Norton Publishing Chemical Bonding Tutorials

Background: Open the webpage found at
http://www.wwnorton.com/college/chemistry/chemistry3/welcome.aspx
Use the "Chem Tour" button and then select the following in order to better understand the various theories used to try to explain how atoms bond together.

View the on-line "Chapter 4 and then Lewis Dot Structures"

1a. Summarize 3 rules used when starting to draw a Lewis dot structure for the elements that bond together to form a compound.

1b. Draw all possible structures for the compound N_2O.

1c. Describe how formal charges are calculated and used to determine which of the 3 possible structures for N_2O is correct.

1d. Draw the possible Lewis structures for the carbonate ion, CO_3^{2-}, and calculate the formal charges.

View the on-line "Chapter 5 then Hybridization"

2a. Describe how sp^3 hybridization can occur between the 2s and 2p orbitals.

2b. Explain the differences between sp, sp^2 and sp^3 hybridization.

2c. How are sigma (σ) and pi (π) bonds formed?

2d. Sketch the Lewis dot structures for the molecules in Practice Questions # 1, 2 and 4. What type of orbital hybridization is predicted to occur in each molecule?

2e. For Practice Question #7, complete the following chart matching the type of hybridization and number of sigma (σ) bonds formed with the correct geometric descriptions.

Hybridization	Number of σ bonds	Molecular geometry
Sp	2	
sp^2	3	
sp^2	2	
sp^3	4	
sp^3	3	
sp^3	2	

View the on-line "Chapter 4, then Expanded Valence Shells Tutorial"

3a. Summarize the 3 conditions that usually result in the central atom expanding its valence shell to obtain more than an octet.

3b. Which element is more likely to expand its outer shell when reacting with fluorine, N or P? Justify your answer.

3c. Determine the most reasonable Lewis structure for the arsenate ion, AsO_4^{3-}. Draw this structure and include the calculated formal charges for each atom.

3d. Draw the most reasonable Lewis structure for the arsenite ion, AsO_3^{3-}. Explain how this structure differs from that of the arsenate ion.

3e. Does the central iodine atom in I_3^- have an expanded valence shell? Justify your answer.

View the on-line "Chapter, then Intermolecular Forces"

4a. Explain the differences between **inter**molecular forces and **intra**molecular forces.

4b. Which of the following ionic compounds would exhibit the strongest ion-ion attractions; KF, CaF_2, CaO, CaS or SrS. Site the 2 factors that supports your answer.

4c. Describe the type of intermolecular attractions that occur between polar molecules. What factor(s) affect the strength of this type of attraction?

4d. What conditions are necessary for “hydrogen bonding” to occur?

4e. What are “dispersion forces”? Explain how they form, their relative strength and the type of molecules which are held together by this type of attraction.

4f. Solve the 4 “Practice Questions” and justify your answers.

View the on-line "Chapter , then Estimating Enthalpy Changes"

6a. Explain how average bond energies can be used to estimate the enthalpy (heat energy) change, ΔH, of a chemical reaction.

6b. Show the steps used to calculate the ΔH for the combustion of propane. The chemical equation for the reaction is: $C_3H_5(g) + 5\ O_2\ (g) \rightarrow 3\ CO_2(g) + 4\ H_2O(g)$