

PART I

Instructions for Part I

- (i) For each of the 3 questions in Part I, fill in the appropriate response in each of the boxes alongside each part of the question.
- (ii) You should attempt as many questions as possible. There are no penalty marks for incorrect answers.
- (iii) You are not asked to show how you arrived at an answer. Should you need paper for rough working, use Page 8.
- (iv) Should you find the wording of any question ambiguous or unclear, please write a brief comment on Page 9.
- (v) You are advised to spend about 50 minutes on Part I, which carries 29% of the total marks for the examination.

Q.1-1 This question concerns experiments that provided results of great importance to the formulation of quantum theory and the understanding of atomic structure.

- (i) Select the ONE option from the key that best describes an experiment that suggested the existence of the atomic nucleus. ☐
- (ii) Select the ONE option from the key that best describes an experiment that suggested the existence of atomic energy levels. ☐
- (iii) Select the ONE option from the key that best describes an experiment that suggested the wave nature of particle propagation. ☐
- (iv) Select the ONE option from the key that best describes an experiment that suggested the photon nature of light. ☐

KEY for Q.1-1 (i) to (iv)

- A An experiment in which charged droplets of oil were studied in a combination of electric and gravitational fields.
 - B An experiment in which electrons were scattered by crystals of nickel.
 - C An experiment in which electrons were accelerated through mercury vapour at low pressure.
 - D An experiment in which electrons were ejected from an illuminated metal surface.
 - E An experiment involving a cathode ray tube and transverse electric and magnetic fields.
 - F An experiment in which alpha particles were scattered by a thin sheet of gold foil.
 - G An experiment in which silver atoms were passed through a region of inhomogeneous magnetic fields.
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