NEET	Class – 12th	Topic – Photoelectric

Q.1

Problem: Light of frequency 6×10^{14} Hz is incident on a metal surface. The work function of the metal is 2 eV. Calculate the kinetic energy of the emitted photoelectrons.

Solution: Energy of incident photon = hν = 6.63×10^-34 × 6×10^14 = 3.978×10^-19 J = 2.48 eV

K.E. = Energy - Work function = 2.48 - 2 = 0.48 eV

Q.2

Problem: A metal surface is illuminated by light of wavelength 400 nm. The stopping potential is measured to be 1.2 V. Find the work function of the metal.

Solution: $E = hc/\lambda = 1240/400 = 3.1$ eV

$\phi = E - eV_0 = 3.1 - 1.2 = 1.9$ eV

Q.3

Problem: What is the threshold frequency for a metal whose work function is 3.31 eV?

Solution: $\phi = h\nu_0 \Rightarrow \nu_0 = \phi/h = (3.31 \times 1.6 \times 10^{-19})/(6.63 \times 10^{-34}) \approx 8 \times 10^{14}$ Hz

Q.4

Problem: If the intensity of incident light is doubled, how does the photoelectric current change?

Solution: Photoelectric current is directly proportional to intensity. So, it also doubles.

Q.5

Problem: Find the maximum wavelength of light that can cause photoemission from a metal with work function 2.07 eV.

Solution: $\lambda = hc/\phi = 1240/2.07 \approx 599$ nm

Q.6

Problem: The threshold frequency of a metal is 5×10^{14} Hz. Will light of frequency 6×10^{14} Hz cause photoemission? If yes, find K.E.

Solution: Energy of incident light $= h\nu = 3.98 \times 10^{-19}$ J $= 2.48$ eV. Threshold energy $= 5 \times 6.63 \times 10^{-34} = 3.32 \times 10^{-19}$ J $= 2.07$ eV

K.E. $= 2.48 - 2.07 = 0.41$ eV $\Rightarrow$ Yes, photoemission occurs.

Q.7

Problem: A photoelectric surface has a threshold wavelength of 620 nm. Calculate its work function.

Solution: $\phi = hc/\lambda = 1240/620 \approx 2$ eV

Q.8

Problem: Light of frequency 8 × 10^14 Hz causes photoemission with K.E. 1.2 eV. Find the metal's work function.

Solution: E = hν = 5.3 × 10^-19 J = 3.3 eV. ϕ = 3.3 - 1.2 = 2.1 eV

Q.9

Problem: If stopping potential is 1.5 V, what is the maximum kinetic energy of photoelectrons?

Solution: K.E. = eV_0 = 1.5 eV

Q.10

Problem: The photoelectric current increases with:

(a) frequency (b) work function

(c) intensity (d) wavelength.

Solution: Answer: (c) intensity. More photons = more electrons emitted.