Question Number	Answer	Mark
14a	The electron only receives energy from one photon **Or** there is a one to one interaction between photons and electrons (1) Some of the photon energy is needed to overcome the work function **Or** There is a minimum energy required to release electrons from the (surface of the) plate (1) Remaining photon energy is transferred to kinetic energy of electron (and is therefore lower than photon energy) **Or** Photon energy is shared between the work function and kinetic energy of electron (so kinetic energy less than photon energy) (1)	**3**
14b	Use of $E_k = ½\ mv^2$ (1) Use of $hf = \Phi + ½\ mv^2{}_{max}$ (1) Conversion of work function from eV into J (1) $f = 1.1 \times 10^{15}$ (Hz), so source A (1) <u>Example of calculation</u> $E_k = ½\ mv^2 = ½ \times 9.11 \times 10^{-31}\ kg \times (5.70 \times 10^5\ m\ s^{-1})^2 = 1.48 \times 10^{-19}\ J$ $\Phi = 3.68\ eV \times 1.60 \times 10^{-19}\ J\ eV^{-1} = 5.89 \times 10^{-19}\ J$ $hf = 1.48 \times 10^{-19}\ J + 5.89 \times 10^{-19}\ J = 7.37 \times 10^{-19}\ J$ $f = \frac{7.37 \times 10^{-19}\ J}{6.63 \times 10^{-34} Js} = 1.11 \times 10^{15}$ Hz, so source A	**4**
	Total for question 14	**7**