Structure of Materials Answer Key

Directions: Watch the What is Matter and What is a Molecule? videos and answer the following questions based on the information presented in the videos. You may watch the videos as often as you'd like.

PART 1

1. What is Matter?
   Matter is anything that has ____**Mass**__ and _**Volume**____.

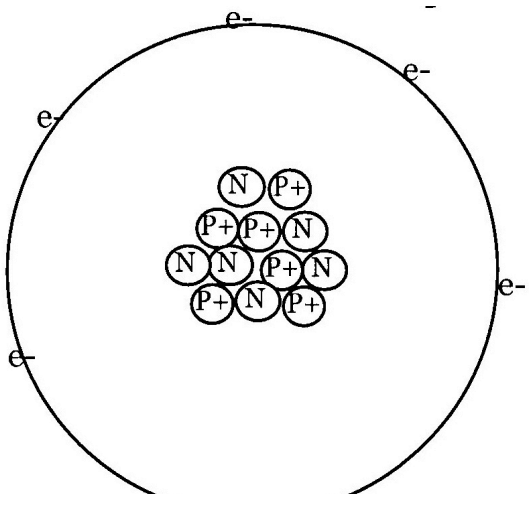
2. The building blocks of Matter are __**Atoms**_____.

3. Atoms are divided into three subatomic particles. Fill in the information in the following chart.

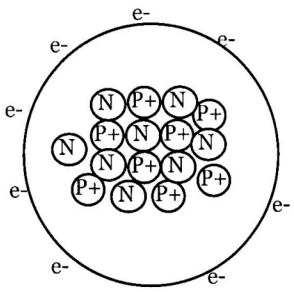
Subatomic Particle	Location within the Atom	Charge	Size
Proton	**Nucleus**	**+1**	**1 amu**
Neutron	**Nucleus**	**Neutral**	**1 amu**
Electron	**Electron Cloud**	**-1**	**1/2000 amu**

Part 2
Directions: We will now build some models of atoms. Follow the example shown and answer the following questions.

Example: A Carbon atom that has 6 protons, 6 neutrons, and 6 electrons.



4. Now construct your own atomic model of Oxygen that has 8 protons, 8 neutrons, and 8 electrons.

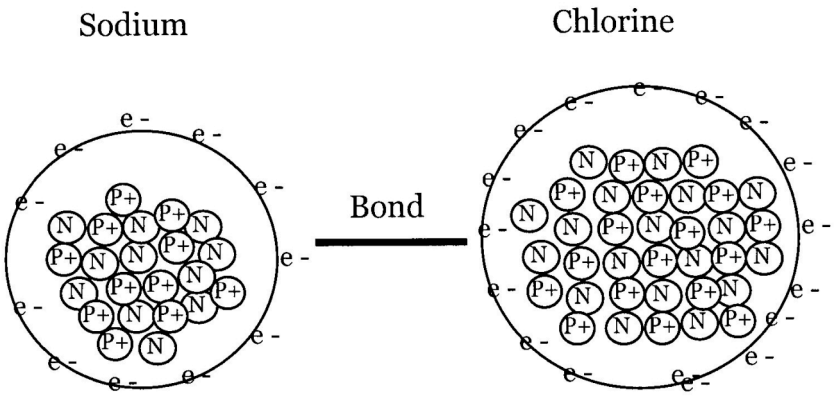


Carbon is the element that makes the graphite that is found in pencils. When you write with a pencil, you are writing with carbon atoms. Oxygen is a gas that we find in the air. Our bodies need oxygen to survive.

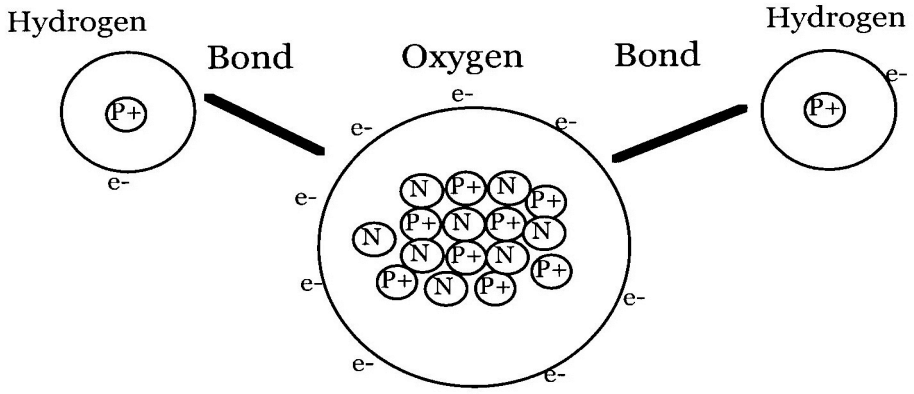
5. Look back at your atomic models of Oxygen and Carbon. Write a paragraph that compares the similarities and differences between the two models. **The similarities between the oxygen and carbon atomic models are that they both are comprised of protons neutrons and electrons. They both have a nucleus and electron orbit. The differences are the number of subatomic particles found in each atom.**

Part 3
Watch the What is Matter and What is a Molecule? video again with your class and discuss what you've learned.

Atoms can bond together to form more complex structures called molecules. We will now draw some models of molecules.
Example: A molecule of table salt (NaCl) has 1 Sodium atom and 1 Chlorine atom. (Sodium has 11 P+, 11 N, and 11 e-) (Chlorine has 17 P+, 18N, 17 e-)



6. Now construct your own molecule of Water (H2O). Water has 2 Hydrogen atoms and 1 Oxygen atom. (Hydrogen has 1 P+, 0 N, and 1 e-) (Oxygen has 8 P+, 8N, and 8 e-)



7. You have now constructed an atom of oxygen and hydrogen and a molecule of water. Explain what has changed about the structure of the hydrogen atom and oxygen atom when they bond to form water. (Has the number of subatomic particles changed? What is the only difference?)

When bonding oxygen and hydrogen to form water the number of protons, neutrons, and electrons did not change. The only difference to the atomic models is that they formed a chemical bond.

This change is called a chemical bond. When we chemically bond two atoms the properties of the substance will change.

8. We will now construct some models of atoms and molecules using marshmallows, gumdrops, and toothpicks. The marshmallows represent oxygen molecules and the gumdrops represent hydrogen. Build a water molecule using your molecule drawing as a guideline.

9. Is a chemical bond formed between water molecules when they come together to fill a glass of water? Explain.

A chemical bond is not formed when water molecules come together to fill a glass of water. If a chemical bond did form between the water molecules then the properties of the molecules would have changed. Since one molecule of water has the same properties as a glass of water there was no chemical bond formed between the water molecules.

Teacher Notes

This lesson is designed to be an introduction to atoms and matter. Students are assumed to come without any prior knowledge of atoms, molecules, or bonding. A focus on identification of the building blocks of matter helps provide a base to build upon with future lessons. The concept that chemical bonding changes the properties of matter is very abstract and difficult for middle school students to grasp. Further investigation may be necessary for students to master this concept. A reference to the difference between mixtures and pure substances may help clear up confusion. For example, there is no chemical bond between salt and water in saltwater. This is why salt water has the properties of both water and salt.