

Chapter 6

$$6.15 \text{ a) } \nu = c/\lambda, \quad \nu = \frac{3.0 \times 10^8 \text{ m/s}}{955 \text{ nm} \left(\frac{10^{-6} \text{ m}}{1 \text{ nm}} \right)} = \boxed{3.14 \times 10^{11} \text{ 1/s}}$$

$$\text{b) } \lambda = \frac{c}{\nu}, \quad \lambda = \frac{3.00 \times 10^8 \text{ m/s}}{5.5 \times 10^{14} \text{ 1/s}} = 5.45 \times 10^{-7} \text{ m} = \boxed{545 \text{ nm}}$$

$$\text{d) } d = v \cdot T = c \cdot T = 3.00 \times 10^8 \frac{\text{m}}{\text{s}} \cdot 50 \text{ ns} \left(\frac{1 \text{ ns}}{10^{-6} \text{ s}} \right) = \boxed{1.50 \times 10^4 \text{ m}}$$

$$6.23 \text{ a) } E = h\nu = h \frac{c}{\lambda} = (6.626 \times 10^{-34} \text{ J s}) \frac{3 \times 10^8 \text{ m/s}}{(3.3 \text{ nm}) \left(\frac{10^{-6} \text{ m}}{1 \text{ nm}} \right)} =$$

$$h \frac{c}{\lambda} = (6.626 \times 10^{-34} \text{ J s}) \frac{3 \times 10^8 \text{ m/s}}{(0.154 \text{ nm}) \left(\frac{10^{-9} \text{ m}}{1 \text{ nm}} \right)} =$$

$$6.29 \text{ a) } E = h\nu = (6.626 \times 10^{-34} \text{ J s}) (1.09 \times 10^{15} \text{ 1/s}) = \boxed{7.22 \times 10^{-19} \text{ J}}$$

$$\text{b) } \nu = \frac{c}{\lambda}, \quad \lambda = \frac{c}{\nu} = \frac{3.0 \times 10^8 \text{ m/s}}{1.09 \times 10^{15} \text{ 1/s}} = 2.75 \times 10^{-7} \text{ m} = \boxed{275 \text{ nm}}$$

$$\text{c) } E = h\nu = h \frac{c}{\lambda} = (6.626 \times 10^{-34} \text{ J s}) \frac{3 \times 10^8 \text{ m/s}}{(20 \text{ nm}) \left(\frac{10^{-9} \text{ m}}{1 \text{ nm}} \right)} = 1.66 \times 10^{-18} \text{ J}$$

The excess energy is $1.66 \times 10^{-18} \text{ J} - 7.22 \times 10^{-19} \text{ J} = \boxed{9.3 \times 10^{-19} \text{ J/e}^-}$

$$6.35 \text{ } E = -R_H \left(\frac{1}{n^2} \right) = (-2.18 \times 10^{18} \text{ J}) \left(\frac{1}{2^2} \right) = \boxed{-5.45 \times 10^{-19} \text{ J}}$$

$$E = -R_H \left(\frac{1}{n^2} \right) = (-2.18 \times 10^{18} \text{ J}) \left(\frac{1}{6^2} \right) = \boxed{-0.606 \times 10^{-19} \text{ J}}$$

$$E = -R_H \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right) = (-2.18 \times 10^{18} \text{ J}) \left(\frac{1}{2^2} - \frac{1}{6^2} \right) = \boxed{4.84 \times 10^{-19} \text{ J}}$$

$$E = h \frac{c}{\lambda}, \quad \lambda = \frac{hc}{E} = \frac{(6.626 \times 10^{-34} \text{ J s})(3.0 \times 10^8 \text{ m/s})}{4.84 \times 10^{-19} \text{ J}} = 410 \text{ nm} \rightarrow \text{Violet}$$

$$6.41 \text{ a) } \lambda = \frac{h}{mv} = \frac{(6.626 \times 10^{-34} \text{ J s})}{(85 \text{ kg}) \left(50 \frac{\text{km}}{\text{hr}} \cdot \frac{1 \text{ hr}}{3600 \text{ s}} \right) \left(\frac{1000 \text{ m}}{1 \text{ km}} \right)} = \boxed{5.6 \times 10^{-37} \text{ m}}$$

$$\text{b) } \lambda = \frac{h}{mv} = \frac{(6.626 \times 10^{-34} \text{ J s})}{(10 \text{ g}) \left(\frac{10^{-3} \text{ kg}}{1 \text{ g}} \right) (250 \text{ m/s})} = \boxed{2.65 \times 10^{-34} \text{ m}}$$

$$\text{c) } \lambda = \frac{h}{mv} = \frac{(6.626 \times 10^{-34} \text{ J s})}{(6.941 \text{ amu}) \left(\frac{1.66 \times 10^{-27} \text{ kg}}{1 \text{ amu}} \right) (2.5 \times 10^5 \text{ m/s})} = \boxed{2.3 \times 10^{-13} \text{ m}}$$

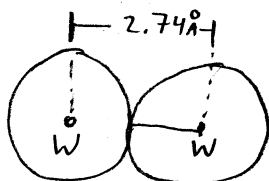
6.45 a) $\Delta x \cdot \Delta(mv) \geq \frac{h}{4\pi}$

$\Delta x \geq \frac{h}{4\pi \Delta(mv)} = \frac{6.626 \times 10^{-34} \text{ J s}}{4\pi \cdot 1.5 \text{ mg} \left(\frac{10^{-6} \text{ kg}}{1 \text{ mg}}\right) (0.01 \text{ m/s})} = 4 \times 10^{-27} \text{ m}$ $\Delta x \geq 4 \times 10^{-27} \text{ m}$

b) $\Delta x \geq \frac{h}{4\pi \Delta(mv)} = \frac{6.626 \times 10^{-34} \text{ J s}}{4\pi \cdot (1.673 \times 10^{-21} \text{ kg}) (0.01 \times 10^4 \text{ m/s})} = 3 \times 10^{-10} \text{ m}$ $\Delta x \geq 3 \times 10^{-10} \text{ m}$

Chapter 7

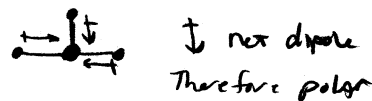
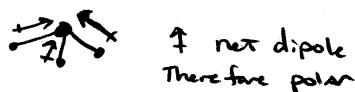
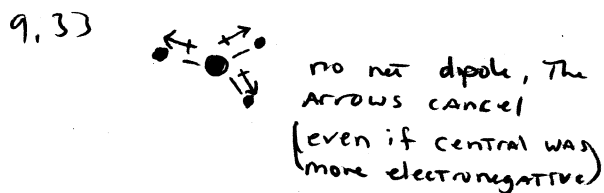
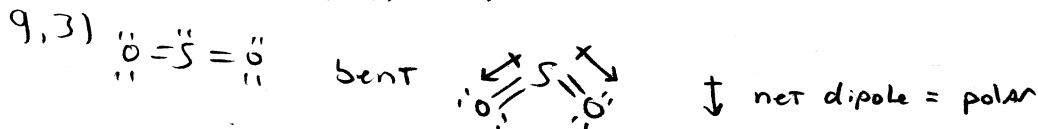
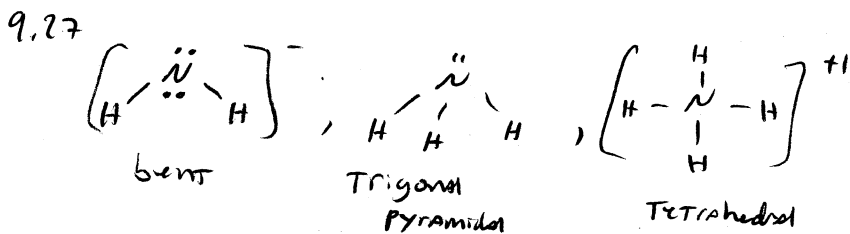
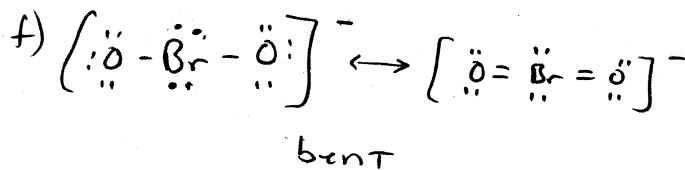
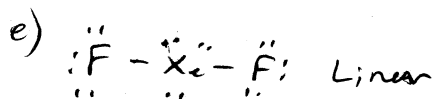
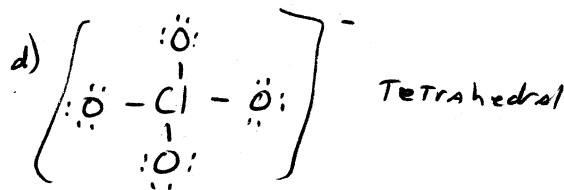
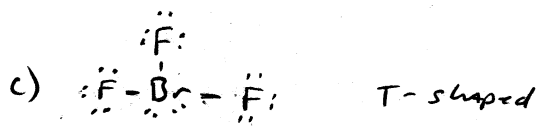
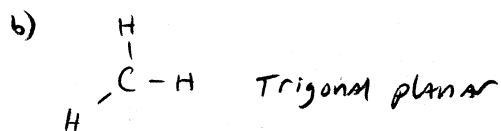
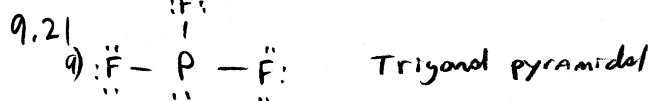
7.17



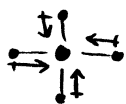
radius $W = \frac{2.74 \text{ Å}}{2} = 1.37 \text{ Å}$

Chapter 8 - ANSWERS in back of book

Chapter 9



9.33



All arrows cancel - **nonpolar**

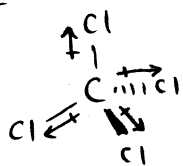


All arrows cancel - **nonpolar**

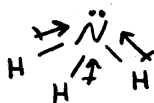


← net dipole
Polar

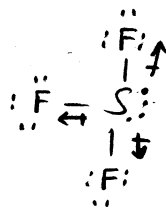
9.35



nonpolar



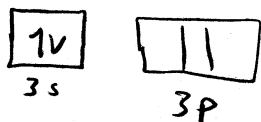
Polar
net dipole ↑



← net dipole
Polar

9.41

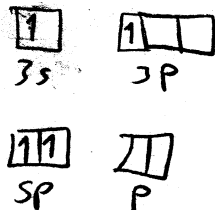
Mg: [Ne] 3s²



promote ↓

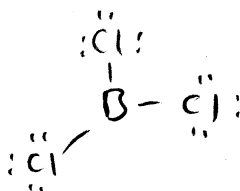
H-Mg-H

hybrid ↓

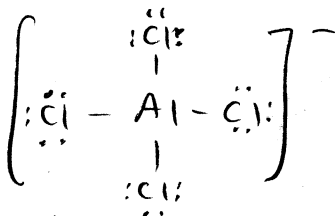


The two half-filled sp orbitals will bond w/ H to fill orbitals

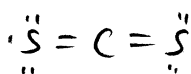
9.47



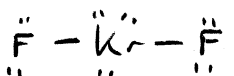
3 e⁻ domains
Trigonal planar → sp² hybridization



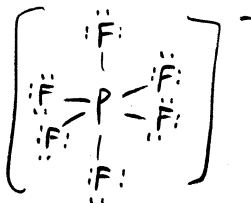
4 e⁻ domains
Tetrahedral → sp³ hybridization



2 e⁻ domains
Linear → sp hybridization



5 e⁻ domains
Linear → sp³d hybridization



6 e⁻ domains
Octahedral → sp³d² hybridization