Homework Solution
Chapter 2

Pb#4.

If the filament is an ideal radiator $\Rightarrow \mathcal{E} = \sigma T^4 \left(\frac{W}{m^2}\right)$ (Stefan's law).

a) $T = 3000\ K \Rightarrow e = (5.7\times10^{-8})(3000)^4 = \boxed{4.62\times10^{6}\ \frac{W}{m^2}}$

b) $e = \frac{P}{A} \Rightarrow A = \frac{P}{e} = \frac{75}{4.62\times10^{6}} = \boxed{16.2\times10^{-6}\ m^2}$

Pb # 12. $V_s = 2.92\ eV \quad \lambda = 250nm = 2500\ \text{Å}$

$eV_s = hf - \phi = h\frac{c}{\lambda} - \phi$

$\Rightarrow \phi = \frac{hc}{\lambda} - eV_s = \frac{12400\ eV.\text{Å}}{2500\ \text{Å}} - 2.92\ eV$

$= \boxed{2.04\ eV}$

Pb # 16.

$\phi_{Li} = 2.3\ eV$ (Lithium)

$\phi_{Be} = 3.9\ eV$ (Beryllium)

$\phi_{Hg} = 4.5\ eV$ (Mercury)

$\lambda = 300nm = 3000\ \text{Å}$

To have photoelectric effect, we need $\frac{hc}{\lambda} > \phi$

So that $eV_s = K_{max} > 0$!