

Chem 462—Instrumental Analysis

Chapter 6 Solution Set

- 6.3. $\lambda = 5.715 \mu\text{m} = 5.715 \times 10^{-6} \text{ m}$
 $v\lambda = c$
$$v = \frac{c}{\lambda} = \frac{2.9979 \times 10^8 \text{ m/s}}{5.715 \times 10^{-6} \text{ m}} = 5.246 \times 10^{13} \text{ Hz}$$
$$E = hv = (6.626 \times 10^{-34} \text{ J s})(5.246 \times 10^{13} \text{ Hz}) = 3.476 \times 10^{-20} \text{ J}$$
$$E = 3.476 \times 10^{-20} \text{ J} \left(\frac{6.2415 \times 10^{18} \text{ eV}}{\text{J}} \right) = 0.2169 \text{ eV}$$
- 6.14. $A = -\log_{10}(T)$
 $T = 10^{-A}$
a. $T = 10^{-.375} = 0.422 \times 100\% = 42.2\%$
b. $T = 10^{-1.325} = 0.0473 \times 100\% = 4.73\%$
c. $T = 10^{-.0012} = 0.997 \times 100\% = 99.7\%$
- 6.15. $A = -\log_{10}(T)$
a. $A = -\log_{10}(.336) = 0.474$
b. $A = -\log_{10}(.921) = 0.0357$
c. $A = -\log_{10}(.0175) = 1.76$
- 6.18. $[X] = 4.14 \times 10^{-3} \text{ M}$ $b = 2.00 \text{ cm}$ $T = 0.126$
 $A = -\log_{10}(.126) = 0.900 = \epsilon b[X]$
$$\epsilon = \frac{0.900}{(2.00 \text{ cm})(4.14 \times 10^{-3} \text{ M})} = 109 \text{ cm}^{-1} \text{ M}^{-1}$$
$$T = 3(.126) = 0.378$$
$$A = -\log_{10}(.378) = 0.423$$
$$[X] = \frac{0.423}{(1.00 \text{ cm})(109 \text{ cm}^{-1} \text{ M}^{-1})} = 3.88 \times 10^{-3} \text{ M}$$
- 6.19. $\epsilon = 2.17 \times 10^3 \text{ cm}^{-1} \text{ M}^{-1}$
 $A = -\log_{10}(.0842) = 1.075 = \epsilon b[X]$
$$[X] = \frac{1.075}{(2.17 \times 10^3 \text{ cm}^{-1} \text{ M}^{-1})(2.50 \text{ cm})} = 1.98 \times 10^{-4} \text{ M}$$