27. (a) We use the photoelectric effect equation (Eq. 39-5) in the form $hc/\lambda = \Phi + K_m$. The work function depends only on the material and the condition of the surface, and not on the wavelength of the incident light. Let λ_1 be the first wavelength described and λ_2 be the second. Let $K_{m1} = 0.710\,\text{eV}$ be the maximum kinetic energy of electrons ejected by light with the first wavelength, and $K_{m2} = 1.43\,\text{eV}$ be the maximum kinetic energy of electrons ejected by light with the second wavelength. Then,

$$\frac{hc}{\lambda_1} = \Phi + K_{m1} \quad \text{and} \quad \frac{hc}{\lambda_2} = \Phi + K_{m2} \ .$$

The first equation yields $\Phi = (hc/\lambda_1) - K_{m1}$. When this is used to substitute for Φ in the second equation, the result is $(hc/\lambda_2) = (hc/\lambda_1) - K_{m1} + K_{m2}$. The solution for λ_2 is

$$\begin{aligned} \lambda_2 &= \frac{hc\lambda_1}{hc + \lambda_1(K_{m2} - K_{m1})} \\ &= \frac{(1240\,\text{eV}\cdot\text{nm})(491\,\text{nm})}{1240\,\text{eV}\cdot\text{nm} + (491\,\text{nm})(1.43\,\text{eV} - 0.710\,\text{eV})} \\ &= 382\ \text{nm} \ . \end{aligned}$$

Here $hc = 1240\,\text{eV}\cdot\text{nm}$, calculated in Exercise 3, is used.

(b) The first equation displayed above yields

$$\Phi = \frac{hc}{\lambda_1} - K_{m1} = \frac{1240\,\text{eV}\cdot\text{nm}}{491\,\text{nm}} - 0.710\,\text{eV} = 1.82\ \text{eV} \ .$$