draw a labelled diagram of an induction coil *or* a moving-coil meter and show how its operation is based on (i) or (ii) above.

7. Describe how you would perform *two* of the following experiments:

(a) to measure the acceleration due to gravity, *g*,

(b) to show that the heat produced in a given time in a current-carrying conductor is proportional to the square of the current,

(c) to measure the refractive index of glass,

(d) to compare the electromotive force (e.m.f.) of two cells.

8. What are X-rays, cathode rays? List their principal properties.

Describe, with the aid of a diagram, how X-rays are produced.

How can (i) the intensity, (ii) the penetrating power, of X-rays be increased?

9. Give an account of the nature, penetrating power, ionising power of the radiations (alpha, beta and gamma) emitted from radioactive substances.

State briefly how the neutron was discovered. Give one advantage of its use in the production of radio-active isotopes.

10. Answer any *two* of the following.

(a) Give the assumptions on which the kinetic theory of gases is based.

Show how the pressure of a gas can be explained qualitatively on the basis of the kinetic theory.

(b) Three capacitors, $2\mu F$, $4\mu F$, $6\mu F$, respectively, are connected in series. If a potential difference of 220 V is connected across them, calculate the charge on each of the capacitors.

(c) Outline an experiment to measure the ratio of the charge to mass of the hydrogen ion.

(d) Outline an experiment to measure the wavelength of sodium light.