

Investigating Chemical Reactions

Name _____

Section (CRN) _____

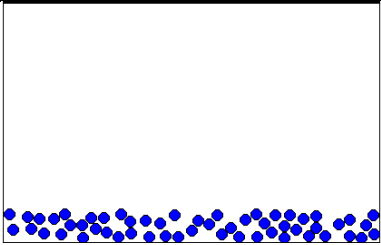
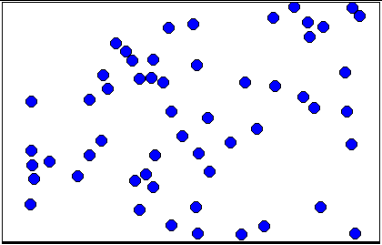
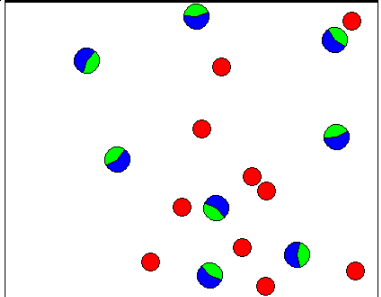
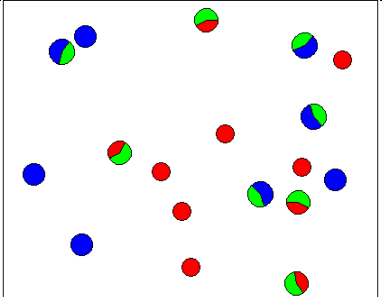
Problem Statement: How are masses of reactants and products related in a chemical reaction?

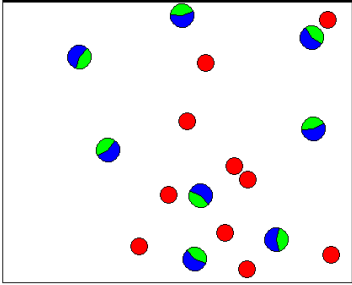
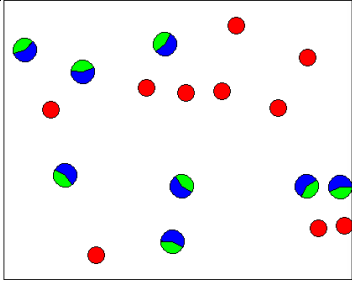


I. Preliminary Information

A. Using your textbook or an online source define/describe a chemical reaction. (Cite your source.)

A chemical reaction is the term used to indicate what happens when two or more substance, mixed together, produce new substances that are chemically distinct from the reactants.

B. For each of the following changes indicate which represents a chemical change and which represents a physical change. For each provide a brief explanation to support your claim.

 <p>Initial</p>	→	 <p>Final</p> <p>This change is physical, a phase change from liquid to gas.</p>
 <p>Initial</p>	→	 <p>Final</p> <p>This change is chemical, a R atom colliding with a BG molecule reacts to produce an RG molecule and a B atom.</p>

 <p>Initial</p>	→	 <p>Final</p> <p>Actually there is no change here other than the position of the particles in the container.</p>
 <p>Initial</p>	→	 <p>Final</p> <p>This is a chemical change at the macroscopic level (the previous exams were at the particulate level). We can see a flame, which is one characteristic of a chemical change happening.</p>

C. Answer the questions below regarding the reaction between hydrogen and oxygen to form water.

- i) Write the formula for the element, hydrogen.

Formula for hydrogen is H_2 .

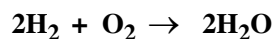
- ii) Write the formula for the element oxygen.

Formula for oxygen is O_2 .

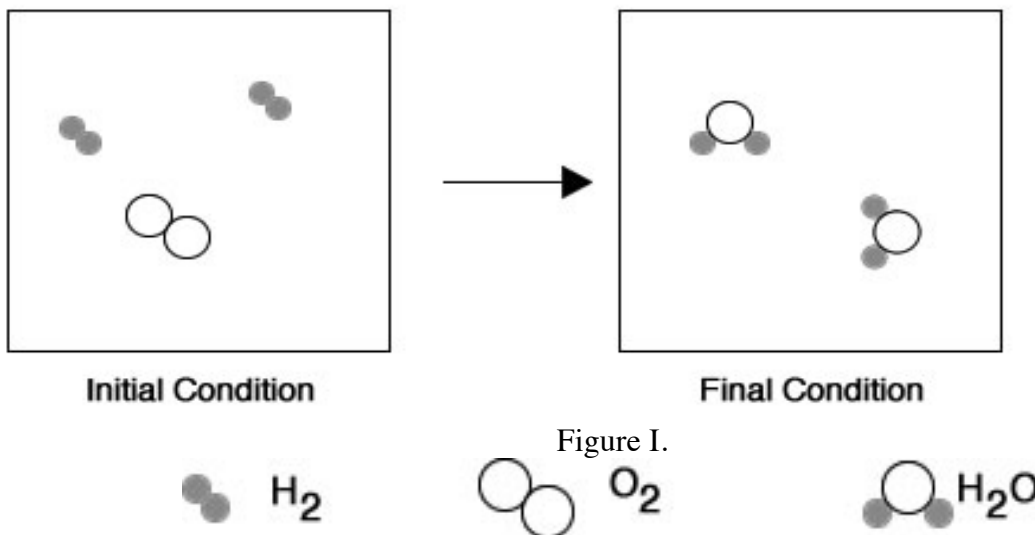
- iii) Write the formula for the compound water.

Formula for water is H_2O .

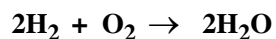
- iv) Write the balanced chemical equation (using the smallest whole number coefficients) that describes the reaction of hydrogen plus oxygen to form water.



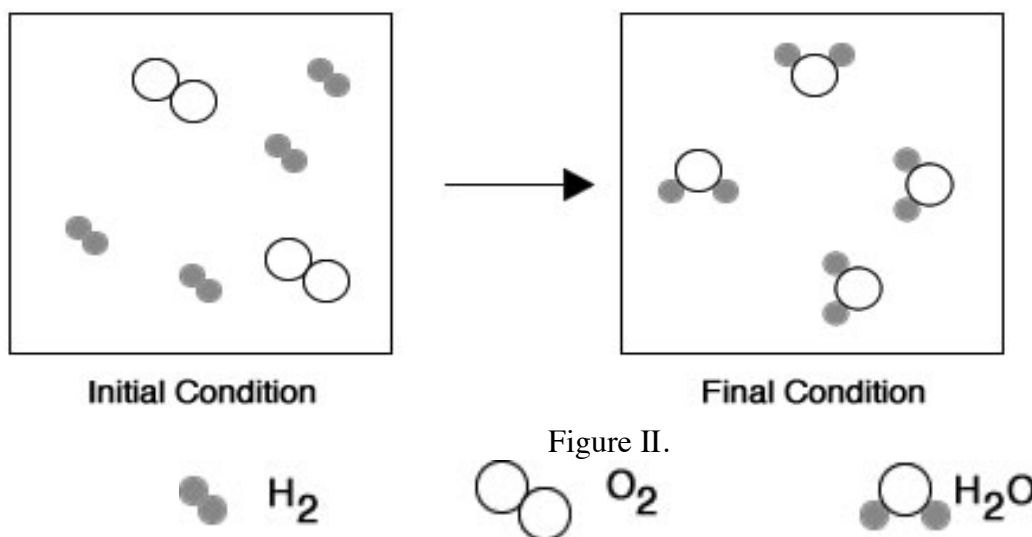
D. The Figure I. below depicts the particulate level (submicroscopic) representation of a container (the box on the left) with a mixture of hydrogen and oxygen molecules before a reaction occurs, and the same container (the box on the right) after a reaction occurs.



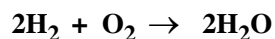
Write the balanced chemical equation (using whole number coefficients) that describes the reaction of hydrogen plus oxygen to form water.



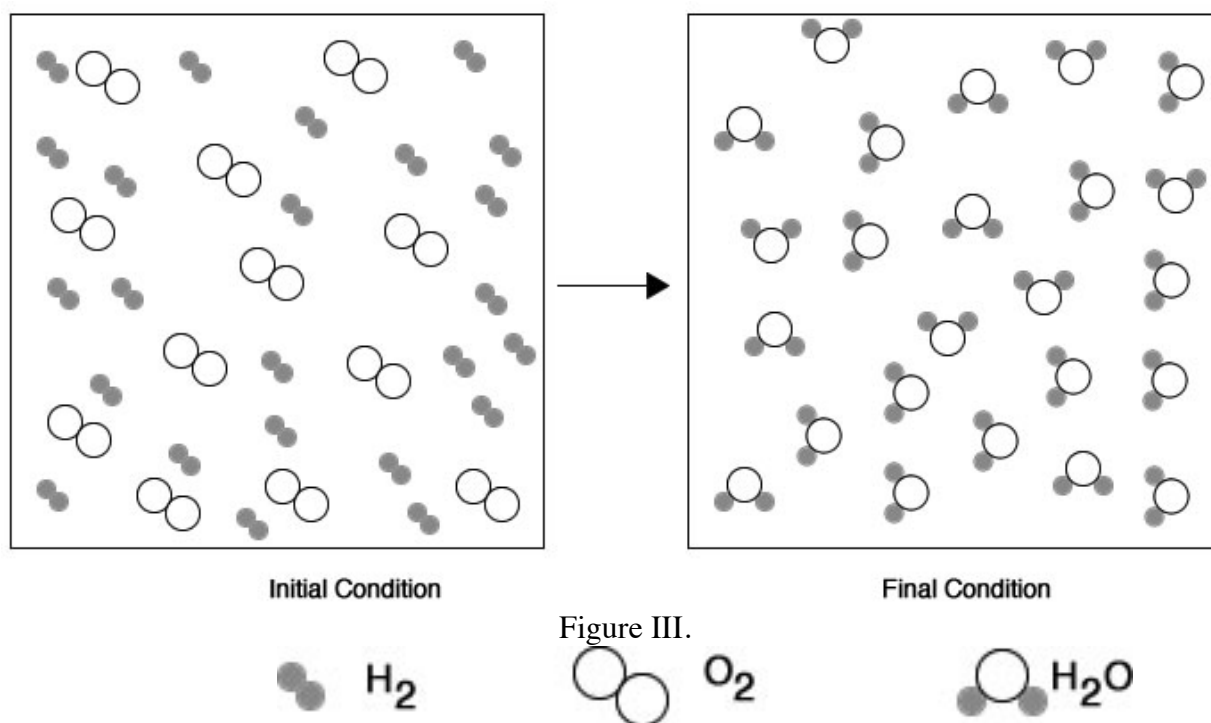
E. The Figure II. below depicts the particulate level (submicroscopic) representation of a container (the box on the left) with a mixture of hydrogen and oxygen molecules before a reaction occurs, and the same container (the box on the right) after a reaction occurs.



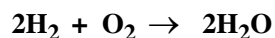
Write the balanced chemical equation (using whole number coefficients) that describes the reaction of hydrogen plus oxygen to form water.



F. The Figure III. below depicts the particulate level (submicroscopic) representation of a container (the box on the left) with a mixture of hydrogen and oxygen molecules before a reaction occurs, and the same container (the box on the right) after a reaction occurs.



Write the balanced chemical equation (using whole number coefficients) that describes the reaction of hydrogen plus oxygen to form water.



G. Summarizing parts D – F.

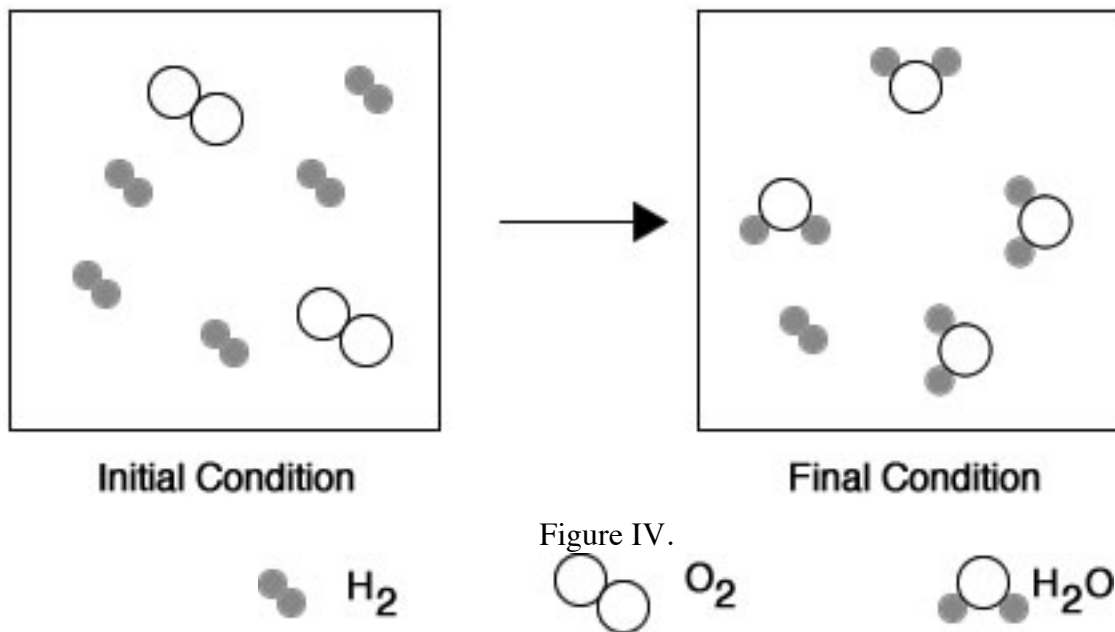
i) What is different about Figures I - III shown above?

They all have different amounts of reactants initially, and therefore, different amounts of products.

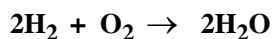
ii) What is the same about Figures I - III shown above?

The overall reaction is the same: $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

H. The Figure IV. below depicts the particulate level (submicroscopic) representation of a container (the box on the left) with a mixture of hydrogen and oxygen molecules before a reaction occurs, and the same container (the box on the right) after a reaction occurs.



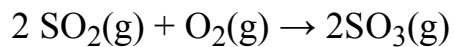
- i) Write the balanced chemical equation (using whole number coefficients) that describes the reaction of hydrogen plus oxygen to form water.



I. What is different about the Initial condition in Figure IV compared to Figures I - III?

The initial amounts are not stoichiometrically related

5. In the synthesis reaction



Calculate the number of moles of SO_3 formed when:

a. 2.0 moles of SO_2 are mixed with 5.0 moles of O_2 and allowed to react.

b. 4.0 moles of SO_2 are mixed with 6.0 moles of O_2 and allowed to react.

c. 5.0 moles of SO_2 are mixed with 9.0 moles of O_2 and allowed to react.

d. 0.812 moles of SO_2 are mixed with 0.125 moles of O_2 and allowed to react.

e. 20.0 grams of SO_2 are mixed with 15.0 grams of O_2 and allowed to react.

Appendix

Instructions for using Java Applets

This activity use Java applets which can be a little funky at time. Please follow the instructions below to insure the computer you are using is setup properly to access both of these simulations.

Download Java at <http://java.com/en/> and follow the instructions.

Continue for a PC

- 1) Search for Java on the computer by typing java into the search feature. Do not search for Java using a browser, simply search on the computer itself. In the list of items that are provided, open Configure Java and in the window that appears click on the security tab. Near the bottom of the page click 'edit site list'. A new window will appear. Click the Add button and enter <http://introchem.chem.okstate.edu> in the exception list and then click the Add button then click the OK button, then click the next OK button. (NOTE: If you are interested what this is doing is indicating to the Security feature on the computer that any future software being downloaded from <http://introchem.chem.okstate.edu> can be trusted.
- 2) Now open up an Explorer window or a Firefox browser window. (Do not attempt to use Chrome!) Chrome is not equipped to run this particular Java applet (any Java applet?)
- 3) Copy and paste the link to the java applet into your browser. There maybe a few windoids that appear that you must respond properly to for the software to load. Here are possible windoids and how to respond to the questions.
 - a. A screen with what might appear to be a battery icon with the words 'activate Java' below: click on the activate Java link then,
 - b. A windoid may appear in the upper left corner with two buttons (Allow and Allow and Remember), click on the Allow and Remember button,
 - c. A windoid indicating the version of Java on the computer is out-of-date. Buttons at the bottom of this windoid include, Remind Me Later, Stop/Quit, and Update Java. Click the Remind Me Later button,
 - d. A windoid asking you if it is okay to run the software. In this windoid, click Run.
 - e. This should result in the simulation working.
- 4) On a Mac: Assuming you have Java installed, go to System Preferences. Near the bottom you will see a Java icon. Open the Control Panel. Go to the Security tab. In the Exceptions Site List select the Edit Site list button. Click on the Add button and enter '<http://introchem.chem.okstate.edu>', then click the OK button. Click OK to exit the Control Panel. You should be able to access the simulation after following these instructions. It is possible you may have to quit your browser and re-open the web site.
- 5) If you continue to have problems contact please contact me at john.gelder@okstate.edu.