P783 10, 13, 18, 19, 21, 24, 26

(10.) $E = hf$

$$= \frac{(6.63\times10^{-34}\ \text{J·s})(88.5\times10^{6}\ \text{Hz})}{1.60\times10^{-19}\ \text{J eV}^{-1}} = \underline{3.67\times10^{-7}\ \text{eV}}$$

(13) $E = hf$

$$f = \frac{E}{h} = \frac{(0.1\ \text{eV})(1.6\times10^{-19}\ \text{J eV})}{(6.63\times10^{-34}\ \text{Js})} = \underline{2.41\times10^{13}\ \text{Hz}}$$

$c = \lambda f$

$$\lambda = \frac{c}{f} = \frac{3.0\times10^{8}\ \text{ms}^{-1}}{2.41\times10^{13}\ \text{Hz}} = \underline{1.24\times10^{-5}\ \text{m}}$$

(18.) $hf = \phi \qquad c = \lambda f$

$$f = \frac{\phi}{h} = f = \frac{c}{\lambda}$$

$$\lambda = \frac{ch}{\phi} = \frac{(3.0\times10^{8}\ \text{ms}^{-1})(6.63\times10^{-34}\ \text{Js})}{(3.10\text{eV})(1.60\times10^{-19}\ \text{J eV}^{-1})} = 4.0\times10^{-7}\ \text{m}$$

$$= \underline{400\ \text{nm}}$$

(19) visible light $\lambda \simeq 500\ \text{nm}$

$$\phi = hf = \frac{hc}{\lambda} = \frac{(6.63\times10^{-34}\ \text{Js})(3.0\times10^{8}\ \text{ms}^{-1})}{(1.60\times10^{-19}\ \text{J eV}^{-1})(500\times10^{-9}\ \text{m})}$$

$\phi = 2.49\ \text{eV}$ Copper, Iron

(21.) $hf = \phi + E_{max} \qquad c = \lambda f \qquad f = \frac{c}{\lambda}$

$$E_{max} = \frac{hc}{\lambda} - \phi = \frac{(6.63\times10^{-34}\ \text{Js})(3.0\times10^{8}\ \text{ms}^{-1})}{(1.60\times10^{-19}\ \text{J eV}^{-1})(400\times10^{-9}\ \text{m})} - 2.48\text{eV}$$

$$= \underline{\underline{0.63\ \text{eV}}}$$

$$= \frac{(6.63\times10^{-34}\ \text{Js})(3.0\times10^{8}\ \text{ms}^{-1})}{(1.6\times10^{-19}\ \text{J eV}^{-1})(750\times10^{-9}\ \text{m})} - 2.48\text{eV}$$

$$= -0.82\ \text{eV}$$

(24) $\lambda_0 = 350\ nm$ $\quad c = \lambda f_0$

$hf_0 = \phi$

$\phi = \frac{hc}{\lambda_0}$

$hf = E_{max} + \phi$

$E_{max} = hf - \phi = hf - \frac{hc}{\lambda_0} = \frac{hc}{\lambda} - \frac{hc}{\lambda_0} = hc\left(\frac{1}{\lambda} - \frac{1}{\lambda_0}\right)$

(a) $E_{max} = \frac{(6.63\times10^{-34}\ Js)(3.0\times10^{8}\ ms^{-1})}{(1.6\times10^{-19}\ J\,eV^{-1})}\left(\frac{1}{280\times10^{-9}\ m} - \frac{1}{350\times10^{-9}\ m}\right)$

$= \underline{0.89\ eV}$

(b) $E_{max} = \frac{(6.63\times10^{-34}\ Js)(3.0\times10^{8}\ ms^{-1})}{(1.6\times10^{-19}\ J\,eV^{-1})}\left(\frac{1}{350\times10^{-9}\ m} - \frac{1}{350\times10^{-9}\ m}\right)$

$= -0.10\ eV$

(NO EJECTED ELECTRONS)

(26) $hf = E_{max} + \phi$ $\quad c = \lambda f$

$\phi = hf - E_{max} = \frac{hc}{\lambda} - E_{max} = \frac{hc}{\lambda} - qV$

$= \frac{(6.63\times10^{-19}\ Js)(3.0\times10^{8}\ ms^{-1})}{(1.6\times10^{-19}\ J\,eV^{-1})(230\times10^{-9}\ m)} - \frac{(1.6\times10^{-19}\ C)(1.64V)}{(1.6\times10^{-19}\ J\,eV^{-1})}$

$= \underline{3.76\ eV}$