

Objective:

Students who understand that atoms are neither created nor destroyed in the chemical reaction will be able to animate a rudimentary reaction mechanism.

Target student audience:

All levels of chemistry students

ChemSense User Level:

Beginning users are able to do this activity.

ChemSense Tools used:

Drawing, Animation, Feedback-Peer

Specialized Tools needed:

None

Classroom Implementation

Time: Including pre-laboratory discussion, laboratory work, and computer work, 1.5 hour.

Student Grouping: Pairs

Activity Type:

Chemistry Concepts in Activity:

California State Standards in Chemistry

3.0 The student understands the conservation of atoms in chemical reactions lead to the principle of conservation of matter and the ability to calculate the mass of products and reactants.

3.a The student knows how to describe chemical reactions by writing balanced equations.

ChemSense Connectivity The connectivity of atoms to make molecule structures sits at the core of contemporary chemistry. Chemical reactions, that is, the transformation of one set of compounds into another, are changes in chemical identity and re expressed in terms of connectivity changes.

Prerequisite Chemistry Concepts:

Students must be able to balance equations by counting atoms of elements. The lessons begin with a discussion of The Law of Conservation of Matter

Inquiry Skills (linked to NSES):

ACTIVITY Summary:

Students have a difficult time grasping the concept that atoms in molecules physically separate and regroup to form new molecules. Previously students have cut out two-

dimensional paper atoms and glued them onto construction paper. The activity did not show the “regrouping” of the atoms, but with the ChemSense visualization tool, the students demonstrate the process, as they understand it to happen. The lessons begin with a discussion of The Law of Conservation of Matter. To introduce the concept of stoichiometry students are taught to balance simple equations by tallying the numbers and types of atoms on both the reactant and product side of a chemical reaction. The next step is to check for understanding using the ChemSense animation tool. Students who understand that atoms are neither created nor destroyed in the chemical reaction will be able to animate a rudimentary reaction mechanism.

Sources:

none

Application:

The conservation of matter is a fundamental concept in teaching energy flow within a biological system.

ACTIVITY:

Stoichiometry Activity 1: Formation of Water from Hydrogen and Oxygen

Purpose:

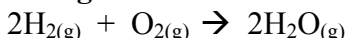
The student will show the formation of water molecules from hydrogen and oxygen molecules.

California State Standard in Chemistry:

3.0 The student understands the conservation of atoms in chemical reactions lead to the principle of conservation of matter and the ability to calculate the mass of products and reactants.

3.a The student knows how to describe chemical reactions by writing balanced equations.

Background Information:



This is the balanced equation for the formation of gaseous water from gaseous hydrogen and gaseous oxygen. Both the hydrogen and oxygen molecules are diatomic. Two molecules of hydrogen gas react with one molecule of oxygen gas to create two molecules of water. The Law of Conservation of Matter states that matter is neither created nor destroyed. We can also say that atoms are neither created nor destroyed, they are rearranged to create new molecules with different chemical properties. Hydrogen gas and oxygen gas are flammable, but when they react to form gaseous water, the resultant is a non-flammable molecule. In this activity you will animate this chemical reaction.

Procedure:

1. Copy the balanced equation into your laboratory notebook.
2. Do an atom inventory to verify the equation is balanced.

3. In your laboratory notebook sketch a model of each molecule using circles for individual atoms. Label the hydrogen atoms with an H and the oxygen atoms with an O.
4. Log onto ChemSense and open up the Stoichiometry folder.
5. Create an animation that models the hydrogen molecules and oxygen molecules separating and regrouping as water molecules. Include narrative that describes what is happening.
6. Title your work with your name and save your work to your account folder.

Rubric for scoring:

Rubric Score	Level of Competence	Expectation Level
4	Mastery	Animation has smooth transitions between frames. Artwork accurately represents the formation of water molecules from the hydrogen and oxygen atoms. Text accurately addresses the rearrangement of the atoms.
3	Skilled	Animation may not be smooth or may have minor errors. Artwork accurately represents the formation of water molecules or the hydrogen and oxygen molecules. Text accurately addresses the rearrangement of the atoms.
2	Proficient	Animation is not smooth, but water molecules are accurate. Artwork does not accurately represent the formation of water molecules or hydrogen and oxygen molecules. Text accurately addresses the rearrangement of the atoms.
1	Introductory	Animation may not be smooth. Neither the shape of the water molecules nor the hydrogen and oxygen molecules are correct. Text contains errors.
0	Incomplete	Animation may have smooth transitions between frames, but the artwork does not accurately represents the formation of water molecules. Text contains errors.