

# Activity 4 - Making a Sentence

## Activity 2

For this lab, you'll be using molecular model kits to model what happens during two different chemical reactions. Each kit includes nine small wooden spheres representing atoms: four yellow (**hydrogen**), four red (**oxygen**), and one black (**carbon**). Each kit also includes eight springs to connect the atoms together.

### The Molecular Models:

1. a. Draw Lewis dot diagrams for carbon, oxygen and hydrogen.  
b. Examine the wooden spheres. There are holes to connect the atoms together. Explain why each type of atom can make the number of connections it does (you may find the Lewis dot diagrams you just drew helpful for this).
2. Explain what the springs represent in these molecular models.

### Reaction #1:

3. Take out four yellow spheres, two red spheres, and four springs from the model kit. Put the rest of the kit to the side for now. Take two of the yellow spheres and connect them with a spring. What molecule did you just make (write the molecular formula for this molecule)? Make a second molecule identical to the one you just made.
4. Now, take two of the red spheres and connect them with a spring. You'll notice that each of the red spheres still has an empty hole to connect to another atom. Using a second spring, connect the two red spheres again. There should now be two bonds holding the two spheres together. What molecule have you made this time (again, give the molecular formula)?
5. Connecting the spheres with *two* springs represents a "double bond". Draw Lewis dot diagrams for two oxygen atoms and show why these two atoms form a double bond with each other.
6. You now have the *reactants* for the first chemical reaction: two hydrogen molecules and an oxygen molecule. From these reactants, rearrange the atoms and bonds to form two water molecules. (A water molecule consists of a single oxygen atom with two hydrogen atoms attached to it.) Describe what needed to be done to go from the reactants (the hydrogen and oxygen molecules) to form the products (the water molecules). What did these actions represent at the level of the molecules?
7. a. Write out the chemical reaction you just modeled (hydrogen and oxygen reacting to form water). Be sure to include coefficients to show the correct numbers of each of the reactants and products.  
b. What type of reaction is this (decomposition, single displacement, etc.)?

### Reaction #2:

8. For the second reaction, you'll be using all of the atoms and bonds in the kit. For the reactants, put together two molecules of oxygen (remember: each oxygen molecule is two atoms of oxygen connected by a double bond) and one molecule of methane (one carbon bound to four hydrogens). After you've put together your reactants, rearrange these molecules to form carbon dioxide and water. (Hint: a carbon dioxide molecule contains two double bonds.)
  - a. Write out the chemical reaction you just modeled (methane and oxygen reacting to form carbon dioxide and water). Be sure to include the correct coefficients.
  - b. What type of reaction is this?