

Physics Assignment: Dual Nature of Radiation and Matter

Complete Chapter Practice Question Bank

1. If light of wavelength 412.5 nm is incident on each of the metals given below, which ones will show photoelectric emission and why?

Metal	Work Function (eV)
Na / K / Ca / Mo	1.92 / 2.15 / 3.20 / 4.17

2. Photoelectric emission occurs when a surface is irradiated with frequencies ν_1 and ν_2 . Max K.E. are K and 2K. Obtain threshold frequency.

3. Monochromatic light of frequency 6.0×10^{14} Hz, power 2.0×10^{-3} W. Calculate: (i) Energy of photon (ii) Number of photons/sec. [AI 2012]

4. Particle moving 3x as fast as electron; ratio of de Broglie wavelength is 1.815×10^{-4} . Find mass and identify particle. [AI 2011]

5. Wavelength of sodium line is 590 nm. Find K.E. for electron with same de Broglie wavelength. [AI 2019]

6. Metals: K=2.3 eV, Na=2.75 eV, Mo=4.17 eV, Ni=5.15 eV. Radiation 330 nm from laser at 1 m. Which won't emit? What if distance is 50 cm?

7. Light of 600 nm on potassium (work function 2.3 eV). Will photoemission occur? Longest wavelength? ($hc = 1240$ eV·nm)

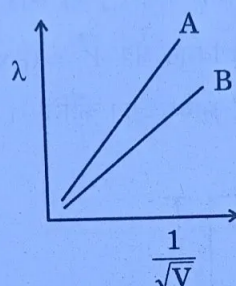
8. Give reasons: (a) Max K.E. independent of intensity. (b) Current increases with intensity. (c) Stopping potential V_0 varies linearly with frequency ν .

9. Calculate de Broglie wavelength of proton with energy (500 / 1.673) eV. Effect for alpha particle with same energy?

10. 26. (a) Particle (mass m, charge q) accelerated by potential V. Plot λ vs $1/\sqrt{V}$ or V. (b) Energy and λ for electron at 400 V.

11. What will be de Broglie wavelength associated with: (a) Electron speed 5.4×10^6 m/s. (b) Ball mass 150 g speed 30 m/s. Why macroscopic objects don't show wave properties?

30. (a) The figure shows de Broglie wavelength (λ) for two particles A and B having same charges but different masses as a function of $\frac{1}{\sqrt{V}}$, where V is the potential through which the particles are accelerated.



- (i) Which of them is heavier and why?
 (ii) What does the slope of the line represent?
- (b) Calculate the momentum of an electron having de Broglie wavelength of $3.0 \text{ \AA}$.