

Science Number

To Bond or Not Bond That is the Question

Chp 14: Chemical Bonding
Complete the oxidation numbers for this chart

		Most common oxidation number															
1a	2a											3a	4a	5a	6a	7a	8a
Alkali metals	Alkaline - Earth metals	Transition Metals										Boron Family	Carbon Family	Nitrogen Family	Oxygen Family	Halogens	Noble Gases

Definitions: From the Book / or YOUR definition

Match the name to the correct definition	Sect 1: Electrons & chemical bonding 352-355 Sect 2: Types of Chemical Bonds Pg 356-365
Chemical bonding _____	A. a repeating three-dimensional pattern of ions
Chemical bond _____	B. a force of attraction that holds two atoms together
Valence electrons _____	C. the joining of atoms to form new substances
Ionic bond _____	D. a neutral group of atoms held together by covalent bonds
ions _____	E. the force of attraction between the nuclei of atoms and the electrons shared by the atoms
Crystal lattice _____	F. the attraction between a positively charged metal ion and the electrons in a metal
Covalent bond _____	G. charged particles that form during chemical changes when one or more valence electrons transfer from one atom to another
molecule _____	H. the force of attraction between oppositely charged ions
Metallic bond _____	I. the electrons in the outermost energy level of an atom, and are involved with bonding

Chp 14: Space for Notes you want for the final:

Name: _____ Pd _____ Sci Number: _____

Parent's signature of completion _____

Lewis Dot Structures

Lewis dot diagrams are a simplified way to show how the electrons are arranged in their outer shell. These are the valence electrons. This is where the chemical bonding & reactions take place. Here are the steps to drawing a Lewis dot structure:

Example: Draw the Lewis dot structure for Nitrogen

1. Write the element symbol. N
2. Determine the # of valence electrons. 5
3. Draw that # of dots around the symbol!



Draw the Lewis structures for each of the elements below:

H	Al	B	Ne	Kr
Cl	F	Ga	S	Li
C	Cs	He	Sr	P
Be	Si	Ba	Mg	As

Teach a parent :

Explain what a valence electron is AND how they are involved with the bonding process. Use the periodic table to show how many electrons are available for bonding.

Parent Response

1. _____ I'm not sure my child really understands, therefore, I don't either. Please work with him/her and let's try again.
2. _____ The concept was explained thoroughly with effective examples he/she created. "By golly, I think they've got it!"
3. _____ WOW! My child did an exceptional job! It was logically explained, therefore I caught on immediately and feel confident about teaching it to others.

Parent Signature: _____ Date: _____ + 1-2 sentences

Ionic Bonding Basics

Element	# of Electrons	# of Valence Electrons	# of electrons gained or lost	Oxidation #
Sodium example:	11	1	1 lost	1+
Chlorine				
Calcium				
Fluorine				
Aluminum				
Oxygen				
Potassium				

Drawing Ionic Bonding:

Ionic bonding occurs when a _____ transfers 1 or more electrons to a _____ in an effort to attain a stable octet of electrons.

1. Write the symbol for each element and Use dots to create each Lewis structure.
2. Draw an arrow(s) to show the transfer of electrons and move the dots to the new location.
3. Decide if you need additional elements (if you have extra electrons that need to be bonded)
4. Determine the charge for each ion and write the formula.
5. Make sure the sum of the oxidation numbers is zero & write the chemical formula.
6. Use crayons or colored pencils to color in the electrons once you remove them.

(1) Potassium + Fluorine example: $\text{K} + \text{F} \rightarrow \text{K}^{1+}\text{F}^{1-}$	(2) Magnesium + Iodine	(3) Sodium + Oxygen
(4) Sodium + Chlorine	(5) Calcium + Chlorine	(6) Aluminum + Chlorine

Drawing Covalent Bonding:

Covalent bonding occurs when 2 or more _____ SHARE electrons, attempting to attain a stable octet of electrons. Complete the examples below:

1. $H + H \rightarrow H_2$
2. $O + O \rightarrow O_2$
3. $C + O_2 \rightarrow CO_2$
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> </div> <div style="flex: 1; padding-left: 10px;"> <p>• Lets use HCl (2 non-metals)</p> <ul style="list-style-type: none"> • 1st - Draw the Lewis Structure for each atom • 2nd - Draw the electron(s) being shared • 3rd - Draw each covalent bond as a line between the two atoms </div> <div style="flex: 1; text-align: center;"> </div> </div> <p>Example:</p>

Types of bonds: Classify the following compounds as ionic (_____ + _____) or covalent (_____ + _____) or metallic (_____ + _____)

- | | | |
|-------------------|-------------------------|-------------------|
| 1. $CaCl_2$ _____ | 4. MgO _____ | 7. $FeCl_2$ _____ |
| 2. CO_2 _____ | 5. Aluminum Foil: _____ | 8. P_2O_5 _____ |
| 3. H_2O _____ | 6. NO_2 _____ | 9. Cu_2 _____ |

Today's concept is in 3 parts: Explain the different types of bonding:

1. Covalent 2. Ionic 3. Metallic AND Explain HOW each bond takes place.

Help your parent become an expert !

Parent Response

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Parent Signature: _____ Date: _____ + 1-2 sentences

Fill in the Blank Review Questions:

1. When _____ are formed, electrons are transferred between atoms
2. Atoms covalently bonded together form a _____
3. Charged particles that form when atoms transfer electrons are called _____
4. A _____ is a three-dimensional pattern formed from alternating positive and negative ions.
5. A force of attraction that holds two atoms together is called _____

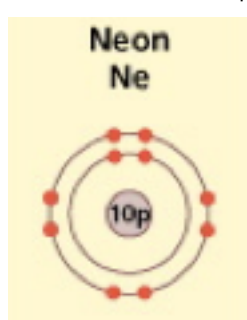
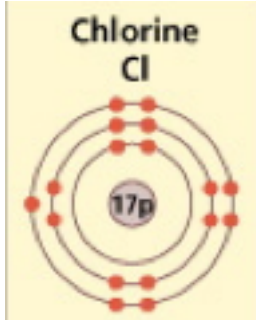
Multiple Choice Circle your choice:

6. The number of _____ is most important in determining how an atom will bond.
 - a. protons
 - b. neutrons
 - c. electrons in the innermost energy level
 - d. electrons in the outermost energy level
7. Which type of element is most likely to gain electrons when it forms bonds?
 - a. metal
 - b. metalloid
 - c. nonmetal
 - d. noble gas
8. Why do atoms have no charge (so they are neutral) ?
 - a. The number of protons is equal to the number of neutrons.
 - b. The number of electrons is equal to the number of neutrons.
 - c. The number of protons is equal to the number of electrons.
 - d. There is an equal number of neutrons, protons, and electrons.
9. Which of the following elements does not exist as a diatomic molecule?
 - a. oxygen
 - b. argon
 - c. nitrogen
 - d. iodine
10. _____ are formed by atoms losing electrons:
 - a. Negative ions
 - b. Positive ions
 - c. Elements
 - d. Compounds
11. Which of the following is NOT a metallic property?
 - a. a hard and brittle texture
 - b. high density
 - c. the ability to be flattened and shaped
 - d. the ability to conduct electricity
12. Which element has a full outermost energy level containing only two electrons?
 - a. oxygen (O)
 - b. hydrogen (H)
 - c. fluorine (F)
 - d. helium (He)
13. Which of the following describes what happens when an atom becomes an ion with a 2- charge?
 - a. The atom gains 2 protons.
 - b. The atom loses 2 protons.
 - c. The atom gains 2 electrons.
 - d. The atom loses 2 electrons.
14. The properties of ductility and malleability are associated with which type of bonds?
 - a. ionic
 - b. covalent
 - c. metallic
 - d. None of these
15. In which area of the periodic table do you find elements whose atoms easily gain electrons?
 - a. across the top two rows
 - b. across the bottom row
 - c. on the right side
 - d. on the left side
16. What type of element tends to lose electrons when it forms bonds?
 - a. metal
 - b. metalloid
 - c. nonmetal
 - d. noble gas
17. Which pair of atoms can form an ionic bond?
 - a. sodium (Na) and potassium (K)
 - b. potassium (K) and fluorine (F)
 - c. fluorine (F) and chlorine (Cl)
 - d. sodium (Na) and neon (Ne)

Procedure:

Bohr's Models

1. Draw Bohr atomic models for each of the atoms using your Periodic Table.
2. To represent # of protons, write a P- followed by the number of protons. Place in the nucleus.
3. To represent # of neutrons, write a N- followed by the number of neutrons. Place in the nucleus.
4. Use the Periodic Table to determine how many electrons are in each orbital.
5. Use **dots** to represent the electrons. Pair electrons after the 1st orbital to make it easier for counting
6. Be sure to write the symbol, atomic # and atomic mass # for each element.
7. Look at Bohr's Atom of Chlorine&Neon as examples of what the Bohr model should look like.



Remember:

- Level 1: holds: 2 electrons
- Level 2: holds: 8 electrons
- Level 3: holds: 8 electrons
- Level 4: holds: 18 electrons

Hydrogen
Symbol _____
Atomic Number _____
Mass Number _____

Beryllium
Symbol _____
Atomic Number _____
Mass Number _____

Boron
Symbol _____
Atomic Number _____
Mass Number _____

Carbon
Symbol _____
Atomic Number _____
Mass Number _____

Sodium
Symbol _____
Atomic Number _____
Mass Number _____

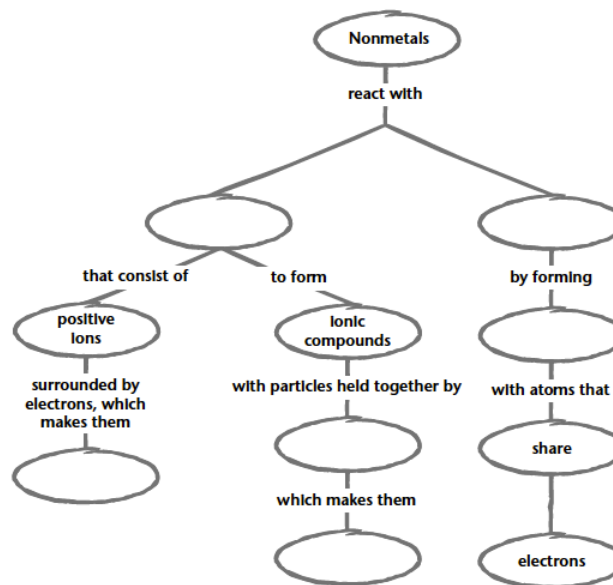
Magnesium
Symbol _____
Atomic Number _____
Mass Number _____

Aluminum
Symbol _____
Atomic Number _____
Mass Number _____

Silicon
Symbol _____
Atomic Number _____
Mass Number _____

CONCEPT MAPPING

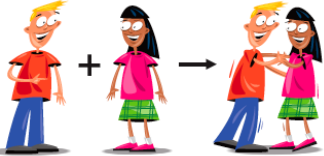
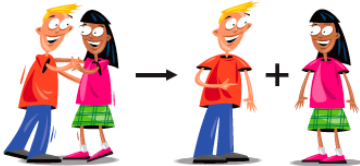
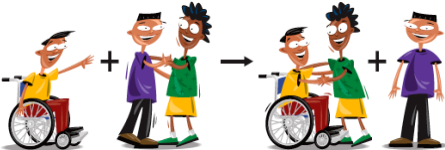
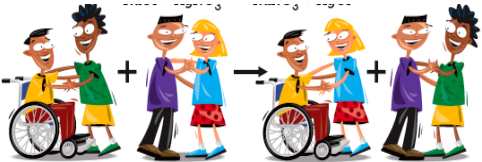
15. Use the following terms to complete the concept map below: malleable, brittle, metals, nonmetals, covalent bonds, electrostatic attraction.



Additional Notes/Drawing Space for Chp 14

CHEMICAL REACTIONS

Label of the 4 types of reactions FROM section 2 and your class notes
Skim pages 382-384 & title the type of reactions below.

_____	
Reaction	
_____	
Reaction	
_____	
Reaction	
_____	
Reaction	

Copy the diagrams from figure 22 on page 387. Be sure to label.

Exothermic Reaction	Endothermic Reaction

Definitions:

All mixed up! Write the correct letter to define the word. What page do you find the word on?

Sect 1: Forming New Substances Pg 374-382

Chemical reaction Correct letter: _____	a. An efficient way to represent what happens in a chemical reaction
Chemical formula Correct letter: _____	b. a process in which one or more substances are changed into new substances
Subscript Correct letter: _____	c. The full sized numbers written in front of symbols and formulas that tells how many atoms, molecules or formula units take part in a chemical reaction
Chemical equation Correct letter: _____	d. Lavoisier's supported this through experiments that the total mass before a chemical reaction is the same as the total mass after the reaction
Reactants Correct letter: _____	e. The starting materials in a chemical reaction
Products Correct letter: _____	f. The new substances that are formed during a chemical reaction
Coefficient Correct letter: _____	g. An ingredient list for a compound that uses atomic symbols and subscripts
Law of conservation of mass Correct letter: _____	h. The small number written to the right of the chemical symbol that tells how many atoms of an element are contained in one molecule of a substance

Sect 2: Forming New Substances Pg 382-384

Synthesis reaction Correct letter: _____	a. A reaction in which ions in 2 compounds switch places
Decomposition reaction Correct letter: _____	b. A reaction in which an element takes the place of another element that is part of a compound. The products are a new compound and a different element
Single-replacement reaction Correct letter: _____	c. A reaction in which two or more substances combine to form a single compound
double-replacement reaction Correct letter: _____	d. A reaction in which a single compound breaks down to form two or more simpler substances

Sect 3: Energy & Rates of Chemical Reactions Pg 385-386

Exothermic letter: _____	a. A substance that speeds up a reaction without permanently being changed
Endothermic letter: _____	b. The minimum amount of energy needed for a substance to react
Law of conservation of energy : _____	c. A substance that slows down or stops a chemical reaction
Activation energy: _____	d. A chemical reaction that releases or removes energy
Catalyst : _____	e. A chemical reaction that absorbs energy
Inhibitor : _____	f. Energy can neither be created nor destroyed in chemical reactions

TYPES OF BONDS

Write **I** for ionic bond, **C** for covalent bond, or **M** for metallic bond. (1/2 point each)

- _____ An attraction between positive & negative ions
- _____ An attraction between a positive metal ion & the negative electrons in a metal
- _____ When two atoms share electrons equally
- _____ Created when two atoms transfer electrons
- _____ Occurs between two metals
- _____ Occurs between a metal & a nonmetal
- _____ Occurs between two nonmetals
- _____ Found in regular sugar, Splenda, & equal
- _____ Found in regular table salt (NaCl)
- _____ Possess high melting & boiling points
- _____ Possess low melting & boiling points
- _____ Create rigid crystalline substances
- _____ Do not conduct electricity
- _____ Great conductors heat or electricity
- _____ Conducts heat or electricity only when dissolved in water

Use your periodic table to classify the substances as **Ionic** (metal – nonmetal), **Covalent** (nonmetal – nonmetal), or **Both** (contains both). (1/2 point each)

Example: CaCl_2 Calcium is a metal & chlorine is a nonmetal, so CaCl_2 contains an ionic bond.

- | | |
|------------------------------------|----------------------------------|
| 16. _____ CO_2 | 26. _____ NH_4Cl |
| 17. _____ H_2O | 27. _____ HCl |
| 18. _____ BaSO_4 | 28. _____ KI |
| 19. _____ K_2O | 29. _____ NaOH |
| 20. _____ NaF | 30. _____ NO_2 |
| 21. _____ Na_2CO_3 | 31. _____ AlPO_4 |
| 22. _____ CH_4 | 32. _____ FeCl_3 |
| 23. _____ SO_3 | 33. _____ P_2O_5 |
| 24. _____ LiBr | 34. _____ N_2O_3 |
| 25. _____ MgO | |

Fill in the grid below about the 4 clues of chemical reactions: see your lecture notes

Clue	Explanation

USING VOCABULARY

To complete the following sentences, choose the correct term from each pair of terms listed, and write the term in the blank.

- A _____ is a shorthand notation that represents a compound or diatomic element. (coefficient or chemical formula)
- The _____ in a reaction is the minimum amount of energy needed for substances to react. (catalyst or activation energy)
- In a _____ reaction, ions in different compounds switch places. (single-replacement or double-replacement)
- In a chemical formula, if no _____ is written after an element, then only one atom of that element is present. (subscript or coefficient)
- A(n) _____ slows down or stops a chemical reaction. (catalyst or inhibitor)

UNDERSTANDING CONCEPTS

Multiple Choice

Circle the correct answer.

- Which of the following is an example of a diatomic element?
 - NaCl
 - O_2
 - Mg
 - CaCl_2
- Which of the following is an example of a single-replacement reaction?
 - $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2$
 - $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
 - $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$
 - $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- Which of the following is NOT an example of a chemical reaction?
 - milk turning sour
 - food being digested
 - a match burning
 - ice melting
- How many atoms are represented in the formula CaCO_3 ?
 - three
 - four
 - five
 - six
- Which of the following usually increases the rate of a reaction?
 - decreasing the concentration of the reactants
 - grinding a solid reactant into a powder
 - lowering the temperature of the reactants
 - raising the temperature of the products

Teach a parent: :

Teach your parents about the 4 different types of chemical reactions.

Parent Response

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