Name: _____ Date: _____ Class: _____

Pre-Activity Quiz Answer Key

1. Consider a molecule of carbon monoxide (C ≡ O):

   A. Do you think the electrons in the triple bond pull closer to the C atom or the O atom, or are they equally shared? Use the concept of electronegativity to explain your response.

   Answer: They are closer to the O atom. Using the electronegativity scale from a textbook, the result is a polar covalent bond shifted towards the O atom.

   B. Is the bond polar or non-polar?

   Polar

2. In today's engineering challenge, you will sketch out Lewis dot diagrams for various molecules and polyatomic ions. Then you will construct each molecule using a molecular model kit. The kits contain three different representations: colored balls, short sticks and long flexible springs.

   A. Each colored ball corresponds to a different atom. How can you determine which color to use for each atom?

   Use the reference sheet that comes with the kit.

   B. For what bond type do you think the short sticks are used?

   Covalent bonds

   C. If you were to build a triple bond, what would you use to represent a triple bond and how many would you use?

   Use springs, three springs

3. You will become familiar with different geometries of simple molecules.

   A. Name the theory used to predict molecular shapes of these molecules?

   VSEPR theory

B. What if a molecule contains a central atom bonded to two identical outer atoms with the central atom surrounded by a lone pair of electrons? Name the geometry of this molecule. List the bond angles in this particular molecule.

Trigonal planar; 120 degrees

C. What if a molecule contains a central atom bonded to four identical outer atoms without any lone-pair electrons on the central atom? Name the geometry of this molecule. List the bond angles in this particular molecule.

Tetrahedral; 109.5 degrees

4. What are the advantages of constructing a 3D molecular model compared to a ball-and-stick model?

Applying the VSEPR theory helps to determine how lone-pair electrons will affect the overall molecule geometry. Lone-pairs occupy more space due to electron repulsion, which consequently pushes closer together the perimeter atoms around the central atom. So, more details are included in a 3D molecular model compared to a ball-and-stick model, which consists of just connecting the sticks in pre-set positions around a central atom.

5. How does the VSEPR theory help to identify the overall geometry of a molecule?

The VSEPR theory takes into account electron repulsion with respect to lone-pair electrons.

6. How do unshared electron pairs affect a molecule's bond angles?

The unshared electron pairs create large bond angles adjacent to themselves while reducing the bond angles between the other perimeter atoms around the central atom.