

Question Number	Answer	Mark
17(a)	<p>Use of <math>v = f\lambda</math> (1)</p> <p>Use of <math>E = hf</math> (1)</p> <p>Converts work function from eV to J (1)</p> <p>Use of <math>hf = \Phi + \frac{1}{2}mv_{\max}^2</math> (1)</p> <p><math>v_{\max} = 4.5 \times 10^6 \text{ m s}^{-1}</math> (1)</p> <p>(MP4 can only be awarded if values substituted are valid energy and mass values)</p> <p><u>Example of calculation</u></p> <p><math>v = f\lambda</math>, <math>3.00 \times 10^8 \text{ m s}^{-1} = f \times (20 \times 10^{-9} \text{ m})</math>, <math>f = 1.50 \times 10^{16} \text{ Hz}</math></p> <p><math>E = hf = (6.63 \times 10^{-34} \text{ Js}) (1.50 \times 10^{16} \text{ Hz}) = 9.95 \times 10^{-18} \text{ J}</math></p> <p>Work function <math>\Phi = (3.68 \text{ eV}) (1.60 \times 10^{-19} \text{ J/eV}) = 5.89 \times 10^{-19} \text{ J}</math></p> <p><math>hf = \Phi + \frac{1}{2}mv_{\max}^2</math>, <math>9.95 \times 10^{-18} \text{ J} = 5.89 \times 10^{-19} \text{ J} + \frac{1}{2}mv_{\max}^2</math></p> <p><math>\frac{1}{2} (9.11 \times 10^{-31} \text{ kg}) v_{\max}^2 = 9.36 \times 10^{-18} \text{ J}</math></p> <p><math>v_{\max} = 4.53 \times 10^6 \text{ m s}^{-1}</math></p>	5
17(b)	<p>Increasing intensity leads to more photons/electrons (1)</p> <p>But intensity does not affect the speed/ KE (of electrons) (1)</p> <p>Increasing <math>\lambda</math> leads to a decrease in photon/light energy (1)</p> <p>Leads to decrease in speed/ KE (for electrons), so student incorrect (1)</p> <p>(MP1 – Allow equations with arrows correctly indicating increased and decreased components)</p>	4
Total for Question 17		9