Class	:	XII
Subject	:	PHYSICS Practice Questions
Topic	:	Dual Nature of matter and radiation

1. A) The stopping potential of photoelectric effect in an experiment is 1.5V. What is the maximum kinetic energy of the emitted electrons?

   B) For what kinetic energy of a neutron will the associated de-Broglie wavelength give the value 1.40×10^{-10}m

   C) The threshold frequency of a certain metal is 3.3×10^{14}Hz. If light of frequency 8.2×10^{14}Hz is incident on the metal, find the cut-off voltage for photoelectric emission
2. Write Einstein's photoelectric equation and point out any two characteristic properties of photons on which this equation is based. Briefly explain the three observed features which can be explained by this equation
3. With reference to photoelectric effect, show the variation of following graphically

   a) Photoelectric current with intensity of incident radiation b) Photoelectric current against anode potential for different intensity of incident radiation c) Photoelectric current against anode potential for different frequency of incident radiation d) Stopping potential V_0 with frequency of incident radiation for a given photosensitive material
4. If the frequency of incident light on a metal surface is doubled, will the kinetic energy also be doubled? Show mathematically
5. Monochromatic radiation of λ = 640.22nm is incident on a photosensitive surface and the stopping potential is measured to be 0.54V. If the source is replaced by another source of λ = 427.2nm, find the new stopping potential
6. A beam of 450nm is incident on a metal having work function 2.0eV and [placed in a magnetic field B. The most energetic electrons emitted perpendicular to the field B are bent in a circular arc of radius 20cm. Find B
7. In a photoelectric experiment, it was found that the stopping decreases from 1.85V to 0.82V as the wavelength of incident light is varied from 300nm to 400nm. Calculate the value of Planck's constant in eV-s using this data
8. A nucleus of mass ***m*** initially at rest splits into two components of mass $\frac{M'}{3}$ and $\frac{2M'}{3}$ (M'<M). Find the ratio of De-Broglie wavelength of the two fragments

9. For an electron accelerated from rest, through a potential difference of V volt, obtain the following relation: $\lambda = \frac{12.27}{\sqrt{V}} \overset{0}{\mathrm{A}}$

10. An electron is revolving around the nucleus with a constant speed of 2.5 X 10^8 m/s. Find the de Broglie wavelength associated with it.

11. I) Define the term 'threshold frequency' as used in photoelectric effect.

    II) Plot a graph showing the variation of photoelectric current as a function of anode potential for two light beams having the same frequency but different intensities I_1 and I_2 ($I_1 > I_2$).

12. Write three basic properties of photons which are used to obtain Einstein's photoelectric equation. Use this equation to draw a plot of maximum kinetic energy of the electrons emitted versus the frequency of incident radiation

13. X-rays fall on a photosensitive surface to cause photoelectric emission. Assuming that the work function of the surface can be neglected, find the relation between the de-Broglie wavelength (λ) of the electrons emitted to the energy (E_ν) of the incident photons. Draw the nature of the graph for λ as a function of E_ν

14. Two monochromatic radiations of frequencies ν_1 and $\nu_2 \left(\nu_1 > \nu_2\right)$ and having the same intensity are, in turn, incident on a photosensitive surface to cause photoelectric emission. Explain, giving reason, in which case (i) more number of electrons will be emitted and (ii) maximum kinetic energy of the emitted photoelectrons will be more

15. A) Why photoelectric effect cannot be explained on the basis of wave nature of light? Give reasons.

    B) Write the basic features of photon picture of electromagnetic radiation on which Einstein's photoelectric equation is based.