D6 The Photoelectric Effect

When the photon energy is insufficient for the ejection of photoelectrons, answer the question by writing 'no electrons emitted'.

D6.1 Complete the questions in the table:

Frequency of Light /Hz	Wavelength of Light /nm	Work Function	Max. KE of Photoelectrons	Stopping Potential /V
6.0×10^{14}		1.2×10^{-19} J	(a)	
6.0×10^{14}		2.6 eV		(b)
	350	2.6 eV		(c)
	530	(d)		1.35

D6.2 A material's work function is 1.3 eV. Calculate its threshold frequency.

D6.3 A material will not emit photoelectrons unless it is irradiated by light with a wavelength less than 380 nm. Calculate its work function in electronvolts.

D6.4 a) Calculate the maximum speed of the photoelectrons emitted when a material with an 8.4×10^{-20} J work function is illuminated by light of frequency 7.0×10^{14} Hz.

b) What is the minimum speed of the photoelectrons emitted?

D6.5 A graph of stopping potential (y) against frequency of light (x) is plotted for zinc, and also for aluminium. Without knowing more information, answer the following questions:

a) Are the lines straight or not?

b) Are the y-intercepts positive, negative or zero?

c) Are the gradients positive, negative or zero?

d) Are the gradients of the two lines the same or different?

e) Are the y-intercepts of the two lines the same or different?

f) What is the significance of the x-intercept?

g) If you answered 'same' to parts (d) or (e), write down the value of the common gradient or intercept.

D6.6 A material has a work function of 3.4 eV, and is illuminated by 5.0 eV photons. Calculate the stopping potential of its photoelectrons.