18249

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LEAVING CERTIFICATE EXAMINATION, 1984

PHYSICS—ORDINARY LEVEL

MONDAY, 25 JUNE—MORNING, 9.30 to 12.30

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 acceleration.

(*b*) A ball of mass 0·5 kg is moving with a velocity of 8 m s^{-1} in a given direction. Calculate the momentum of the ball.

(*c*) The mass of a body is 5 kg on the surface of the earth. What is the weight of the body on the surface of the moon? (Take the acceleration due to gravity on the moon = 1·6 m s^{-2}.)

(*d*) State Avogadro's law.

(*e*) At what temperature on the Absolute (Kelvin) scale does (i) ice melt, (ii) water boil at standard atmospheric pressure?

(*f*) Fig. 1 shows two narrow-bore glass tubes which are partly immersed in a beaker of distilled water. Indicate which one of the following phenomena is illustrated in the diagram:
diffusion capillarity viscosity evaporation

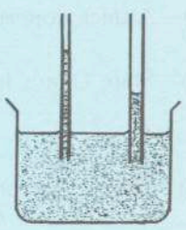

Fig. 1

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

(*h*) Fig. 2 shows a current-carrying wire which is passing at right-angles through a sheet of cardboard. Copy the diagram and show (i) the magnetic field pattern, (ii) the direction of the magnetic field, due to the current.

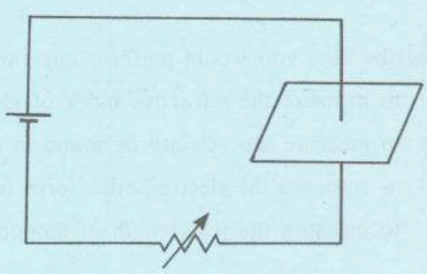

Fig. 2

(*i*) Complete the following statement:
"An electric current will flow between two points in a conductor when there is a ..... between the points".

(*j*) Which of the following is an electrolyte:
silver, copper sulphate solution, mercury, platinum?

(*k*) The insulated conductor shown in Fig. 3 is given a charge. Which of the three parts X, Y, Z will have the greatest concentration of charge?

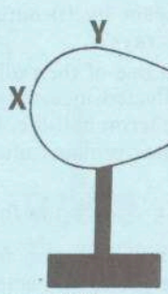

Fig. 3

(*l*) How may a moving-coil galvanometer be converted in order to function as an ammeter?

(*m*) Calculate the energy of a photon of light of frequency 6×10^6 Hz.
(Take Planck's constant, $h = 6{\cdot}6 \times 10^{-34}$ J s.)

(*n*) Give *two* properties of neutrons.

(*o*) Complete the nuclear reaction:

$$^{14}_{7}N + {}^{4}_{2}He \rightarrow {}^{17}_{8}O +$$

(*p*) An alternating voltage of 220 V is applied to a transformer which has 500 turns in the primary coil. If there are 2,000 turns in the secondary coil, what is the voltage across the secondary coil?

2. Describe a laboratory experiment to measure *g*, the acceleration due to gravity. Mention any *two* precautions you would take to ensure an accurate result in the experiment.
An object is thrown vertically upwards with an initial velocity of 50 m s^{-1}. Calculate (i) the maximum height reached by the object, (ii) the time the object takes to reach that height. (Take $g = 10$ m s^{-2}.)

3. (*a*) Give an account of an experiment to measure the specific heat capacity of a liquid *or* of a metal. Mention any precaution which could be taken to reduce the heat loss to the surroundings.

(*b*) State one advantage in each case which an electrical resistance thermometer has over (i) a mercury thermometer, (ii) a gas thermometer.
An electrical resistance thermometer has a resistance of 11 ohms at 0°C and a resistance of 12 ohms at 30°C. What would be the resistance of the thermometer at 100°C?

4. (*a*) Describe how you would measure the focal length of a convex lens.

(*b*) What is meant by dispersion of light?
Show, with the aid of a ray-diagram, how a spectrum of white light may be produced using two lenses and a prism.

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

(*a*) The water at the bottom of a waterfall is slightly warmer than at the top.

(*b*) A bicycle fitted with a dynamo produces less light as it slows down.

(*c*) A concave mirror is sometimes used by a dentist as a magnifying mirror.

(*d*) The timekeeper of a race watches for the flash of the starting gun.

(*e*) A thick copper strip, with one end buried in the earth, is often attached to the outside of a tall building.

6. (*a*) State Ohm's law. Describe a laboratory experiment to demonstrate Ohm's law.

(*b*) Derive an expression for the effective resistance (R) of two resistors r_1 and r_2, connected in parallel.
Fig. 4 shows an arrangement of three 2 ohm resistors.
Calculate the effective resistance of the arrangement.

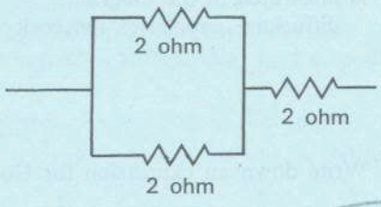

Fig. 4

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

(*a*) to measure the refractive index of glass,

(*b*) to measure the velocity of sound in air,

(*c*) to compare the electromotive force (e.m.f.) of two cells,

(*d*) to measure the wavelength of monochromatic light, e.g. sodium light.

8. Give *two* properties of electrons.
What is meant by thermionic emission? Describe, with the aid of a labelled diagram, the operation of a thermionic diode and give *one* application of the diode.
State briefly the part played by electrons in the production of X-rays.

9. What is meant by (i) natural radioactivity, (ii) artificial radioactivity, (iii) alpha particles, (iv) beta particles, (v) gamma rays?
State which one of the radiations (alpha, beta, gamma) is (i) the most penetrating, (ii) the most strongly ionising, (iii) not deflected in a magnetic field.
Explain the term: half-life. If a radioactive substance has a half-life of 3·8 days, what fraction of a given sample of this substance remains after 11·4 days?

10. Answer any *two* of the following.

(*a*) Give an expression for Einstein's photoelectric law. State what each term of the expression represents.
A zinc plate, connected to the cap of a gold-leaf electroscope, is given a negative charge. Ultra-violet light is then allowed to fall on the plate. Describe what happens to the leaves of the electroscope and explain why.
What would happen if the plate had been positively charged rather than negatively charged?

(*b*) Distinguish between a longitudinal wave and a transverse wave. Give an example of each.
Calculate the velocity of radio waves which have a wavelength of 1,500 metres and a frequency of 2×10^5 Hz.

(*c*) Define capacitance.
Describe an experiment to show that the capacitance of a parallel-plate capacitor depends on the distance between the plates of the capacitor.

(*d*) What is meant by electrolysis?
Outline an experiment to measure the ratio of the charge to mass of the hydrogen ion.