VCD 12/12/23 FYBSc SEM-I PHY-II 75M Time:-2 ½ hrs

Note: **1. All questions are compulsory.**
2. All questions carry equal marks.
3. Draw neat, labelled diagrams wherever necessary.

Q.1 A] Attempt *any one* of the following: **[10M]**

1) Explain how to determine the size of nucleus on the basis of Rutherford alpha particle scattering.
2) Explain and derive the expression for law of radioactive disintegration and Half-life period.

Q.1 B] Attempt *any two* of the following: **[Each 5M]**

1) What is radioactivity? Explain the three major kinds of radioactivity with suitable examples.
2) Write a short note on a nuclear composition of nuclear size and nuclear charge.
3) State and explain the law of radioactive disintegration.
4) Calculate the mass of deuterium nucleus if 1 MeV is the B.E/nucleon.

Q.2 A] Attempt *any one* of the following: **[10M]**

1) Obtain an expression for Q-equation.
2) Write a short note on Interaction between particles and matter. Explain direct reactions.

Q.2 B] Attempt *any two* of the following: **[Each 5M]**

1) Write short notes on nuclear fission
2) Draw diagram of the following:-i) proportional counter ii)ionization chamber.
3) Find the energy released when two deuterium nuclei used to form Alpha particle.
(Given:-atomic mass of deuterium:-2.014102 amu , mass of helium:-4.002603 amu)
4) What is Q-value of nuclear reaction?

Q.3 A] Attempt *any one* of the following: **[10M]**

1) Discuss Davisson Germer experiment and explain its importance.
2) Why are crystals used to study diffraction of X-rays? Derive Bragg's law for x-ray diffraction by Crystal.

Q.3 B] Attempt *any two* of the following: **[Each 5M]**

1) Write a short note on Laue –diffraction
2) Explain the Compton effect.
3) Explain theory of black holes.
4) Find the de Broglie wavelength of electron of kinetic energy one electron volt
(Given: $h = 6.6\times10^{-34}$ J-sec^{-1} , $q = 1.6\times10^{-19}$ C, mass of electron $= 9.1\times10^{-31}$ kg)

Q.4 Attempt *any three* of the following: **[Each 5M]**

1) Write different types of nuclides with suitable examples.
2) Write difference between alpha decay and beta decay.
3) Determine the Q-value of the reaction ${}_3{}^{6}Li\ (d,\alpha)\alpha$
Given:- mass of lithium = 6.015125 a.m.u , mass of helium = 4.002603amu and mass of deuterium = 2.014102 a.m.u
4) From the following nuclear reactions determine the unknown X:-
i) ${}^{10}{}_5B(X,n){}^{13}{}_7N$ ii) ${}^{15}{}_7N(X,n){}^{16}{}_8O$ iii) ${}^{7}{}_3Li(\alpha,X){}^{11}{}_5B$
5) How do de Broglie waves support the Bohr quantization rule?
6) Give five properties of x-rays.

-x-x-x-x-x-x-x-x-x-x-x-x-