Chp 14: Lect 3: Chemical Bonding

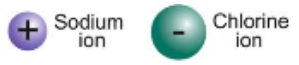
Part 3: Ionic Bonds & Ions ***1 pt ec printing***

Cooperating Covalents

Last time we talked about covalent bonds. What is a covalent bond? A bond formed by _____. Also, _____ are groups of atoms that are held together by covalent bonds in a specific ratio & shape.

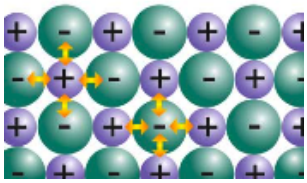
Ions ions ions

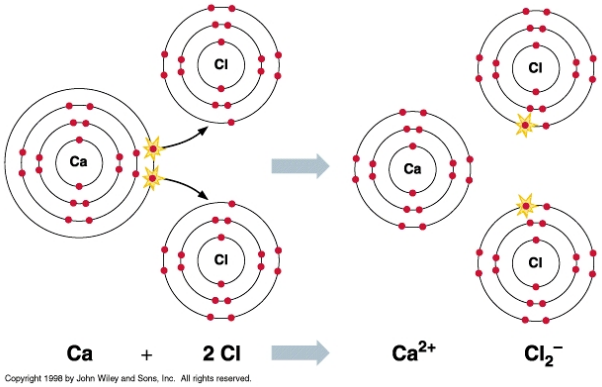
We've also talked about ions….What is an ion? An ion is a _____ or an atom that has either _____ or _____ an _____. We also talked about how Sodium willingly gives away its lone valence electron. Chlorine very greedily takes that electron, in order to full its outer shell. Like we said, sodium & chloride are a match made in heaven. As sodium gives away its electron, it becomes a _____ ion. This is called a _____. When chlorine receives the electron, it becomes a _____ ion. This is called an _____. After the electron moves, the positive sodium ion is then immediately attracted to the negative chloride ion. Why are they attracted to teach other? _____



Ionic Bonds

This bond is called an ionic bond, because the electrons are _____ from one atom to another, creating an _____ between _____. These bonds are not limited to a single pair of atoms. In NaCl, each Na+ is attracted to all of the neighboring chloride ions. Likewise, each Cl- is attracted to all the neighboring sodium atoms. These ions form in a repeated, 3-dimensional pattern called a _____ _____ This means the positive and negative atoms are arranged in alternating patterns. This is why salt is formed in cubes.





Ionic Bond Examples

The prime example of an ionic bond is NaCl, but there are many more examples of ionic bonds. Look how it takes 1 calcium atom to bond with 2 chlorine atoms. Also, notice how calcium is now Ca^{2+}. Why? Well, because calcium _____ electrons, leaving it with an overall charge of 2+. Conversely, each chlorine _____ electron, leaving each with an overall charge of 1-. This new compound would be written as _____

Ions Example #2

Here's another example. I've got two ions: H^{1+} and $(SO_4)^{2-}$. This time, the _____ (high #) represents the charge number. Remember that the subscript (low #) refers to the number of atoms. How many hydrogens does it take to pair with the sulfate ion (SO_4)? Well, 2!. I need 2 positive charges to match the 2- charge. The final compound would be _____

You Try It!

Cation	Anion	Compound
Li^{1+}	S^{2-}	
Mg^{2+}	Cl^{1-}	
Al^{3+}	$(PO_4)^{3-}$	

Covalent	Ionic
_____ Electrons	_____ Electrons
Creates _____	Creates _____
Bond consists of 2 electrons	Bonds form with all oppositely charged neighbors

Metallic bond

Quickly… a metallic bond is the force of attraction between a positively charged _____ and the _____ in a metal. Metals atoms are so tightly packed, their electron shells overlap This lets electrons move freely from one atom to another. THIS lets metal conduct electricity & change shape easily (ductility, malleability).

Counting Atoms

The formula for a compound indicates the elements that make up the compound and the number of atoms of each element present in the compound. These numbers of atoms are indicated by the use of small numbers called subscripts. Sometimes groups of atoms act as a single atom. Such a group of atoms is called a polyatomic ion. If a polyatomic ion is used in a formula more than once, it is put in parentheses and the subscript appears outside the parentheses. When a subscript appears outside the parentheses, it indicates that all the elements inside the parentheses should be multiplied by that subscript. For example, the formula $Fe(OH)_3$ indicates the combination of 1 atom of iron, Fe, 3 atoms of oxygen O, and 3 atoms of hydrogen H.

In the following examples, list each element in the compound and the number of atoms of each element present. The first example has been done for you. You may already be familiar with some of these compounds. In addition, you are to also identify the elements atomic number and group/family, and what type of atom it is: metal, nonmetal, metalloid.

Name	**Use**	**Formula**	**Atoms in Formula**	**Element's atomic number**	**Element's group/family**	**Type of element**
Calcium Carbonate	Limestone	$CaCO_3$	Ca = Calcium : 1 C= Carbon: 1 O= Oxygen: 3	Ca=20 C= 6 O = 8	Alkaline EarthMetals Carbon Family Oxygen family	metal nonmetal nonmetal
Aspirin	Pain reliever	$C_9H_8O_4$	_____ _____ _____			
Magnesium hydroxide	Tummy tablets for gas pain	$Mg(OH)_2$	_____ _____ _____			
Paradichloro-benzene	Moth balls	$C_6H_4Cl_2$	_____ _____ _____			
Acetic acid	Vinegar	$C_2H_4O_2$	_____ _____ _____			
Trinitro-toluene (TNT)	explosive	$C_7H_5(NO_2)_3$	_____ _____ _____ _____			
Calcium dihydrogen phosphate	fertilizer	$Ca(H_2PO_4)_2$	_____ _____ _____ _____			
Pyrite	Fool's gold	FeS_2	_____ _____			
Sucrose	Sugar	$C_{12}H_{22}O_{11}$	_____ _____ _____			
Heptane	gas component	C_5H_{12}	_____ _____			
Silicon dioxide	Sand	SiO_2	_____ _____			
Sulfuric acid	used in car batteries	H_2SO_4	_____ _____ _____			

BrainPop Questions:

1. What is an ion?a.an atom with an extra neutron b.An atoms or molecule with an electrical charge C. The outermost shell of an atom
2. What is the nucleus of an atom made up of? A. Neutrons & protons B. Protons & electrons C. Electrons & neutrons?
3. What are the negatively-charged particles orbiting an atom called? A. Electrons B. Protons C. Neutrons
4. When do ions form? a. When an atom loses a proton b. When 2 atoms bond together c. When an atom loses or grains an electron
5. Electrons orbit the nucleus in layers called: A. Valence clouds B. Shells C. Potentials
6. Electrons in the outermost shell are called: A. valence electrons B. Ionization electrons C. Orbital electrons
7. What is the tendency to lose electrons called A. Negative valence B Ionization C. Positive valence
8. Atoms on the right side of the periodic table ten to: a.Gain electrons easily b.Lose electrons easily c.Lose protons easily
9. How do ions stick together? A. With covalent bonds B. With negative bonds C. With ionic bonds
10. What happens to the ionic bond when sodium chloride is dissolved in water?

    a. The bond strengthens b. The bond breaks c. The bond is unaffected