1 Answer in brief :  8
(1) State an expression for the orbital radius of the electron in hydrogen atom.
(2) Define: distance of closest approach.
(3) Define range of the particle.
(4) Define linear absorption coefficient.
(5) Define Plateau.
(6) What is Synchrotron?
(7) Define East- West effect.
(8) What is a positron?

2 (a) Answer any one :  10
(1) Obtain expressions for the orbital radius and energy of electron in Bohr's atom model.
(2) State Schrödinger's equation for H atom in spherical polar coordinates. Using the method of separation of variables, obtain expressions for the radial, zenith and azimuthal parts of the wave function for hydrogen atom.
(b) Attempt any one:

(1) Calculate energy of the electron in hydrogen atom having orbital radius $5.3 \times 10^{-11}$ m.

(e=$1.6 \times 10^{-19}$ C, $e_0 = 8.85 \times 10^{-12}$ F/m)

(2) Calculate the de Broglie wavelength of an alpha particle moving at a speed of $2.0 \times 10^7$ m/s.

(h = $6.63 \times 10^{-34}$ Js, m = $6.6 \times 10^{-27}$ kg)

3 (a) Answer any one:

(1) Describe the construction and working of an ionization chamber.

(2) Describe necessary theory and working of a betatron.

(b) Attempt any one:

(1) The linear attenuation coefficient for 2 MeV gamma rays in water is about 5 m$^{-1}$. How far must such a beam travel in water before its intensity is reduced to 1 percent of its original value?

(2) Deuterons in a Cyclotron describe a circle of radius 0.32 m just before emerging from the dees. The frequency of the applied emf is 10 MHz. Find the flux density of the magnetic field.

(Mass of deuteron = $3.32 \times 10^{-27}$ kg and its charge = $1.6 \times 10^{-19}$ C).

4 Write short note on any two

(1) Magnetic orbital quantum number ($m_l$)

(2) Diffusion Cloud chamber

(3) Synchrocyclotron

(4) Altitude effect of cosmic rays.