Question Number	Answer		Mark
18ai	Use of $E_k = ½ mv^2$ with $m = 9.11 \times 10^{-31}$ kg Conversion of J to eV Energy = 0.35 eV Example of calculation $E_k = ½ \times 9.11 \times 10^{-31}$ kg $\times (3.51 \times 10^5$ m s$^{-1})^2 = 5.60 \times 10^{-20}$ J $E_k = \frac{5.60 \times 10^{-20}\text{ J}}{1.6 \times 10^{-19}\text{ J eV}^{-1}} = 0.35$ eV	(1) (1) (1)	**3**
18aii	Use of $v = f\lambda$ with $v = 3.00 \times 10^8$ m s^{-1} Use of $E = hf$ Use of $hf = \Phi + ½ mv^2_{max}$ $\Phi = 5.86 \times 10^{-19}$ (J), so the metal is magnesium Example of calculation $E = \frac{hc}{\lambda} = \frac{6.63 \times 10^{-34}\text{ J s} \times 3.00 \times 10^8\text{ m s}^{-1}}{310 \times 10^{-9}\text{ m}} = 6.42 \times 10^{-19}$ J $\Phi = hf - ½ mv^2_{max} = 6.42 \times 10^{-19}$ J $- 5.60 \times 10^{-20}$ J $= 5.86 \times 10^{-19}$ J $\Phi = 5.86 \times 10^{-19}$ J	(1) (1) (1) (1)	**4**
18b	Each photon only interacts with one electron Electrons absorb energy from photons **Or** photons transfer energy to electrons Minimum energy required for an electron to be emitted Higher (photon) energy related to higher frequency(, so frequency of radiation has to be above a particular value) (MP3 – allow correct reference to work function) (MP4 – allow reference to E = hf)	(1) (1) (1) (1)	**4**
18c	Any two from: Intensity is related to the number of photons (per second) Intensity is related to the number of (photo)electrons (per second) Intensity does not affect the energy (of the photons/photoelectrons)	 (1) (1) (1)	**2**
	Total for question 18		**13**