

KARIMPUR PANNADEVI COLLEGE

Sub: Physics (HONOURS) **Paper:** PHY-H-CC-T-09 **F.M-20**

4TH SEMESTER INTERNAL EXAMINATION, 2020(BLENDED MODE)

Students are strongly advised to write answers in their own words.

Answer any ten questions from the following:

2×10=20

- 1) Light of wavelength 200 nm falls on an aluminium surface, having work function 4.2 eV. What is the K.E. of the fastest emitted photoelectron? Also find the stopping Potential and calculate the cut off wavelength for Al.

- 2) How many collisions does a photon require to lost its energy completely (that is, to disappear), in Compton scattering and in photoelectric effect?

- 3) An electron initially at rest recoils from a head-on collision with a photon. Show that the kinetic energy acquired by the electron is $2h\nu\alpha/(1 + 2\alpha)$, where α is the ratio of the Photon's initial energy to the rest energy of the electron.

- 4) Why is it that only α -particles are emitted by radioactive nuclei, while protons and neutrons are not?

- 5) Find the maximum kinetic energy of the electron emitted in the beta decay of the free neutron. The neutron-proton mass difference is 1.30 MeV.

- 6) A laser beam emerging from a laser tube operating at 80 nm has a cross-sectional diameter of 2nm.What is the diameter of the beam at a distance of 1 km?

7) Given that $Li_3^7 = 7.01816$ amu, $Li_3^6 = 6.01692$ amu, $n_0^1 = 1.00893$ amu. What is the binding energy of a neutron in a Li_3^7 nucleus?

8) The uncertainty in the location of a particle is equal to de-Broglie wavelength then what will be the uncertainty in its velocity?

9) The wave function of a certain particle is $\Psi = A \cos^2 x$ for $-\frac{\pi}{2}$ to $\frac{\pi}{2}$, then what will be the value of A?

10) Given,

$\Psi(x) = \sqrt{\frac{2}{L}} \sin \frac{\pi x}{L}$, $0 < x < L$, What will be the expectation value of P^2 ?

11) What is the speed of an electron if its de Broglie wavelength equals its Compton wavelength?

12) One of the diffraction peaks observed by Davisson and Germer for a 65 keV electron beam was at a direction such that the angle between the incident beam and the scattered beam is 60° . For what value of crystal spacing is this peak seen in the first order?

13) What is called Population Inversion?

14) In case of wave function $\Psi = \frac{e^{ikr}}{r}$, what will be the Probability Current density?
