

Act 1 - Solution

1. It is observed that shining light with wavelength 310 nm on a material will eject electrons, while 312 nm will not. What is the workfunction of the material?

Hint: What is V_{stop} at the maximum wavelength (minimum frequency)?

a) +2 V

b) -2 V

c) +2 eV

d) -4 eV

e) +4 eV

The workfunction must have units of energy, and is defined to be *positive*, so c) and e) are the only possible candidates. $V_{\text{stop}} = 0$, so $E_{\text{photon}} = \Phi$.
Use $E = hc / \lambda \rightarrow \lambda = hc / E = 1240 \text{ eV}\cdot\text{nm} / 310 \text{ nm} = 4 \text{ eV}$

2. If the same light is shined onto a material with $\phi = 2 \text{ eV}$, what stopping voltage will prevent all electrons from making it to the collector?

a) +2 V

b) +4 V

c) +2 eV

d) -4 eV

e) +4 eV

The answer must have units of voltage. Since 2 eV of every incident photon's energy (4 eV) goes to freeing each electron, they can leave with $\leq 2 \text{ eV}$ in kinetic energy. A potential of 2 V is needed to slow such electrons to 0.