2019 Ph H1 Q16

Section: Particles and Waves

Topic: Forces on Charged Particles / Photoelectric Effect

Brief summary of the question

Photon energy: 6.40×10^-19 J, work function: 4.20×10^-19 J. Find maximum electron speed.

Worked solution

Photoelectric equation: K_max = hf - ϕ.

K_max = 6.40×10^-19 − 4.20×10^-19 = 2.20×10^-19 J.

K = ½ m v^2 ⇒ v = sqrt(2K / m_e).

v = sqrt((2×2.20×10^-19) / (9.11×10^-31)).

v = sqrt(4.83×10^11) = 6.95×10^5 m/s.

Final answer

C — 6.95×10^5 m/s.

Revision tips

- **Subtract work function from photon energy to get K_max.**
- **Use m_e = 9.11×10^-31 kg.**
- **Speed here is non-relativistic (well below 0.1c).**