Question Number	Answer		Mark
17a	Minimum energy (required to release electrons from the surface of a metal)	(1)	**1**
17b	Use of $\lambda = h/p$ with $\lambda = 1.50 \times 10^{-9}$ m	(1)	
	Use of $p = mv$ with $m = 9.11 \times 10^{-31}$ kg	(1)	
	Converts work function from eV into J	(1)	
	Use of $hf = \Phi + \frac{1}{2}mv^2_{max}$ to find hf	(1)	
	Use of $E = hf$ **and** $v = f\lambda$ to find λ	(1)	
	λ = 250 nm, so UVC	(1)	**6**
	Example of calculation $\lambda = h/p$ so $p = h/\lambda = \frac{(6.63 \times 10^{-34}\ \text{Js})}{(1.50 \times 10^{-9}\ \text{m})} = 4.42 \times 10^{-25}\ \text{kg m s}^{-1}$ so $v = \frac{p}{m} = \frac{(4.42 \times 10^{-25}\ \text{kg m s}^{-1})}{(9.11 \times 10^{-31}\ \text{kg})} = 4.85 \times 10^{5}\ \text{ms}^{-1}$ KE = $\frac{1}{2}mv^2 = \frac{1}{2}(9.11 \times 10^{-31}\ \text{kg})(4.85 \times 10^{5}\ \text{ms}^{-1})^2 = 1.07 \times 10^{-19}$ J $\Phi = (4.30\ \text{eV})(1.60 \times 10^{-19}\ \text{J eV}^{-1}) = 6.88 \times 10^{-19}$ J $E = hf = \Phi + \frac{1}{2}mv^2_{max} = 6.88 \times 10^{-19}\ \text{J} + 1.07 \times 10^{-19}\ \text{J} = 7.95 \times 10^{-19}$ J $f = \frac{E}{h} = \frac{(7.95 \times 10^{-19}\ \text{J})}{(6.63 \times 10^{-34}\ \text{Js})} = 1.20 \times 10^{15}$ Hz $\lambda = \frac{v}{f} = \frac{(3.00 \times 10^{8}\ \text{ms}^{-1})}{(1.20 \times 10^{15}\ \text{Hz})} = 2.50 \times 10^{-7}$ m (250nm) UVC		
17c	**MAX 2 for work function** *y*-intercept of graph should be (negative) work function *y*-intercept is approximately (-) 10.0 eV (so cannot be zinc) **Or MAX 2 for threshold frequency** Threshold frequency is the *x*-intercept / 7.5×10^{14} Hz threshold frequency should be 1.0×10^{15} Hz, (so cannot be zinc) **Or MAX 2 for Planck constant** Gradient of graph should be the Planck constant (allow "gradient = h") Calculates that gradient of the graph is approx. 2.1×10^{-33} (Js) (so not correct) (Alternative for work function pair of marks: hf_0 should be the work function **Or** calculate work function from hf_0(1) hf_0 from graph = 3.1eV (so cannot be zinc) (1))	(1) (1) (1) (1) (1) (1)	**4**
	Total for question 17		**11**