

# **Review for Exam 2**

Chemistry H2A

Fall 2009

# Lewis Diagrams & VSEPR

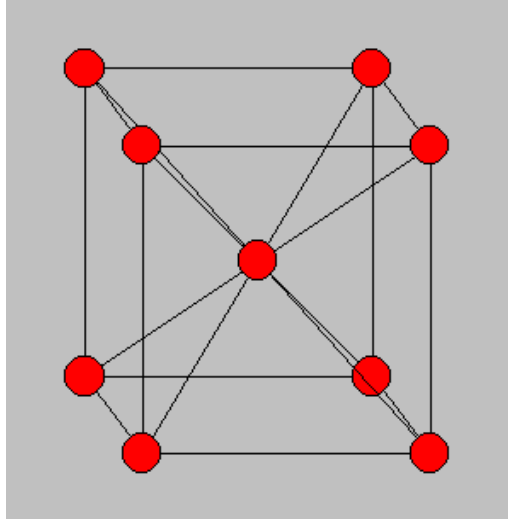


For the above molecules,

- Draw the Lewis Structure
- State the formal charge on each atom
- Write the electron geometry
- Name the molecular geometry
- Determine type of hybridization
- Determine the bond angles
- Is there a net dipole? Is the molecule polar?

# Solids

Find the atomic radius for Molybdenum, given the lattice parameter is 3.150 Angstroms. Molybdenum has a BCC structure.



# IR Spectroscopy

Consider methane ( $\text{CH}_4$ ) and carbonyl sulfide (OCS)

- Draw the structure
- Determine the number of vibrational modes
- Would the symmetric stretches and bends of these molecules be IR active?

# IR Spectroscopy

- Consider the diatomic molecule  $\text{H}^{127}\text{I}$ . Given the mass of Iodine is 126.9044 amu and H is 1.0078 amu, calculate the reduced mass.
- Given the frequency of the vibration is  $2230 \text{ cm}^{-1}$ , what is the spring constant,  $k$ , of this diatomic?
- How would the frequency shift if the less stable isotope,  $^{125}\text{I}$  (124.9046 amu) were used?

atomic mass constant =  $1.661 \times 10^{-27} \text{ kg}$

# Raman Scattering

Assume your Nd:YAG laser emits 1064 nm light.

1. What is the frequency (in  $\text{cm}^{-1}$ ) of this light?
2. Consider the symmetric stretch of  $\text{CO}_2$  ( $1388 \text{ cm}^{-1}$ ), what is the Stokes frequency in  $\text{cm}^{-1}$ ? What is the Stokes wavelength?
3. What is the Anti-Stokes frequency in  $\text{cm}^{-1}$ ? What is the Anti-Stokes wavelength?

# MO Diagrams

Draw the MO diagram for  $B_2$ . Using this diagram, consider the following species  $B_2$ ,  $B_2^+$ ,  $B_2^{2-}$ .

- Write the molecular configuration
- Is the species paramagnetic?
- What is the Bond Order?
- Is the IP greater or less than the IP of Boron (8.298 eV)?