"CARDBOARD" ATOMS LAB. WORKSHEET Science 10

Name: ______________________________

Date: ________________ Block: ______

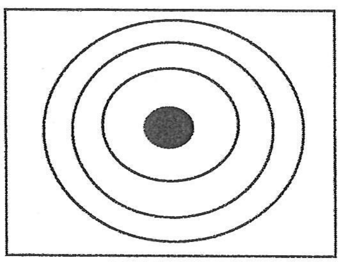
What you need: Periodic Table of the Elements, pen or pencil, set of "Cardboard Atoms"

<u>BOHR MODELS AND "CARDBOARD" ATOM MODELS</u>

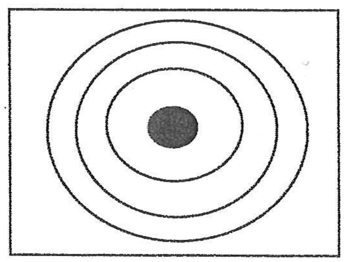
1. Obtain an envelope of "cardboard atoms" and place all the atoms "right-side-up" on your desk.

2. Pick out a "Na" and a "Cl" atom, and place in front of you on your desk. Use the Periodic Table to help you draw the Bohr Model of the atoms in the partially-draw models below. Show only the positions of the electrons. The black dot represents the atom's nucleus.

Na, sodium



Cl, Chlorine



3. Look at the outer electron shell of Na. Notice that there is only __________ electron in that shell. All of Na's (sodium's) chemical properties are concerned with that single electron!

4. Our "cardboard" model of Na is : This outer point reminds us that Na has a single outermost (valence) electron.

5. Now look at the Bohr model above that you drew for Chlorine. It has _________ electrons in the outermost shell, but all atoms are able to hold a maximum of ________ electrons in that shell! Hence, the "cardboard" model of Cl shows a "hole" or indent which shows Cl can hold one more electron in its outermost or valence shell.

6. If Na and Cl are in the same container, they will fit nicely together. Try it!
   The two atoms have made a compound, **NaCl**, (sodium chloride, or table salt). Notice that *no subscripts* beside each atom symbol, means *one atom of each*!

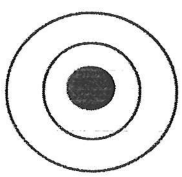
***** GO NO FURTHER IF YOU ARE CONFUSED ABOUT THIS!!! ASK FOR HELP!**

COMBINING CAPACITY

The number of electrons in the outer shell of atoms is very important!

7. Draw a Bohr Model of Lithium (Li). Again, the electrons are all you need to show (use your periodic table).

   Lithium, Li

   Cardboard Model of Lithium

8. You have no "cardboard" atom of Lithium. If you did, what would be its shape? (draw your "cardboard" atom model in the right-hand box above.

9. All metals have one, two, **or** three electrons in their outermost shell. This number is referred to as the "combining capacity" (or ion charge) and is called "Plus one", "Plus two", or "Plus three", respectively. These numbers are written as 1^+, 2^+, and 3^+, respectively.
   Look at all your "cardboard" models. Give the combining capacities of :

   H ________ Ca ________ NH_4 ________

   Al ________ Ag ________ (This is a polyatomic ion that acts like a metal and is really a tight cluster of atoms, with a charge.)

10. All non-metals have spaces available in their outer shell. Their combining capacities are 1^-, 2^-, or 3^-, which means they need one, two or three electrons to fill their outer shells. Look at your "cardboard" models. Give the combining capacities of the following non-metals:

O ____________ CH_3COO ______________ SO_4 ______________

(These last two are also polyatomic ions that act like non-metals.)

AGAIN, GO NO FURTHER IF YOU ARE CONFUSED! ASK FOR HELP!

WRITING FORMULAS OF COMPOUNDS

Metal atoms (e.g. Al, Aluminum) **combine** easily with **non-metals** (e.g. Cl, chlorine) to form ionic compounds. **There must be a matching of combining capacities:**

E.G. Draw the cardboard Model of:

Aluminum

Chlorine

Aluminum is 3^+ and Chlorine is 1^-. How many Chlorine atoms will it take to "fit" with one Aluminum atom? _____

Assemble this compound model!

Thus, a compound formula of aluminum and chlorine is written as **$AlCl_3$** ! Notice that the "3" is a subscript, written below and to the right of the atom symbol. (This means there are three Chlorine atoms for every one Aluminum atom in the compound.)

Use the "Cardboard" models to **assemble** and then, **write the formulas** of the following compounds.

Silver and Chlorine ________________

Hydrogen and Oxygen ________________

Hydrogen and Chlorine ________________

NH_4 and CH_3COO ________________

Hydrogen and SO_4 ________________

Hydrogen and NO_3 ________________

Calcium and Chlorine ________________

Calcium and Oxygen ________________

Silver and Oxygen ________________

Sodium and SO_4 ________________

** Aluminum and SO_4 ________________

**** This one is tricky! You will have to use more than one Aluminum atom and more than one SO_4 polyatomic ion called sulphate. Be sure to use up all the joining points.**