Lesson Topic: Molecules and Compounds

Objective:
Students will be able to:

1. Recognize that atoms combine to form molecules that can range in size from 2 to 1000s of atoms.
2. Describe how compounds are made from elements.
3. Explain that a chemical formula describes the number of atoms of each element present a compound.

Time Required: 75 minutes

Materials Needed:

- 3-4" foam balls (7 total, 4 of one color, 3 of another color)
- Toothpicks (4)
- Marker (label 4 balls with H, label 3 balls with O)
- Periodic table for reference
- Teacher computer with internet access
- Projector/Smartboard/Interactive whiteboard
- Molecules and Compounds Worksheet (attached)

Teacher Preparation:

- Assign a Legends of Learning Instructional Quick Play playlist for the day(s) you will be teaching the lesson.
    - Instructional – Middle School – Molecules and Compounds
- Assign a Legends of Learning Content Review Quick Play playlist for the day(s) you will be teaching the lesson.
    - Content Review – Middle School – Molecules and Compounds
- Make copies of Molecules and Compounds Worksheet (1 per student)

Engage (10 minutes):

1. Explain to students that each ball represents an atom of an element. Show them hydrogen and oxygen as examples.
2. Show students hydrogen and oxygen on the periodic table, reminding them that all elements have a set number of protons and can be located on the periodic table by their chemical symbol.
3. Explain to students that atoms of elements combine to form molecules. If two different atoms combine, a type of molecule called a compound is formed.
4. Hold up two hydrogen atoms. Quickly insert the toothpick between the two atoms, explaining that hydrogen atoms cannot exist on their own and bond to other hydrogen atoms.
5. Draw the chemical formula for diatomic hydrogen (H_2) on the board.
    a. Define a diatomic molecule as a molecule composed of two atoms chemically bonded together. Explain that some atoms cannot exist separately and bond with other atoms of the same element for stability.
6. Hold up two oxygen atoms. Quickly insert the toothpick between the two atoms,

explaining that oxygen atoms also form diatomic molecules.

7. Ask for a student volunteer to assist with the construction of a water molecule.
8. Have the student hold up two hydrogen atoms, while holding up one oxygen atom.
9. Explain to students that oxygen combines with two hydrogen atoms to form a water molecule.
    a. Insert the toothpicks at angles to show the polarity of the water molecule. Have the student carefully place the hydrogen molecules on the toothpicks.
10. Hold up the water molecule for the class. Explain that water is both a molecule and a compound.
    a. Write the definition of a compound on the board. (Compound – substance formed when two or more different elements chemically combine)
    b. Write the definition of a molecule on the board. (Molecule – substance formed when atoms of the same element chemically combine)
11. Hold up the oxygen and hydrogen molecules.
12. Ask the students how many different types of atoms are in each molecule. (one)
13. Ask students if it is possible for either of these molecules also to be a compound. (No, because they only have one type of atom)
14. Hold up the water molecule.
15. Ask students how many different types of atoms are in this molecule. (two)
16. Ask students why water is considered a compound. (water has more than one type of element chemically combining)

Explore (30 minutes):

1. Have students sign into Legends of Learning. Instruct students to complete the Instructional playlist.
2. As students complete the assigned games, students should fill out the Molecules and Compounds Worksheet.
3. Circulate as students work through the playlist and complete the worksheet. Listen for evidence of understanding and use this opportunity to correct any misconceptions.

Explain (20 minutes):

1. Review answers to Molecules and Compounds Worksheet by recreating the word splash on the board.
2. Ask for student volunteers to help connect the words and fill in phrases on the connecting lines.
    a. Use this opportunity for formative assessment to gauge understanding and address any misconceptions.
3. Relate student knowledge to the demonstration at the beginning of class.
    a. How are molecules and compounds similar and different? (both are chemical bond atoms; compounds are molecules that join different types of atoms)
    b. What is the minimum number of atoms needed to form a molecule? (two)
    c. What does the chemical formula tell us about a compound? (the number of atoms of each element present in a molecule)
    d. Have a student volunteer identify which model represents a compound and which does not?
        i. Have the student explain how all compounds are molecules, but not all molecules are compounds.

Elaborate (5 minutes):

1. Molecules can be as small as 2 atoms to as large as billions of atoms in human DNA.
2. Show this video of diatomic hydrogen.
3. Ask students to describe what is happening in the video.
    a. Two atoms of hydrogen are bonded together.
4. Ask students whether the hydrogen atoms exist as a compound or only as a molecule.
    a. Answer: A molecule because the chemical bond exists between two of the same kind of atoms.

Evaluate (5 minutes):

1. Have your students sign in to Legends of Learning. Instruct students to complete the Content Review playlist.
2. Analyze student results to determine what concepts need to be a focus for reteaching.

Additional Lesson Strategies:

- To use Legends for additional instruction, create a custom playlist with an instructional game and pre and post assessment.
- To use Legends for a quick formative assessment, create a 5-question assessment in a playlist.
- To use Legends for a student-directed experience, create a targeted freeplay playlist.
- Encourage students to play on their own at home in Legends of Learning: Awakening for a student-driven experience including avatars, battling, and quests all centered around topics they are covering in class.

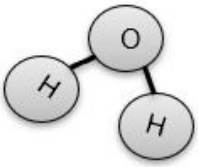
Molecules and Compounds: Word Splash

Name:_____

While playing the instructional games in Legends of Learning, draw lines connecting the related words or symbol and write a short phrase on top of the line that describes how they relate.

Molecule

Element



Atom

Chemical Bonding

Compound

Chemical Formula

Molecules and Compounds: Word Splash

Name:_____KEY_____

While playing the instructional games in Legends of Learning, draw lines connecting the related words or symbol and write a short phrase on top of the line that describes how they relate.