

PHYSICS - PASS

WEDNESDAY, 17th JUNE - Morning, 9.30 to 12

Six questions to be answered.

1. From the equations  $v = u + at$  and  $s = ut + \frac{1}{2}at^2$  for uniformly accelerated motion, derive an equation which does not contain  $t$ .

A body starts from rest and travels with a uniform acceleration of  $400 \text{ cm per second}^2$ . What is the velocity of the body when it has moved  $50 \text{ cm}$ ? A force is then applied to the body which reduces its velocity to  $100 \text{ cm per second}$  in  $4 \text{ seconds}$ . Find the magnitude of this force if the mass of the body is  $250 \text{ gm}$ .

(66 marks)

2. What is Brownian movement and how may it be demonstrated?

How is (i) the pressure of a gas, (ii) the temperature of a gas, interpreted in terms of the kinetic theory?

Explain how temperature is measured on the gas scale. What is the main use of a gas thermometer?

(66 marks)

3. Distinguish between reflection and refraction of light and state the laws associated with either one of them.

Show, with the aid of a diagram, the conditions under which total internal reflection occurs.

Draw a ray-diagram to show how a right-angled glass prism with angles of  $45^\circ$  may be used to turn a ray of light (i) through  $90^\circ$ , (ii) through  $180^\circ$ . Mention any application of total internal reflection.

(66 marks)

4. "Light consists of transverse waves. Interference of light waves can be produced if the two sources of light are coherent and their distance apart is of the order of the wavelength of the light." Explain the underlined terms.

List the measurements which you would make to find the wavelength of light by Young's interference experiment.

If the wavelength of yellow light is  $6 \times 10^{-5} \text{ cm}$  and its frequency is  $5 \times 10^{14} \text{ cycles per second}$  find the velocity of the light. What other radiations have the same velocity in air as visible light?

(66 marks)

5. For what purpose is (i) an electroscopes, (ii) a capacitor (condenser) used?

How would you show experimentally that the charge on a conductor (other than a sphere) is not uniformly distributed over the surface of the conductor whereas the potential is uniform over the surface.

State the factors on which the capacitance (capacity) of a capacitor depends and outline an experiment to illustrate the effect of one of those factors.

(66 marks)

6. Describe an experiment to show (i) electromagnetic induction, (ii) thermionic emission.

What is meant by alternating current?

Name a device by which the voltage of a source of alternating current may be changed, and a device which converts alternating current into direct current. Indicate briefly how either one of them functions.

(66 marks)

7. What are electrons, X-rays?

Describe, with the aid of a diagram, how X-rays are produced and summarise their properties.

Discuss how the energy-changes in the target atoms give rise to X-rays.

(67 marks)

8. Explain the terms: atomic nucleus, radioactive isotopes.

Comment on the role played by the nucleus in the production of radioactive isotopes.

Compare the radiations (alpha, beta and gamma) emitted from radioactive substances, under the following headings: (i) nature, (ii) effect of magnetic field, (iii) ionising ability, (iv) penetrating power. How may (iii) and (iv) be shown by experiment?

(67 marks)

9. Describe (i) an experiment to measure the angle of dip at a given place, (ii) an experiment to compare the electromotive force (e.m.f.) of two cells.

(67 marks)

10. Answer any two of the following:

(a) State Newton's law of gravitation. Why is the gravitational constant,  $G$ , rather than the acceleration due to gravity,  $g$ , regarded as a universal constant? What electrostatic and magnetic phenomena can be expressed by laws which resemble the law of gravitation?

(b) What is the basic principle underlying moving-coil meters?

A moving-coil galvanometer of resistance  $10 \text{ ohms}$  gives a full scale deflection with a current of  $5 \text{ milliamperes}$ . How may the galvanometer be converted to an ammeter to read up to  $2 \text{ amperes}$ ?

(c) Give the essentials for electrolysis.

How may the ratio of the charge to mass of the hydrogen ion be measured?

(d) What is the photoelectric effect? Describe a photoelectric cell and state any one of its applications.

(67 marks)