Chp 14: Lect 1:Chemical Bonding:

Part 1: Introduction, Electrons, Lewis Dot Diagrams, & Oxidation Numbers *2 pts ec printing*

What do aspirin, plastic wrap, & vinegar have in common? Give up? They are all _____ made from different combinations of the same 3 atoms: Carbon, Hydrogen, Oxygen. Individually, these 3 elements cannot reduce pain, keep food fresh, or season food. But when they are chemically combined in certain ways to form compounds, they are extremely useful!

"C" is for Compound A compound contains two or more elements that are _____ _____ together. Examples: Water - H_2O, Salt - NaCl, Sugar - $C_6H_{12}O_6$, Practically everything you eat is a compound. In fact, most matter is in the form of a compound.

What is a bond? A chemical bond! What does it mean to be "chemically combined" or bonded? A chemical bond forms when atoms _____ or _____. This is actually a _____ of attraction, like gravity or magnetism, that holds the atoms together. A bond also involves _____

Electrons & Bonds In order to understand WHY bonding occurs, we need to revisit electrons. We use a concept called "Happy Atoms." We figure most atoms want to be happy, just like you. The idea behind Happy Atoms is that atomic shells like to be full. That's it. If you are an atom and you have a shell, you want your shell to be full. Some atoms have too many electrons (one or two extra). These atoms like to give up their electrons. Some atoms are really close to having a full shell. Those atoms go around looking for other atoms who want to give up an electron. The only electrons that can do the bonding are the ones in the outermost shell - the farthest from the nucleus. We call these special guys _____

Valence electrons are the electrons in an atom's outermost shell- the shell that is the furthest from the nucleus that holds electrons. They are the only electrons that are allowed to participate in a bond. Remember the secret for finding the number of valence electrons? It's the same as the _____ (column) _____ the element belongs in Think of it valence electrons as an atom's "skin".

You try it! Calculating the number of valence electrons →

	Total Electrons	First Shell	Second Shell	Third Shell?	Valence Electrons
Hydrogen					
Helium					
Lithium					
Oxygen					
Sodium					

Shhh! Secret rule!
Remember, elements in a family on the periodic table have similar properties, including the # of valence electrons. The number of valence electrons is identical to the _____ _____ on the periodic table.

Lewis Dot Structure
A Lewis Dot Structure, also called an Electron-Dot Diagram, is a drawing that shows the number of valence electrons in an atom. They're easy! Here's how you draw one:

1. Write the element symbol (oxygen)
2. Determine the # of valence electrons
3. Draw that # of dots around the symbol!

You Try It: Draw Lewis Dot Structures

	Valence Electrons	Lewis Dot Structure
Carbon		
Fluorine		
Calcium		
Krypton		

Happy atoms!

Again, in order for an atom to be happy - it needs a _____ shell. We have a _____ rule.

- The 1st shell is happy with _____ electrons.
- The 2nd shell is happy with _____ electrons.
- The 3rd shell is happy with _____ (or 18) electrons.

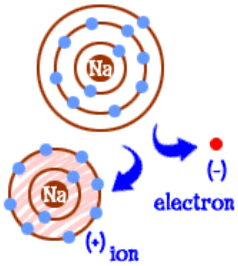
Now that you're a pro at calculating the # of valence electrons in an element, let's take it 1 step further & determine how many more electrons an atom needs to become happy. Looking back at this table we did earlier… add another column & calculate HOW many more electrons each element needs to be happy.

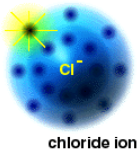
Consider this…

Look at Sodium & Oxygen. Which one is going to have a harder time finding enough electrons to make it happy? _____! Why? Because it needs 7 more! That's a lot! It's going to be impossible for it to find an atom that is willing to give it 7 whole electrons. Instead, Sodium will have a much better chance at being happy if it is willing to give its electron away.

Generous "Giving" Sodium

Some atoms are better off giving electrons away & some are better getting a couple. When electrons get passed around, it changes the overall charge of the atom. Look at Sodium again. It wants to give away one electron. When it gives the negative electron away, sodium becomes _____. When an atom becomes either negative or positive (it has an overall charge), we call it an _____.





chloride ion

Greedy "Gimme" Chlorine

Compare that to chlorine. Chorine (valence # = 7) wants 1 electron. By gaining a negative electron, the chlorine atom becomes a _____ with a charge of -1. Yes, the names change when atoms become ions…but we'll talk about that later!

A match made in chemistry heaven

Hmmmmm… Notice something? Greedy Chlorine is willing to take an electron. Generous Sodium is willing to give an electron away. No wonder these atoms like each other so much!!! Throw in a little bit of chemical magic and you get salt! Sodium chloride - NaCl! We'll talk more about this soon.

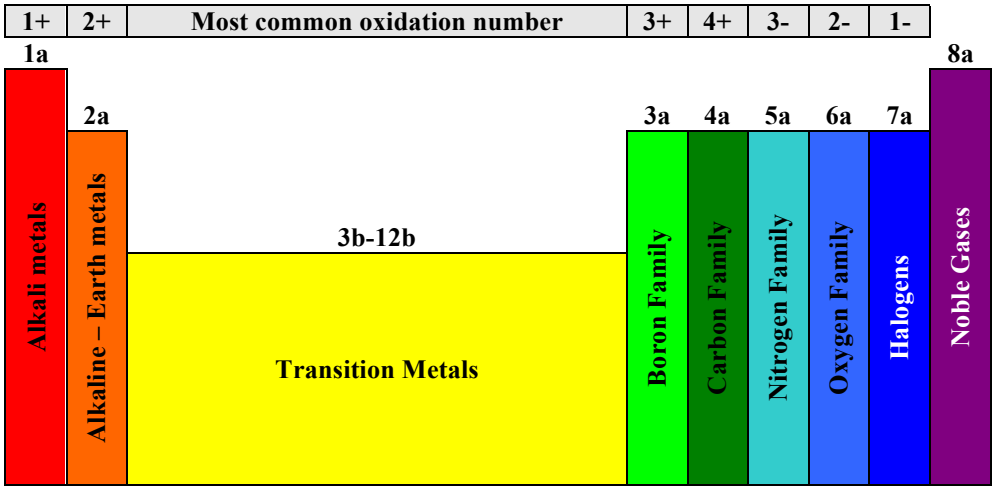
Giving vs. Getting

Since sodium always ionizes to become Na+, with a positive charge of +1, we can say it has has an _____ of 1+. An oxidation number indicates the charge on the atom when electrons are lost or gained. Typically, we write the charge _____ the number.

Use this table to help and remember…

- _____ Oxidation Number = _____ electrons
- _____ Oxidation Number = _____ electrons

Atom	Electrons gained or lost	Oxidation #
K	Loses 1	
Mg	Loses 2	
Al	Loses 3	
P	Gains 3	
Se	Gains 2	
Br	Gains 1	
Ar	Loses 0	



Here is what you should be able to do:

- Define chemical bond
- Determine the # of valence electrons
- Draw Lewis Dot Structure (Electron Dot Diagrams)
- Calculate how many electrons atoms need to have full outer shells
- Find out whether an atom becomes a positive or negative ion
- Determine the oxidation number of atoms