Board – CBSE	Class – 12	Topic – Dual Nature of Radiation and Matter

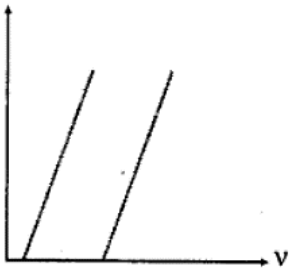
1 Mark Questions:

1. The graph shows variation of stopping potential V0 versus frequency of incident radiation v for two photosensitive metals A and Which one of the two metals has higher threshold frequency and why?
2. Show on a plot the nature of variation of photoelectric current with the intensity of radiation incident on a photosensitive surface.
3. Show the variation of photocurrent with collector plate potential for different frequencies but same intensity of incident radiation.
4. Show the variation of photocurrent with collector plate potential for different intensities but same frequency of incident radiation.
5. The stopping potential in an experiment on photoelectric effect is 1.5 V. What is the maximum kinetic energy of the photoelectrons emitted?

2 Marks Questions:

6. (i) Monochromatic light of frequency 6.0×10^{14} Hz is produced by a laser. The power emitted is 2.0×10^{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.
7. Two monochromatic radiations of frequencies v_2 and $\mathrm{v}_2(\mathrm{v}_1 > \mathrm{v}_2)$ 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.
8. Two monochromatic radiations, blue and violet of the same intensity are incident on a photosensitive surface and cause photoelectric emission. Would
   (i) The number of electrons emitted per second and
   (ii) The maximum kinetic energy of the electrons be equal in the two cases? Justify your answer.
9. Write Einstein's photoelectric equation. State clearly the three salient features observed in photoelectric effect which can be explained on the basis of above equation.

10. Figure shows variation of stopping potential (V_0) with the frequency (v) for two photosensitive materials M_1 and M_2.



(i) Why is the slope same for both lines?

(ii) For which material will the emitted electrons have greater kinetic energy for the incident radiation of the same frequency? Justify your answer.

3 Marks Questions:

11. Define threshold wavelength for photoelectric effect? DE Broglie wavelength associated with an electron associated through a potential difference V is λ? What will be the new wavelength when the accelerating potential is increase to 4V?
12. An electron has kinetic energy equal to 100eV. Calculate (1) momentum (2) speed (3) DE Broglie wavelength of the electron.
13. Photoelectric work function of a metal is 1eV. Light of wavelength 3000Å falls on it. What is the velocity of the effected photoelectron?

4 Marks Questions:

14. What is the
    a) Momentum,
    b) Speed, and
    c) De Broglie wavelength of an electron with kinetic energy of 120 eV.
15. Find the typical de Broglie wavelength associated with a He atom in helium gas at room temperature $(27°C)$ and 1atm pressure; and compare it with the mean separation between two atoms under these conditions.