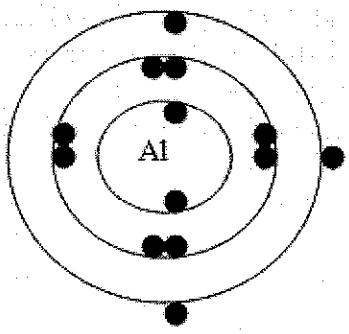
Physical Science 9
Mr. Voight

Name: Key
Hr 1 2 3 4 5 6

Model Bonding Activity

Directions: Your goal during this activity is to become a happy atom! Mr. Voight will give your group one of the boxes below containing the identities of several elements (circle it); split up the elements and each of you must draw a model of your own with the symbol in the middle (nucleus) and the electrons in pairs as dots in the electron shells. Follow this example:



Aluminum
Period 3 – 3 shells
Group 3 – 3 electrons in the valence shell

Draw your atom here:

Group Number	Elements			
1	**Ca**	**I**	**I**	**Ne**
2	**F**	**F**	**Br**	**Br**
3	**H**	**H**	**O**	**Ar**
4	**Na**	**Cl**	**Mg**	**O**
5	**Sr**	**O**	**K**	**Br**
6	**C**	**H**	**H**	**O**
7	**Ba**	**Cl**	**Cl**	**Kr**
8	**O**	**O**	**N**	**N**

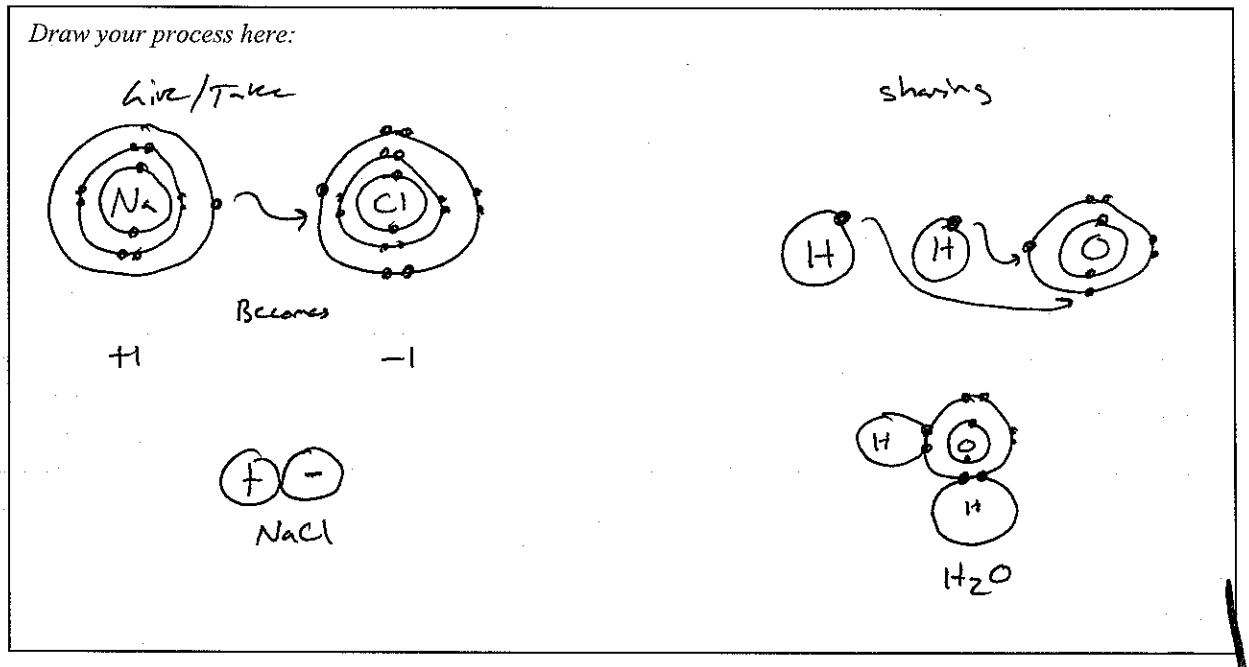
Group Number	Elements				
9	**Be**	**Be**	**Be**	**N**	**N**
10	**Li**	**Li**	**S**	**K**	**Br**

Group Number	Elements		
11	**Li**	**Li**	**S**
12	**C**	**O**	**O**
13	**Si**	**S**	**S**

Directions (continued):

1. Get your atom model approved by Mr. Voight; before asking, check with your partners
2. When approved, get construction paper and draw the "nucleus" and electron shells using permanent marker (make it large).
3. Using marker, draw the electrons on the INTERIOR SHELLS and PAIRED VALENCE ELECTRONS ONLY.
4. Cut out small dots, the same size as your other electrons, to represent the unpaired valence electrons.
5. Loosely tape them to the appropriate location on the valence shell.
6. **STOP !** Wait for all group members to reach this point!
7. It is your job, as a group, to do whatever it takes to make all atoms happy. Happy atoms have a FULL VALENCE SHELL! It does not matter what shell it is! Remember, you may ONLY WORK WITHIN YOUR GROUP.
8. When all of you have achieved an extreme state of happiness, check with Mr. Voight and explain your process.
9. When approval is given, draw what you did below and explain in words what you did and why.

Draw your process here:



Explain how and why:

The electromagnetic forces says that opposites attract. In ionic bonding (give/take) the metal gives the electron(s) to the nonmetal, making the metal overall positive and the nonmetal overall negative. As a result, they stick together. In covalent bonding (sharing) neither atom wants to give away electrons. Therefore, they share and are held together through the mutual attraction of the positive nuclei to the negative electrons.

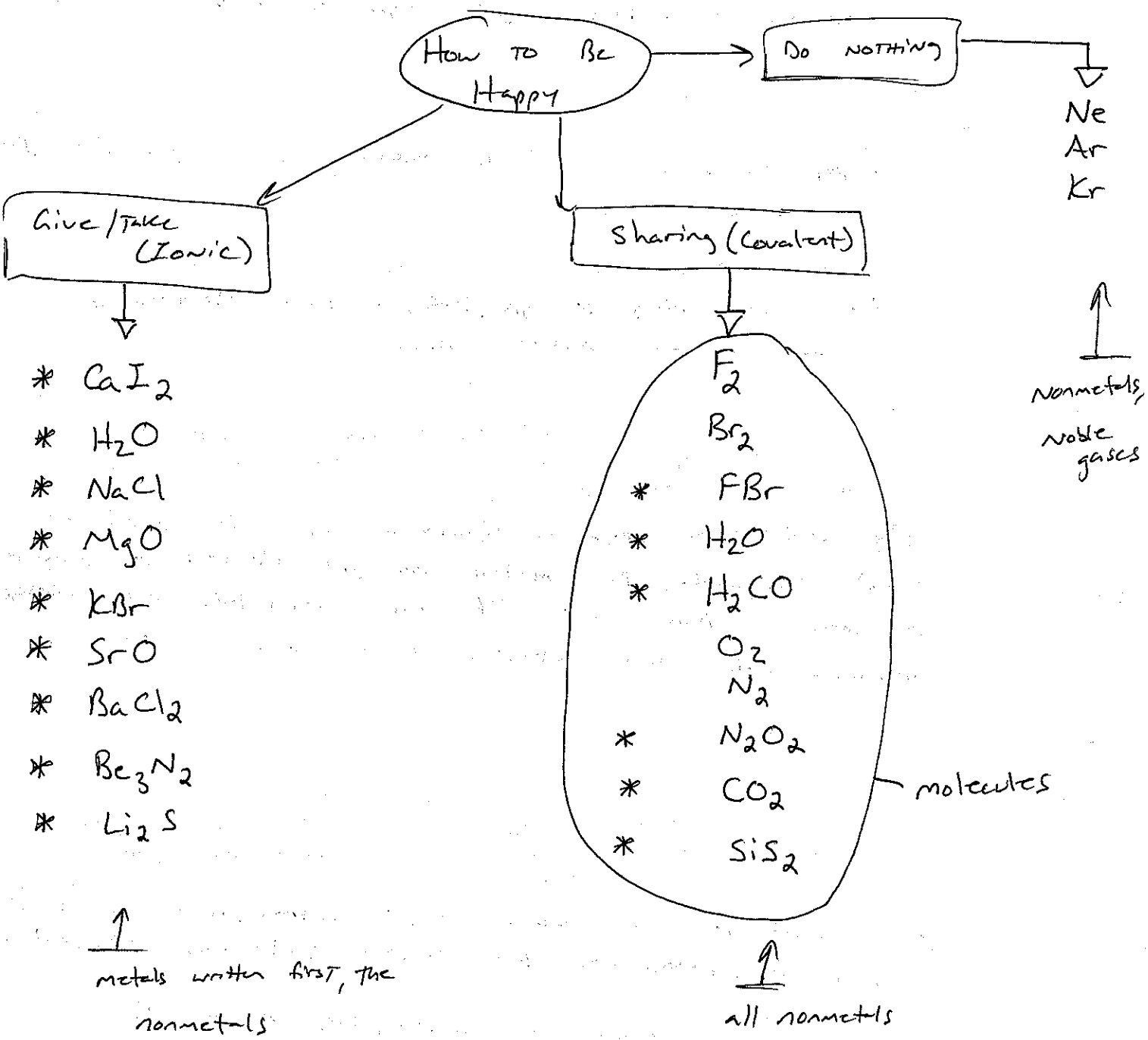
and help your classmates

Follow-up Questions to the Activity:

1. What were the mechanisms that were used to make atoms happy?

giving / taking + sharing (Noble gases didn't do anything)

2. Produce a graphic organizer to chart these mechanisms and list the combination of atoms under the appropriate heading. (make it big – use the rest of the page)



* - compounds

3. Using your Periodic Table as a reference, circle all the symbols of metals in black.
4. Using your Periodic Table as a reference, circle all the symbols of nonmetals in red.
5. Define chemical compound.

   Chemical compounds are the combination of two or more elements

6. Circle all the compounds in green. (*)
7. Define molecule.

   molecules are neutral charged groups of atoms bonded together

8. Circle all the molecules in purple.
9. What makes an atom happy?

   Happy atoms have a full valence shell – just like the noble gases.

10. How can atoms become happy? (read the top paragraph on page 7 of your textbook)

    Atoms are willing to give, take, or share electrons to achieve a full valence shell.

11. Describe how the environment an atom is in affects the types of bonds it will form. For example, what will a nonmetal do if metals are around, what will a non-metal do if other non-metals are around? What type of bonding is this? (look in pages 8-15 of your book)

    The environment plays a significant role. If metals are around nonmetals, the metals will give electrons to nonmetals to form an ionic bond. If only nonmetals are close, nonmetals will share electons in a covalent bond.

12. Protons are positively charged and electrons are negatively charged, remember? So, if a metal atom loses an electron (negative charge), what is its new overall charge? If a non-metal gains an electron, what is its new overall charge? What if that non-metal gains two electrons? Remember the number of protons in an atom never changes during a chemical reaction.

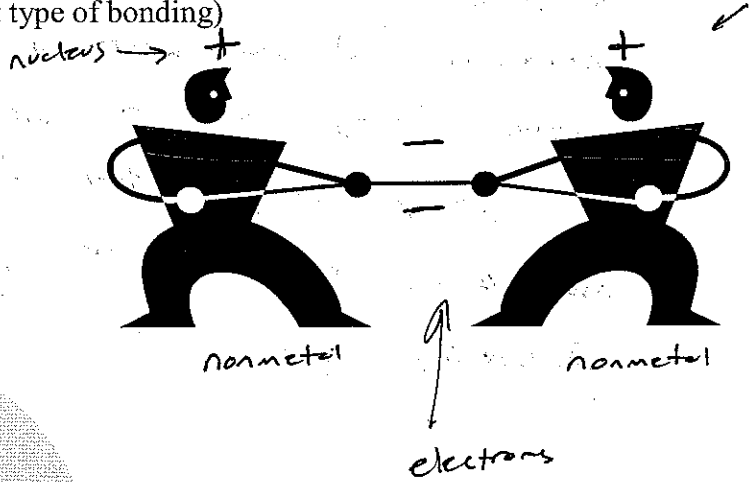
    If a metal loses a negatively charged electron, it becomes +1 (cation) if it loses (gives away) two electrons, it becomes +2 and so on.

    If nonmetals gain (take) an electron, they become −1 charge (anion). If they gain two, they become −2 and so on...

13. What is the driving force behind chemical bonding? (What I mean is, why do they do it and what holds them together? – think of the electrons and protons)

The driving force behind chemical bonding is a combination of two things. First, all atoms want to be happy like Noble Gases. This means they want a full valence shell. Second, in their quest for a full valence shell, they become charged (ionic) or must share charged particles (covalent) which directly involves the electromagnetic force. The EM force says that opposite charges attract.

14. Using the pictures below, demonstrate the bond between a metal and non-metal and between two non-metals. (which picture represents each scenario, label the pictures and describe how it relates to that type of bonding)



Covalent - The two + charged nuclei are "fighting" over the − electrons. As a result of neither letting go, they are bonded.

Ionic The man willingly gives something (electrons) to his wife. As a result, both are happy and are connected through the electromagnetic force. (Opposites attract)

15. Based on the information you have just gathered, what atoms will not form chemical bonds? (list them all)

He Ne Ar Kr Rd Xe

16. Why won't they?

They already have a full valence shell

17. What is the benefit of identifying patterns? Provide a thorough explanation please.

Patterns in our data and observations allows us to make predictions regarding further potential changes. If a pattern indicates that metals give electrons to nonmetals and we want to observe the process of metals bonding with a specific nonmetal, we can be pretty certain that it will follow a specific mechanism based on the pattern. As a result, our understanding grows.