Dual Nature of Radiation and Matter

Q.No.1:
An electron is accelerated through a potential difference of 64 volts. What is the de-Broglie wavelength associated with it? To which part of the electromagnetic spectrum does this value of wavelength correspond?

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Q.No.2:
Plot a graph showing the variation of stopping potential with the frequency of incident radiation for two different photosensitive materials having work functions W_1 and W_2 ($W_1 > W_2$). On what factors does the (i) slope and (ii) intercept of the lines depend?

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Q.No.3: A proton and an α-particle have the same de-Broglie wavelength. Determine the ratio of (i) their accelerating potentials (ii) their speeds.   **CBSE Board Paper 2015**

Q.No.4: Plot a graph showing variation of de Broglie wavelength λ versus $\frac{1}{\sqrt{V}}$, where V is accelerating potential for two particles P and Q, carrying the same charge but different masses m_1, m_2 ($m_1 > m_2$). Which one of the two represents a particle of smaller mass and why?   **CBSE Board Paper 2016**

Q.No.5:
Define the term 'stopping potential' in relation to photo-electric effect.
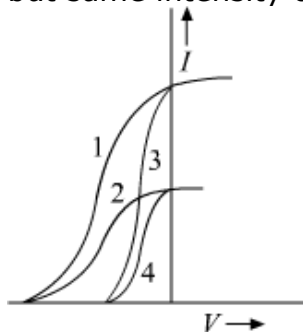
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Q.No.6:
Draw a plot showing the variation of photoelectric current with collector plate potential for two different frequencies, $V_1 > V_2$, of incident radiation having the same intensity. In which case will the stopping potential be higher? Justify your answer.

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Q.No.7:
The given graph shows the variation of photo-electric current (I) versus applied voltage

(V) for two difference photosensitive materials and for two different intensities of the incident radiations. Identify the pairs of curves that correspond to different materials but same intensity of incident radiation.

Q.No.8:
(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.

Q.No.9:
State de-Broglie hypothesis.

Q.No.10:
Write Einstein's photoelectric equation. State clearly how this equation is obtained using the photon picture of electromagnetic radiation.
Write the three salient features observed in photoelectric effect which can be explained using this equation.

Q.No.11: A deuteron and an alpha particle are accelerated with the same accelerating potential.
Which one of the two has
(1) greater value of de-Broglie wavelength, associated with it and
(2) less kinetic energy? Explain. **CBSE Board Paper 2014**

Q.No.12: (i) Monochromatic light of frequency 5.0×10^{14} Hz is produced by a laser. The power emitted is 3.0×10^{-3} W. Estimate the number of photons emitted per second on an average by the source.
(ii) Draw a plot showing the variation of photoelectric current versus the intensity of incident radiation on a given photosensitive surface. **CBSE Board Paper 2014**