Answers HW #1 Chem 1410 Fall 2000

1.7. $\lambda_{max} = 260\ nm$, $T = ?$

$\lambda_{max} T = 2.90 \times 10^{-3}\ mK$ (Eq. 1.4 in text)

$T = \frac{2.90 \times 10^{-3}}{260 \times 10^{-9}}\ K = 1.12 \times 10^{4}\ K$

1.15. $\lambda_{max} = 550\ nm$, $T = ?$

$T = \frac{2.90 \times 10^{-3}}{550 \times 10^{-9}}\ K = 5.27 \times 10^{3}\ K$

1.17 $\phi = 4.40\ eV$, $\lambda = 200\ nm$

$E = h\nu = \frac{hc}{\lambda} = \frac{(6.626 \times 10^{-34})(2.998 \times 10^{8})}{200 \times 10^{-9}} = 9.93 \times 10^{-19}\ J$

$(9.93 \times 10^{-19}\ J)\left(6.241 \times 10^{18}\ \frac{eV}{J}\right) = 6.20\ eV$

K.E. of electron = $6.20 - 4.40 = 1.80\ eV$

or $2.88 \times 10^{-17}\ J$

1.36 $\Delta x \Delta p > h$

$\Delta x \sim 10\ pm$, $\Delta p = ?$

$\Delta p \sim \frac{h}{\Delta x} = \frac{6.626 \times 10^{-34}\ J \cdot s}{10 \times 10^{-12}\ m} = 6.63 \times 10^{-23}\ Kg\ \frac{m}{s}$

What is the momentum of an electron in the 1st Bohr orbit?

$mvr = n\hbar \rightarrow mv = \frac{n\hbar}{r} = \frac{1(6.626 \times 10^{-34})}{2\pi(52.92 \times 10^{-12})}$

$mv = 1.99 \times 10^{-24}\ Kg\ \frac{m}{s}$

1.39 $\tau = 10^{-9}$ s. What is ΔE

$\Delta E \Delta t \sim h$

$$\Delta E = \frac{6.626 \times 10^{-34} \text{ J·s}}{10^{-9} \text{ s}} = 6.626 \times 10^{-25} \text{ J}$$

$$= 4.136 \times 10^{-6} \text{ eV}$$