**Activity Sheet Name Lesson 3**

**Part 1 - Covalent Bonding Date**

# EXPLAIN IT WITH ATOMS & MOLECULES

1. **Write a short caption under each picture to describe the process of covalent bonding.**

Two hydrogen atoms are near each other.

1. **What are two conditions atoms must have to form covalent bonds with one another?**
2. **Why is a hydrogen molecule (H2) more stable than two individual hydrogen atoms?**
3. **Why can’t a third hydrogen atom join the H2 molecule to make H3**
4. **Write a short caption beside each picture to describe the process of covalent bonding.**

Two hydrogen atoms and one oxygen atom are near each other.

1. **Why can’t a third hydrogen atom join the water molecule (H20) to make H3O?**

# ACTIVITY

## Question to investigate

What is produced when electricity is put into water?

## Materials for each group

* + 9-volt battery
	+ 2 wires with alligator clips on both ends
	+ 2 pencils sharpened at both ends
	+ Water
	+ Epsom salt (magnesium sulfate)
	+ Clear plastic cup
	+ Tape

## Procedure

1. Place a battery between 2 pencils. Be sure that the battery is more than half-way up.
2. With the help of a partner, wrap tape around the pencils and battery as shown.
3. Add water to a clear plastic cup until it is about ½-full.
4. Add about a ½ teaspoon of Epsom salt to the water and stir until the salt dissolves.
5. Connect one alligator clip to one terminal of the battery.
6. Using the other wire, connect one alligator clip to the other terminal of the battery.
7. Connect one end of the pencil lead to the alligator clip at the end of one of the wires.
8. Using the other wire, connect one end of the other pencil lead to the alligator clip at the end of the wire.
9. Place the ends of the pencil into the water as shown.
10. **What were the bubbles made out of in this activity?**
11. **Why was there more hydrogen gas produced than oxygen gas?**

**HINT: Look back at the drawings showing the number of hydrogen and oxygen atoms that bond to form a water molecule.**

# TAKE IT FURTHER

1. **Describe the process of covalent bonding between two oxygen atoms to make an oxygen molecule. Be sure to mention attractions between electrons and protons and the number of electrons in the outer energy level for the atoms in the final molecule.**

Each oxygen atom has 6 electrons in its outer energy level.

1. **Describe the process of covalent bonding between the carbon and the four hydrogen atoms to make a methane molecule. Be sure to mention attractions between electrons and protons and the number of electrons in the outer energy level for the atoms in the final molecule.**

1. **Describe the process of covalent bonding between the carbon and the two oxygen atoms to make a carbon dioxide molecule. This molecule has two double bonds. Be sure to mention attractions between electrons and protons and the number of electrons in the outer energy level for the atoms in the final molecule.**

**Activity Sheet**

**Lesson 3**

**Part 2 - Energy Levels, Electrons, and Ionic Bonding**

# EXPLAIN IT WITH ATOMS & MOLECULES

1. **What is the basic difference between covalent and ionic bonding?**
2. **Write a short caption beside each picture to describe the process of ionic bonding.**

Sodium and chlorine atoms are near each other.

# ACTIVITY

## Question to investigate

Why are salt crystals cube-shaped?

## Materials for each group

* + Black paper
	+ Salt
	+ Cup with salt from evaporated saltwater
	+ Magnifier
	+ Permanent marker

## Procedure, Part 1

*Observe sodium chloride crystals.*

1. Place a few grains of salt on a piece of black paper. Use your magnifier to look closely at the salt.
2. Use your magnifier to look at the salt crystals in the cup.

**3. After seeing an illustration and an animation of a sodium chloride crystal, explain why salt crystals are cube-shaped?**

# TAKE IT FURTHER

In the very first lesson you saw that carbon dioxide from different sources could enter water and make that water acidic. Those examples were like models of the process of ocean acidification. Certain characteristics of water and carbon dioxide make this possible.

Now that you know more about the water and carbon dioxide molecules, work with a partner to think of what questions we need to answer to begin to understand the first steps of ocean acidification?