NAME: _____

Student Worksheet

Activity One

Writing a Short Essay

The History of the Atomic Model

Write a short report on the history of the atomic model.

Tell about the models in the order they were suggested:

1. John Dalton's model in 1803
2. J. J. Thompson's model in 1897
3. Ernest Rutherford's model in 1909
4. Niels Bohr's model in 1913
5. Bohr's model is a lot like the one we have been studying, but there is a newer one. It is the electron cloud model. It came from the work of several people around 1926.

Find out what you can about how each model showed the parts of an atom. The ways people showed the electrons are important. Find out what you can about the experiments these people did that led to their models. Tell why Thompson's model was called the "plumb pudding model."

The electron cloud model is the hardest to understand. Don't expect to be able to tell everything about it. It shows the electrons as clouds of different shapes. This is because it is not possible to tell exactly where an electron is, not because they are really clouds.

NAME: _____

Student Worksheet

Activity Two

Make Models of Atoms of Elements

Make models of several of the smaller atoms. Use whatever you can find easily for the electrons, neutrons, and protons. You can use peas, plastic foam balls, old golf balls, fruit, or whatever you can get easily. You could even make models that could be eaten for lunch!

Make the neutrons and protons about the same size and different colors. Glue or fasten them together to form the nucleus. Use something smaller for the electrons.

The easiest way would be to fasten the parts to a piece of cardboard. If you can hang them in the air, that could look be even better. Try hanging the nucleus and electrons from strings inside a cardboard box.

NAME: _____

Student Worksheet

Activity Three

Collect samples of elements

Make a collection of as many pure elements as you can find. Compounds containing the elements don't count. Some of the easiest to get are listed below in order of atomic number.

Atomic Number	Element	Example
He	Helium	in a helium balloon
C	Carbon	as a lump of coal or charcoal
Mg	Magnesium	
Al	Aluminum	
Cr	Chromium	
Fe	Iron	
Ni	Nickel	
Cu	Copper	
Zn	Zinc	scraped from a galvanized nail
Ag	Silver	
I	Iodine	
W	Tungsten	from a light bulb
Pt	Platinum	
Au	Gold	
Hg	Mercury	
Pb	Lead	

You might also be able to find silicon (Si), sulfur (S), and calcium (Ca).

Ask your teacher which would be poisonous or dangerous to touch.

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NAME: _____

Student Worksheet

Activity Four

Designing a Game

The Periodic Table as a Board Game

For two or more players

Use the periodic table as a board game. Get a large copy of the periodic table you can lay on a table top. You could also make you own periodic table on a large piece of paper. You will also need a pair of dice and a mover for each person.

Rules:

1. Take turns rolling the dice.
2. Move one space on the periodic table for each count of the dice. For example, if the first person rolls a six, they put their mover on the carbon square.
3. If you roll a double, you get a free turn.
4. If you land on an inert gas, you loose a turn. (That is, you become inert.)
5. If you land on nickel, you get to move ahead five spaces to arsenic.
6. If you land on silver, you get to move ahead ten spaces to lanthanum.
7. The first person to land on gold wins. *But* you have to land exactly on gold. If you don't roll the exact number, you have to try again next turn.

You can think of it this way—for every dot on the dice you get a proton in you nucleus. You don't have to worry about getting neutrons. Neutrons are free, because there is no charge for neutrons. (No charge…get it?)

NAME: _____

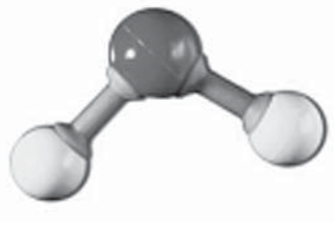
Student Worksheet

Activity Five

Molecular Models

We have studied atomic models, but we have not studied molecular models. Most kinds of molecular models show the bonds and the atoms but not the electrons, neutrons, and protons.

Look for some pictures of molecular models, and think about how you would make them with things you can find. Your school may also have kit for making molecular models. The most common kind of molecular model is the stick and ball model. The balls are atoms and the sticks are bonds. This is a stick and ball model of a water molecule..



The small balls are hydrogen atoms, and the large ball is an oxygen atom. The sticks are bonds. Notice the balls are different sizes. Try to find a list of atom sizes so you know what size balls to use. Molecular models show the sizes and shapes of molecules, but they don't look exactly like molecules. The model below looks more like a real molecule.

You will have to learn a little about chemical formulas and molecule shapes to make your models. Try to make some simple molecules, like oxygen, methane, ammonia, and methanol. Some things you might try for model parts are toothpicks for bonds and marshmallows, grapes, or plastic foam balls for atoms.

NAME: _____

Student Worksheet

Activity Six

The Octet Rule
Learn More about How Outer Electrons Form Bonds

Learn about the octet rule. Octet means a group of eight. The main idea is that eight outer electrons is a very stable number. Stable, for atoms, means about the same as inert. All the inert gases have eight outer electrons.

Atoms that don't have eight outer electrons can get eight by sharing electrons with other atoms or giving away or taking electrons. This is what happens when bonds form.

Learn how to show these ideas with "electron dot structures." These pictures show the symbol for the atom surrounded by its outer electrons. This is the electron dot structure of chlorine.

A chlorine molecule has two atoms of chlorine. This is the electron dot structure of a chlorine molecule.

See how both chlorines are now surrounded by eight electrons because they are sharing a pair.

When you understand the octet rule, you can understand why molecules have certain fixed numbers of each atom. It also helps to learn how to read and write chemical formulas. For example the chemical formula for a chlorine molecule is Cl_2. The little 2 means two atoms of chlorine in each molecule. The formula for water is H_2O. So a water molecule has two atoms of hydrogen and one of oxygen. When you understand the octet rule and electron dot structures, you can understand other chemical formulas, like $AlCl_3$, NH_3, and CCl_4.