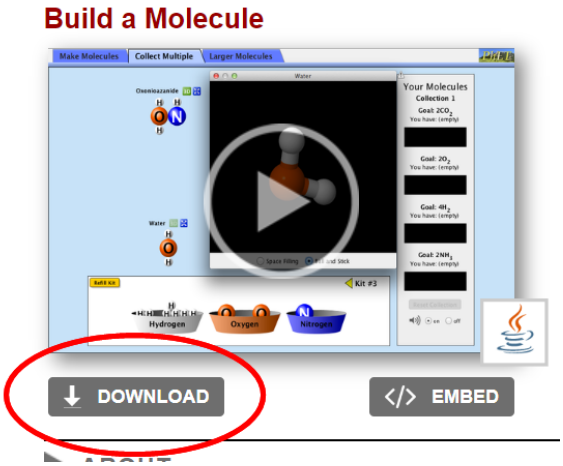
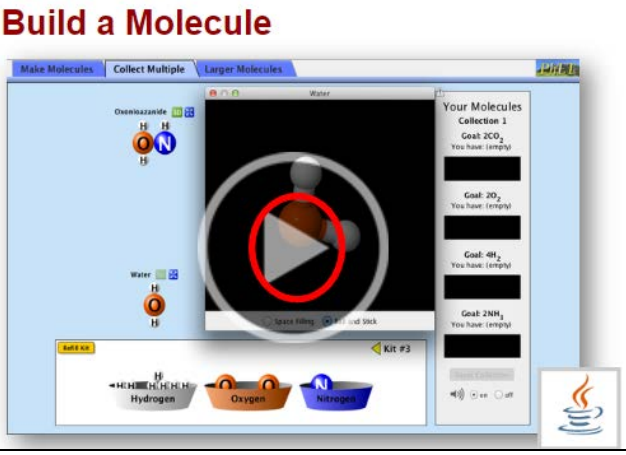
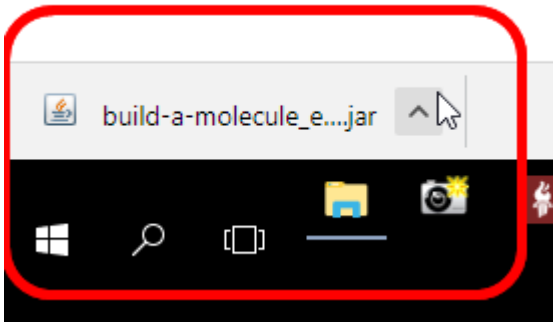
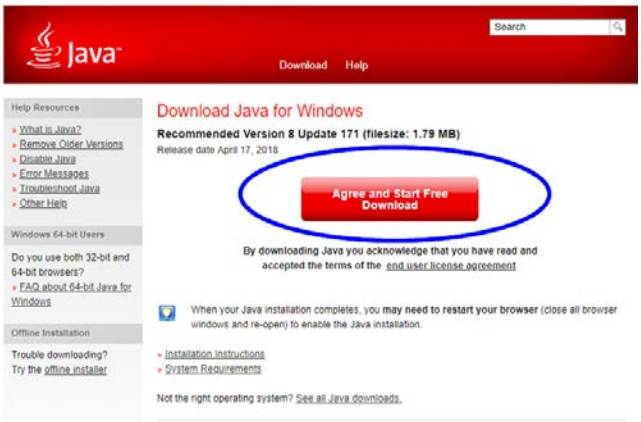
Name: _____ Date:_____ Summer Stem Section: _____

Summer assignment: Build a Molecule Computer Simulation

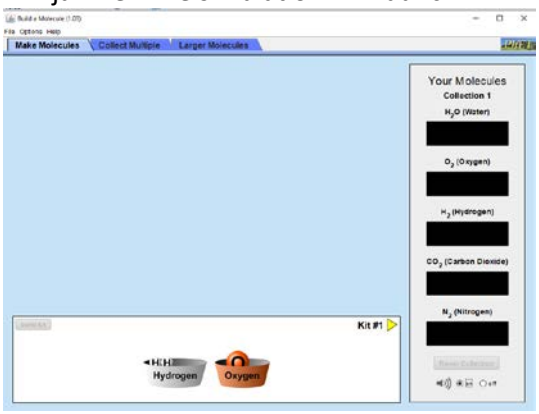
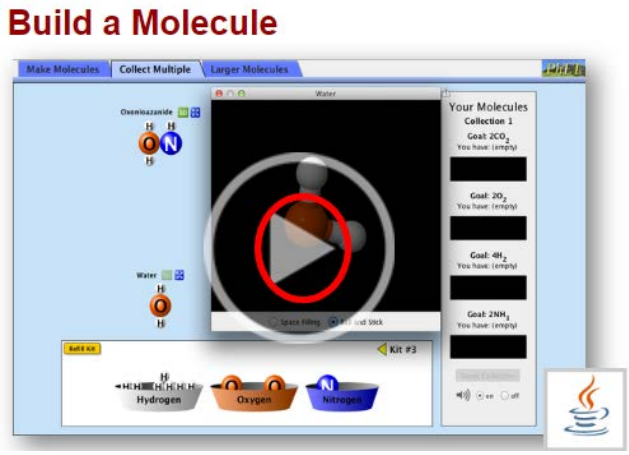
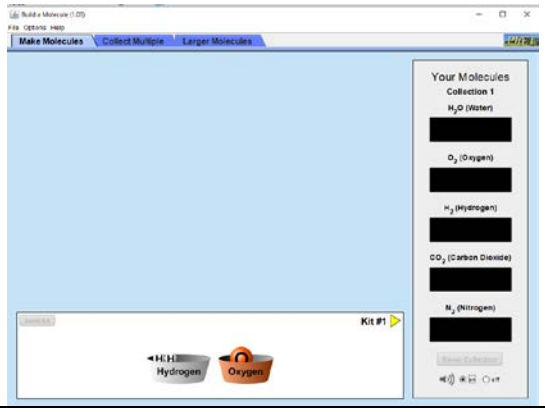
Learning Goals:

1. Students can describe the difference between a molecule name and chemical formula.
2. Students can distinguish between the coefficient and subscript in a chemical formula.
3. Students can use pictorial representations of molecules to generate chemical formulas.
4. Students can differentiate between atoms, compounds, elements, ions, and molecules.

Instructions: Go to https://phet.colorado.edu/en/simulation/legacy/build-a-molecule. The screenshots below will help you launch the application either as downloaded file or played directly within your browser.

<table>
<tr><th>OPTION A: DOWNLOAD THE SIMULATION</th><th>OPTION B: PLAY THE SIMULATION</th></tr>
<tr><td>1.
 
</td><td>1. From ***Internet Explorer:*** (Chrome and Edge are very slow.)
 
</td></tr>
<tr><td>2. You will see the “DOWNLOAD” in the lower left of your computer screen. Download the file. Save it on your computer. REMEMBER the location where you saved the file!
 
</td><td>2. You may need to either:
a) Disable pop-up blocker.
b) Update Java with a free download.
 

If you must update Java, the prompts will take you through the installer. It may be necessary to re-boot your computer before the simulation will play.</td></tr>
</table>

3. Locate the file where you have saved it. Double-click on the file name to launch the jar file. The simulation will launch. 	3. Return to the main simulation screen and launch by selecting "play": 
See above.	4. The simulation will launch. 

First Tab (Make Molecules)

1. Make a molecule using the atoms in the buckets:
   a. How do you know you made a molecule? _____
   b. Write the molecule **name** of some molecules you made (ex. Water).

_____ _____
_____ _____
_____ _____

2. Molecule Names and Chemical Formulas:
   a. Compare the name and chemical formula for some molecules:

Molecule Name	Drawing	Chemical Formula

You will need to load different kits (See the lower right corner of the simulation window.) as you work in order to build all of the molecules.

Second Tab
Click on the <u>second tab</u> along the top labeled 'Collect Multiple'

3. Make Many
   a. Fill all the collection boxes and then complete the questions for each Goal.

Goal: $4H_2$	
Draw it!	
What does the big '4' in $4H_2$ mean?	
What does the little '$_2$' in $4H_2$ mean?	

Goal: $2CO_2$	
Draw it!	
What does the big '2' in $2CO_2$ mean?	
What does the little '$_2$' in $2CO_2$ mean?	

Goal: $2O_2$	
Draw it!	
What does the big '2' in $2O_2$ mean?	
What does the little '$_2$' in $2O_2$ mean?	

Goal: $2NH_3$	
Draw it!	
What does the big '2' in $2NH_3$ mean?	
What does the little '$_3$' in $2NH_3$ mean?	

Third Tab Challenge
Click on the third tab labeled 'Larger molecules'

4. What's the biggest molecule you can make?
   a. Molecule Name: _____
   b. Chemical formula: _____

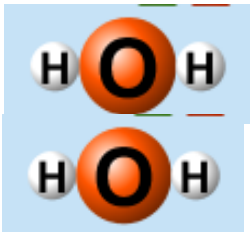
5. Can you make a molecule that can be broken into smaller molecules?
   a. Big molecule **name**: _____
   b. Big molecule **chemical formula**: _____
   c. Smaller molecule **names**: _____
   d. Smaller molecule **chemical formulas**: _____

Build a Molecule Post-Lab

Complete the following questions after you finish the computer simulation

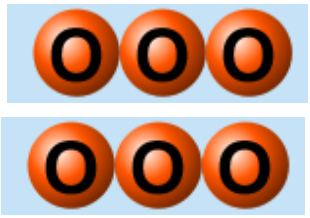
1. We use chemical formulas to represent individual molecules and groups of molecules. Write the **chemical formula** in the box next to each molecule or groups of molecules, using big and small numbers.

a.

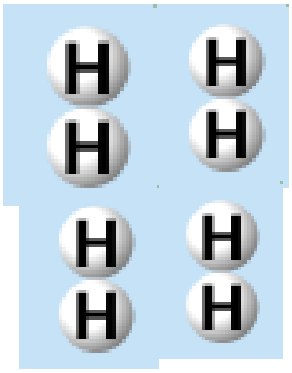


b.

c.



d.



e.

2. Try it!

a. Draw $2CO_2$	
b. Draw $3H_2O$	
c. Draw $4N_2$	
d. Draw $2NH_3$	

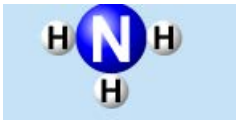
3. **Molecule Names vs. Chemical Formulas**

a. Give an example of a molecule name: _____
b. Give an example of a chemical formula: _____
c. What is the difference between a molecule name and a chemical formula?

Particles vs Substances:

1. In summer STEM, we learned about some different words that can be used to describe the chemicals around us. We discussed that these words can be used to describe a chemical from 2 different perspectives, the particle perspective and the substance perspective. Next to the words below, put a 'P' if the word describes the type of **particle**, and put 'S' if the word describes the type of **substance**.
   - **a.** Atom
   - **b.** Compound
   - **c.** Element
   - **d.** Ion
   - **e.** Molecule

2. **Circle all of the diagrams below that represent a molecule.**



Explain, in complete sentences, WHY you circled the pictures you did but not the others

3. **Describe each of the following using both a PARTICLE term and a SUBSTANCE term.**

   a. Br_2 is a(n) _____ (Particle) of a(n) _____ (Substance)

   b. H_2SO_4 is a(n) _____ (Particle) of a(n) _____ (Substance)

   c. SO_4^{2-} is a(n) _____ (Particle) of a(n) _____ (Substance)

   d. C_2H_6 is a(n) _____ (Particle) of a(n) _____ (Substance)

   e. Mg is a(n) _____ (Particle) of a(n) _____ (Substance)

   f. Na^+ is a(n) _____ (Particle) of a(n) _____ (Substance)

Final Step: You took Cornell notes in class this summer. In order to complete your notes and create a review aid, you must complete the following list. Check off each number as you complete that task.

1. Title the top of each page with a description of what those notes are about.
2. On the left side of the page, fill in questions that the information in your notes answer.
3. Create a summary of each section of notes as a brief review of the section.
4. Review your notes over the summer. Be sure to bring them to school in August!