

8 Bonds

First Last Name _____ Period _____

SCORE _____ / _____

Covalent

Positive Ions (cations)	
Aluminum	Al ³⁺
Ammonium	NH₄⁺
Antimony (III)	Sb ³⁺
Antimony (V)	Sb ⁵⁺
Arsenic (III)	As ³⁺
Arsenic (V)	As ⁵⁺
Barium	Ba ²⁺
Beryllium	Be ²⁺
Bismuth (III)	Bi ³⁺
Bismuth (V)	Bi ⁵⁺
Cadmium	Cd ²⁺
Calcium	Ca ²⁺
Chromium (II)	Cr ²⁺
Chromium (III)	Cr ³⁺
Cobalt (II)	Co ²⁺
Cobalt (III)	Co ³⁺
Copper (I)	Cu ⁺
Copper (II)	Cu ²⁺
Hydrogen, hydronium **	H ⁺ , H ₃ O ⁺
Iron (II)	Fe ²⁺
Iron (III)	Fe ³⁺
Lead (II)	Pb ²⁺
Lead (IV)	Pb ⁴⁺
Lithium	Li ⁺
Magnesium	Mg ²⁺
Manganese (II)	Mn ²⁺
Manganese (IV)	Mn ⁴⁺
Mercury (I)*	Hg ₂ ²⁺
Mercury (II)	Hg ²⁺
Nickel	Ni ²⁺
Oxonium **	H ₃ O ⁺
Potassium	K ⁺
Scandium	Sc ²⁺
Silver	Ag ⁺
Sodium	Na ⁺
Strontium	Sr ²⁺
Tin (II)	Sn ²⁺
Tin (IV)	Sn ⁴⁺
Zinc	Zn ²⁺

Negative Ions (anions)	
Acetate	CH ₃ COO ⁻
Borate	BO ₃ ³⁻
Bromate	BrO ₃ ⁻
Bromide	Br ⁻
Carbonate	CO ₃ ²⁻
Chlorate	ClO ₃ ⁻
Chloride	Cl ⁻
Chlorite	ClO ₂ ⁻
Chromate	CrO ₄ ²⁻
Cyanide	CN ⁻
Dichromate	Cr ₂ O ₇ ²⁻
Dihydrogen phosphate	H ₂ PO ₄ ⁻
Fluoride	F ⁻
Hydrogen carbonate	HCO ₃ ⁻
Hydrogen phosphate	HPO ₄ ²⁻
Hydrogen sulfate	HSO ₄ ⁻
Hydrogen sulfide	HS ⁻
Hydrogen sulfite	HSO ₃ ⁻
Hydride	H ⁻
Hydroxide	OH ⁻
Hypochlorite	ClO ⁻
Iodate	IO ₃ ⁻
Iodide	I ⁻
Nitrate	NO ₃ ⁻
Nitride	N ³⁻
Nitrite	NO ₂ ⁻
Oxalate	C ₂ O ₄ ²⁻
Oxide	O ²⁻
Perchlorate	ClO ₄ ⁻
Permanganate	MnO ₄ ⁻
Peroxide	O ₂ ²⁻
Phosphate	PO ₄ ³⁻
Phosphide	P ³⁻
Phosphite	PO ₃ ³⁻
Silicate	SiO ₄ ⁴⁻
Sulfate	SO ₄ ²⁻
Sulfide	S ²⁻
Sulfite	SO ₃ ²⁻

8

COVALENT BONDS

 Si per Cl Mn P SO_x

Cr

Corrected by: x _____ 1



8.1

MOLECULAR COMPOUNDS

Section Review

Objectives

- Distinguish molecular compounds from ionic compounds
- Identify the information a molecular formula provides

Vocabulary

- covalent bond
- diatomic molecule
- molecular formula
- molecule
- molecular compound

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Every substance is either an element or a(n) 1. 1. _____

A compound is either 2 or ionic in nature. Most molecular 2. _____

compounds are composed of two or more 3. Molecules 3. _____

consisting of two atoms are 4 molecules. The chemical 4. _____

formula of a molecular compound is a 5. Molecular 5. _____

compounds tend to have 6 melting and boiling points, while 6. _____

ionic compounds tend to have 7 melting and boiling points. 7. _____

A molecular formula shows how many 8 of each 8. _____

element a molecule contains, but it does not indicate the 9. _____

9 of the molecule.

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- _____ 10. A diatomic molecule contains two or three atoms.
- _____ 11. Molecular compounds have relatively high boiling points.



Name _____ Date _____ Class _____

- _____ 12. The molecular structure of carbon dioxide is one carbon atom with two oxygen atoms on opposite sides of it.
- _____ 13. Covalent bonds exist when combining atoms give up or accept electrons.
- _____ 14. A molecule contains two atoms.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- _____ 15. molecule
- _____ 16. molecular compound
- _____ 17. covalent bond
- _____ 18. diatomic molecule
- _____ 19. molecular formula

Column B

- a. compound composed of molecules
- b. a molecule consisting of two atoms
- c. shows the kinds and numbers present in a molecule of a compound
- d. joins atoms held together by sharing electrons
- e. an electrically neutral group of atoms joined together by covalent bonds

Part D Questions and Problems

Answer the following in the space provided.

20. A compound has a boiling point of 40°C . Is this compound most likely an ionic or a molecular compound?

21. Identify the number and kinds of atoms present in a molecule of each compound.

a. butane (C_4H_{10}) _____

b. fluorobenzene ($\text{C}_6\text{H}_5\text{F}$) _____

22. Classify each particle as an atom or a molecule.

a. CH_4 _____

d. He _____

b. Ne _____

e. CO_2 _____

c. O_2 _____



8.2

THE NATURE OF COVALENT BONDING

Section Review

Objectives

- State a rule that usually tells how many electrons are shared to form a covalent bond
- Describe how electron dot formulas are used
- Predict when two atoms are likely to be joined by a double or a triple covalent bond
- Distinguish between a single covalent bond and other covalent bonds
- Describe how the strength of a covalent bond is related to its bond dissociation energy
- Describe how resonance structures explain bonding
- Identify some exceptions to the octet rule

Vocabulary

- single covalent bond
- structural formulas
- unshared pairs
- double covalent bonds
- triple covalent bonds
- coordinate covalent bond
- polyatomic ion
- bond dissociation energy
- resonance structures

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

When atoms share electrons to gain the 1 configuration **1.** _____
of a noble gas, the bonds formed are 2. A 3 pair of **2.** _____
valence electrons constitutes a 4 covalent bond. Pairs of **3.** _____
valence electrons that are not shared between atoms are called **4.** _____
5. Sometimes two or three pairs of electrons may be shared **5.** _____
to give 6 covalent bonds. In some cases, only one of the **6.** _____
atoms in a bond provides the pair of bonding electrons; this is a **7.** _____
7. 8 is required to break covalent bonds between **8.** _____
atoms. The total energy required to break the bond between two **9.** _____
covalently bonded atoms is known as the 9. **10.** _____

When it is possible to write two or more valid electron dot
formulas for a molecule or ion, each formula is referred to as a 10.



Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- _____ 11. The modern interpretation of resonance is that electron pairs rapidly flip back and forth between the various electron dot structures.
- _____ 12. The compound NH_3 contains two double covalent bonds.
- _____ 13. The chemical formulas of molecular compounds show the number and type of atoms in each molecule.
- _____ 14. A molecule of bromine has six unshared pairs of electrons.
- _____ 15. Carbon forms four single covalent bonds with other atoms.
- _____ 16. A bond in which one atom contributes both bonding electrons is called a polyatomic covalent bond.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- _____ 17. single covalent bond
- _____ 18. structural formula
- _____ 19. bond dissociation energy
- _____ 20. polyatomic ion
- _____ 21. coordinate covalent bond

Column B

- a. a chemical formula that shows the arrangement of atoms in a molecule or a polyatomic ion
- b. the amount of energy required to break a covalent bond between atoms
- c. a tightly bound group of atoms that has a positive or negative charge and behaves as a unit
- d. a covalent bond in which one atom contributes both bonding electrons
- e. a chemical bond in which only one pair of electrons is shared by two bonded atoms

Part D Questions and Problems

Answer the following in the space provided.

22. Draw electron dot structures for each of the following compounds
- a. Br_2
- b. HCN
- c. NH_4^+



8.4

POLAR BONDS AND MOLECULES

Section Review

Objectives

- Describe how electronegativity values determine the charge distribution in a polar bond
- Describe what happens to polar molecules when placed between oppositely charged metal plates
- Distinguish intermolecular attractions from ionic bonds and from covalent bonds
- Identify the reason network solids have high melting points or decompose without melting

Vocabulary

- nonpolar covalent bond
- polar covalent bond
- polar bond
- polar molecule
- dipole
- van der Waals forces
- dipole interactions
- dispersion forces
- hydrogen bonds
- network solids

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

When like atoms are joined by a covalent bond, the bonding electrons are shared 1, and the bond is 2. When the atoms in a bond are not the same, the bonding electrons are shared 3, and the bond is 4. The degree of polarity of a bond between any two atoms is determined by consulting a table of 5. The attractions between opposite poles of polar molecules are called 6. Another strong intermolecular attractive force is the 7, in which a hydrogen covalently bonded to a very 8 atom, such as 9, is also weakly bonded to an unshared electron pair of another electronegative atom.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____



Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- _____ 10. In a polar covalent bond, the more electronegative atom has a slight positive charge.
- _____ 11. In general, the electronegativity values of nonmetallic elements are greater than the electronegativity values of metallic elements.
- _____ 12. A molecule with polar bonds is dipolar.
- _____ 13. Covalent compounds are network solids.
- _____ 14. If the electronegativity difference between two atoms is greater than 2.0, they will form an ionic bond.
- _____ 15. ~~Dispersion forces are weaker than hydrogen bonds.~~

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- _____ 16. nonpolar covalent bond
- _____ 17. polar covalent bond
- _____ 18. polar molecule
- _____ 19. ~~van der Waals forces~~
- _____ 20. ~~network solid~~

Column B

- a. a substance in which all of the atoms are covalently bonded to each other
- b. a bond formed when the atoms in a molecule are alike and the bonding electrons are shared equally
- c. a term used to describe the weakest intermolecular attractions; these include dispersion forces and dipole interactions
- d. a bond formed when two different atoms are joined by a covalent bond and the bonding electrons are shared unequally
- e. a molecule in which one end is slightly positive and the other end is slightly negative



8

COVALENT BONDING

Practice Problems

In your notebook, solve the following problems.

SECTION 8.1 MOLECULAR COMPOUNDS

- Classify each of the following as an atom or a molecule.
 - Be
 - CO₂
 - N₂
 - H₂O
 - Ne
 - CO
- Which of the following are diatomic molecules?
 - CO₂
 - N₂
 - O₂
 - H₂O
- What types of elements tend to combine to form molecular compounds?
- What information does a molecule's molecular structure give?
- How do ionic compounds and molecular compounds differ in their relative melting and boiling points?

SECTION 8.2 THE NATURE OF COVALENT BONDING

- Draw the electron dot structure for hydrogen fluoride, HF.
- Draw the electron dot structure for phosphorus trifluoride, PF₃.
- Draw the electron dot structure for nitrogen trichloride, NCl₃.
- Draw the electron dot configuration for acetylene, C₂H₂.
- How many resonance structures can be drawn for CO₃²⁻? Show the electron dot structures for each.

SECTION 8.3 BONDING THEORIES

- Predict the shape and bond angle for the compound carbon tetrafluoride, CF₄.
- Predict the shape and bond angle for phosphorus trifluoride, PF₃.
- ~~Predict the type of hybridized orbitals involved in the compound boron trichloride, BCl₃.~~
- ~~What types of hybrid orbitals are involved in the bonding of the silicon atoms in silicon tetrafluoride, SiF₄?~~
- Predict the shape and bond angle of fluorine monoxide, F₂O.



Lewis Structures

Fill in the chart as best as you can because this is worth lots of pts

Chemical Name	Chemical Formula	Number of Electrons	Lewis Dot Structure	Structure Shape (s)	Bond Angle (s)
Ammonia	NH ₃	8	H H-N: H	Trigonal planar	~ 107.5
Alcohol	H ₅ C ₂ OH	16	H H H H-C - C - O : H H	Tetrahedral Tetrahedral Bent	109.5 109.5 104.5
	Na ₃ P			*	*
Methanol	H ₃ COH			* *	* *
Carbon Dioxide				*	*
Water					

* = one answer



Lewis Structures 2

Fill in the chart as best as you can because this is worth lots of pts

Chemical Name	Chemical Formula	Number of Electrons	Lewis Dot Structure	Structure Shape (s)	Bond Angle (s)
Ammonia	NH ₃	8	H H-N: H	Trigonal planar	~ 107.5
Meth_____	CH ₄				
	H ₃ P			*	*
Methanoic Acid	HCO ₂ H			* *	* *
Sulfur Dioxide				*	*
Sulfur DiChloride					

* = one answer



Lewis Structures 3

Fill in the chart as best as you can.

Chemical Name	Molecular Formula	# of Val. Electrons	Ionic or Covalent Transfer or Share	Lewis Dot Structure	Structure Shape (s) Extra Credit	Bond Angle (s) Extra Credit
Ammonia	NH ₃ 5+1+1+1=	8		H H-N: H	Trigonal planar	~ 107.5
Eth_____	C ₂ H ₆					
Prop_____	C ₃ H ₈				*	*
	H ₂ O				*	*
					*	*
Sulfur Trioxide					*	*
Hydrogen Peroxide	H ₂ O ₂					
	Formula Unit Ionic				*	*
Sodium Nitride						
	CaF ₂				*	*
					*	*



Lewis Structures 3

Fill in the chart as best as you can.

Chemical Name	Polyatomic Molecular Formula	# of Val. Electrons	Ionic or Covalent Transfer or Share	Lewis Dot Structure	Structure Shape (s) Extra Credit	Bond Angle (s) Extra Credit
Hydroxide						
Cyanide						
Sulfide					*	*
Sulfite					*	*
					*	*
Sulfate					*	*
Hydrogen Sulfate or (Sulfuric Acid)						
	Formula Unit Ionic				*	*
Potassium Sulfide						
Aluminum Oxide					*	*
					*	*



Electrical Conductivity Of Solutions

Problem

To test the electrical conductivity of various compounds in different states.

Introduction

An electric current is explained to be a flow of electrons. Since all matter is composed of atoms, and all atoms contain electrons; then it would seem that every piece of matter is potentially equipped to accommodate such a flow of electrons. However, it is common knowledge that only some materials will permit the passage of electricity, and are referred to as electrical conductors. Those materials that will not conduct a significant amount of electricity are nonconductors.

Metals are generally good conductors of electricity. This is explained by the fact that their atoms have only few electrons in their out energy levels, and these electrons are rather loosely bound. Under suitable "electrical pressure" these electrons can be caused to flow and produce an electric current.

In addition to metals, some water solutions will also conduct electricity. In this experiment, this property of solutions will be investigated by testing the conductivity of a number of compounds, and water solutions of these compounds.

Procedure

The conductivity apparatus will be demonstrated and explained by your instructor. If the test sample will conduct enough electricity to cause the light bulb to noticeably light up, it will be classified as a conductor (C); if not as a nonconductor (N).

Compound or Solution	Prediction Conduct or Not Conduct	Actual Conduct or Not Conduct	Bond Type	
			<u>Only Metals</u> Metallic	<u>Metal & non</u> Ionic <u>Non-Metals Covalent</u> Polar or Nonpolar
1. Potassium nitrate solution	C		Ionic	
2. Potassium nitrate, solid	N			
3. TAP Water			Metals(minerals)	Non
4. Distilled Water				
5. Copper II Nitrate $\text{Cu}(\text{NO}_3)_2$				
6. Propanol ($\text{C}_3\text{H}_7\text{OH}$)				
7. Sugar, solid				
8. Sugar solution				
9. Aluminum				
10. Glass (SiO_2)				
11. Crystal				
12. Staples Iron Fe				
13. Copper Wire				

Analysis

- Substances with what type of bonds do not conduct? Why?
- Substances with what type of bond conduct well? Why?
- Why do you think Tap water conducts but distilled water doesn't conduct?
- Why doesn't sugar water conduct?
- Why didn't all the metals conduct electricity?
- Rust is formed from Oxygen. When it bonds to metals it's ionic. Why doesn't rust conduct?



8 Covalency Labs

Pinch An Inch

Directions: Punch some holes in the side of a can or bottle. Fill the bottle with water and watch the 3 streams flow out separately. Pinch the 3 streams together. Surface tension will do a trick.

Why does water stick together?

Slide on Down

Directions: Gently slide two micro-slides together and then slide them apart. Do not break the slides. On two other slides, place a drop of water between the two slides. How was it different the second time? Why?

Water Rockets

Directions: Pour some water in a glass and float two matchsticks on the surface about 2 cm apart. Add a small amount of detergent or soap to the water between the sticks. What happens? Why?

Walk on Water

Directions: Try to float a paper clip, heavy gauge wire, aluminum foil or screen material on clean water. Add a drop of detergent or soap to it? What happened? Why?

Pride Comes before a Fall

Directions: Add a drop of water to wax paper? Inspect it from a few angles. Then add a drop of detergent or soap to it? What happened? Why?

Directions: Add water to a thin container. When it gets close to the top keep adding as much as possible until it overflows. Inspect it from a few angles. Then add a drop of detergent or soap to it? What happened? Why?

Questions

1. What is the electronegativity of Oxygen =
2. What is their difference Hydrogen = - _____
/Oxygen - Hydrogen/ = _____
3. What type of bond does water have?
4. Why does oxygen and Hydrogen yield such a bond?
5. Does oxygen or Hydrogen pull electrons more? Why?

COVALENT	MODERATELY POLAR COVALENT	VERY POLAR COVALENT	IONIC
0.0-----	0.4-----	1.0-----	2.0-----4.0



Swirly Milk Chromatography

Purpose: To observe separation by polarity (liquid chromatography)

Material: Milk, soap, food coloring, pipette

Procedure: Place 3-5 drops of various food colors into a petri dish of milk. Then place 2 drops of liquid soap or detergent near the middle of the petri-dish between the color drops.

Observations:

before soap _____

after soap _____

Analysis:

Water has polar (+ & -) charges. Fats are mostly non-polar (neutral charge). Food color dissolves in water rather than fats while oils and fats dissolve very well in soap. Discuss around and debate in your group the best detailed explanation for the movement.

Conclusion:

The food coloring probably in circles because:

Questions:

1. Which way did the food color move first?
2. If the colors moved outward, which way did the fats move?
3. What were the fats attracted to, that they moved that way?
4. Which way did the water flow? Why?

The Water Bender Trick

Directions:

1. Rub the electrons of a pipe made of PVC (Poly Vinyl Chloride).
2. Without contacting the water put the pipe near a small by steady stream of faucet water.
3. Notice the magic of "Water Bending"

Observations:

1. What happened?

Conclusion:

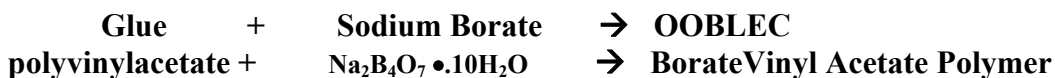
1. Why?



16

OUBLEC MATTERS

Reaction:



Introduction

Borax is a hydrate of **sodium tetraborate**. **Elmer's Glue** ® & similar products are polymers that can be emulsified in water. The chemical structure involves long chains of carbon atoms, 10,000 or more hooked together in a row, with half the carbons having either a hydroxyl (-OH) group or an acetoxy (-OCOCH₃) group attached. The chemical reaction between these two compound is a synthesis or combination reaction in which the product has a regular repeating pattern (like a **crystal**). Because the repeating patterns are long chain of non-metals, the is called a **polymer**.

Lab Directions

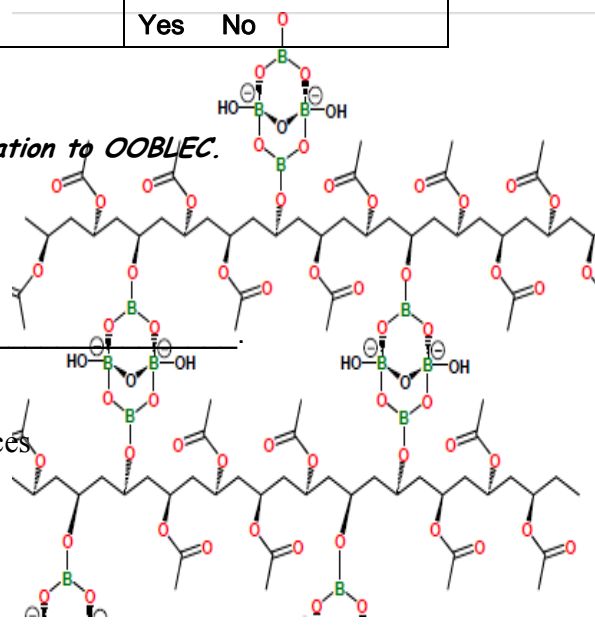
1. For each group add Sodium Borate Solution (4% Borax in water) to Elmers glue in a 1:1 ratio.
2. Stir with a straw or stirring rod.
3. Pull out of solution and mush around in your hands, making sure 100% has reacted.
4. Try bouncing and changing the shape before stuffing into the balloon.
5. For best effect put it into a dark colored medium size balloon & then a small light one.
6. Fill in the below chart, checking which phase changes shape and which changes volume.

Circle Yes or No	Solids	Liquids	Gases
Change Shape	Yes No	Yes No	Yes No
Change Volume	Yes No	Yes No	Yes No

Introduction to Matter

Complete the 5 sentences using the words below explaining their relation to OUBLEC.

1. **Physical Property** **Chemical Change**
 When glue is mixed with the borax, a chemical change is observed as the physical property appearance or property is different.
2. **Solution(s)** **Precipitate**
 The two _____ with dissolved solids reacted to form a solid
3. **Organic** **Inorganic**
 The molecule in glue has carbon from living organisms and is thus _____ but borate comes from non-living _____ substances
4. **Elements** **Compounds**
 Boron, Hydrogen and Oxygen are _____ but altogether when in one molecule they are _____
5. **Solutes** **Solvents** **Solutions**
 _____ are made from solutes like salt dissolved in _____



7 & 8 Jeopardy Bonding

- 1-100 How many valence electrons does a helium atom have?
- 1-200 $1s^2 2s^2 2p^6 3s^2 3p^4$ magnesium Cobalt Sulfur Selenium
- 1-300 What is the electron configuration of the calcium ion?
- 1-400 For ${}_{35}\text{Br}$, the numbers 35, 79.904, & 45 represent
- 1-500 How many electrons does barium have to give up to achieve a noble-gas electron configuration?
- 2-100 The atomic radii of the following groups of the substance are arranged from smallest to greatest distance
- 2-200 Ionization energy of the following groups are arranged from smallest to greatest. Explain. Na, Si, Cl Na, K, Cs
- 2-300 How many electrons does N gain in order to achieve a noble-gas electron configuration? Na, P, Cl O, S, Se
- 2-400 The shielding of the following groups are arranged from greatest to smallest or smallest to greatest
- 2-500 Which of the following are arranged with all electronegativities from smallest to greatest.
- a. H, Li, Na, K b. K, Se, Br, Kr c. Li, B, N, F
- 3-100 The below Lewis dot structures are all correct
- 3-200 Blue, red, yellow, purple & brown columns usually have the following valences or lewis dots
- A. 1,2, 2 to 3, 1 & 8 B. 1,2, 1 to 4, 7 & 8 C. 1,2, 3 to 4, 1 & 8 D. None correct
- 3-300 The electron configuration of a fluoride ion, F, is ____.
- 3-400 Calculate the charge on each ion. X_2Y_3 3-
- 500 How many valence electrons does each have?
- 4-100 NaCl is held together by an Ionic Bond and CuZn is held together by a Metallic Bond
- 4-200 In AlCl_3 Al loses ____ electrons & Cl gains ____ electrons.
- 4-300 Which of the following is true about an ionic compound? A. It's a salt. B. It's composed of anions and cations.
C. It is held together by ionic bonds. D. all of the above
- 4-400 What is the formula unit of sodium nitride?
- 4-500 What type of bond would the below two substances form? Why? $1s^2 2s^2 2p^5$ & $1s^2 2s^2 2p^6 3s^2$
- 5-100 What is the formula for sodium sulfide?
- 5-200 Covalent bonds form rather than ionic because a. Each atom needs electrons b. 1 atoms needs electrons
c. No atoms need electrons d. Both atoms share electrons e. More than one answer
- 5-300
- 5-400 Calculate the difference in electro-negativity difference between Hydrogen and oxygen
- 5-500 Draw the electron dot structure for H_2S :
- 6-100 What is the name of the ionic compound formed from lithium and bromine?
- 6-200 Which two atoms can have the most violent reactions A. Na, F B. Na, Cl C. Cs, F D. Cs, Cl
- 6-300 Ionic bond is a bond between ____.
- 6-500 Sugar burns under fire and salt doesn't. Why? What type of bonds?
- 7-100 In the nonpolar substance XY, X could have an electronegativity of 2.0 & Y could have an electronegativity of 3.5
- 7-200 Which one has a single covalent bond? A. CO_2 B. O_2 C. N_2 D. F_2 E. Na_2S
- 7-300 Which are monomers and which are polymers and explain? Aminos Glucose Nucleotides
Proteins Starch DNA
- 7-400 Which atom(s) can be diatomic? Which one makes 3 covalent bonds?
- 7-500 How many Neutrons, Electrons & Protons does Potassium have in that order?
- 8-100 What is the skeletal structure of 2,3, dimethyl 1-butanol
- 8-200 What is the best way to remember all of the diatomic atoms? _____
- 8-300 S sublevels hold ____ electrons D holds ____ P holds ____ F holds ____
- 8-400 Alpha _____ Beta _____ Gamma _____



Shielding is constant →
 Atomic radius decreases →
 Ionization energy increases →
 Electronegativity increases →
 Nuclear charge increases →

Periodicity Practice

Nuclear charge increases ↓
 Shielding increases ↓
 Atomic radius increases ↓
 Ionic size increases ↓
 Ionization energy decreases ↓
 Electronegativity decreases ↓

1A	2A	3A	4A	5A	6A	7A	0
Li							Ne
Na						I	Ar
Rb							Xe
Cs						t	Rn

Ionic size (cations) decreases → → Ionic size (anions) decreases

Questions (For each question, circle the correct **answer** & the correct **reason**)

- | | <u>Answer</u> | <u>Reason(s)</u> | | |
|---|---------------|---------------------|--------------------|----------------|
| 1. Which has the higher nuclear charge ? Li Be Na Mg | | greater distance | more protons | |
| 2. Which has the lowest nuclear charge? Li Be Na Mg | | smaller distance | less protons | |
| 3. Which has the higher nuclear charge? I Xe At Ba | | greater distance | more protons | |
| 4. Which has the lowest nuclear charge? I Xe At Ba | | smaller distance | less protons | |
| 5. Which has the greatest shielding ? Li Na Rb Cs | | more electrons | more energy levels | |
| 6. <u>Which</u> has the least shielding? Li Na Rb Cs | | less electrons | less energy levels | |
| 7. Which has the greatest shielding? Li Mg I Rn | | more electrons | more energy levels | |
| 8. Which has the same shielding? F Cl I Xe | | same electrons | same energy levels | |
| 9. Which has the greatest atomic radius ? F Ne Cl Ar | | <u>less protons</u> | <u>more levels</u> | <u>both</u> |
| 10. Which has the smallest atomic radius? F Ne Cl Ar | | <u>more protons</u> | <u>more levels</u> | <u>both</u> |
| 11. Which has the greatest atomic radius? Li Be Na Mg | | <u>less protons</u> | <u>more levels</u> | <u>both</u> |
| 12. Which has the smallest atomic radius? Li Be Na Mg | | <u>more protons</u> | <u>more levels</u> | <u>both</u> |
| 13. Which has the greatest ionic radius ? I Xe At Rn | | <u>less protons</u> | <u>more levels</u> | <u>both</u> |
| 14. Which has the smallest ionic radius? Rb Sr Cs Ba | | <u>less protons</u> | <u>more levels</u> | <u>neither</u> |
| 15. Which has the greatest ionic radius? Li Be F Ne | | <u>less protons</u> | <u>more levels</u> | <u>neither</u> |
| 16. Which has the smallest ionic radius? Cs Rb Na Li | | <u>less protons</u> | <u>less levels</u> | <u>both</u> |
| 17. Which has the lowest ionization energy ? Cs Rb Na Li | | <u>less protons</u> | <u>more levels</u> | <u>both</u> |
| 18. Which has the highest ionization energy? Cs Rb Na Li | | <u>more protons</u> | <u>less levels</u> | <u>both</u> |
| 19. Which has the lowest ionization energy? F Ne Cl Ar | | <u>less protons</u> | <u>more levels</u> | <u>both</u> |
| 20. Which has the highest ionization energy? F Ne Cl Ar | | <u>more protons</u> | <u>less levels</u> | <u>both</u> |
| 21. Which has the lowest electronegativity ? F Ne Cl Ar | | <u>more protons</u> | <u>less levels</u> | <u>neither</u> |
| 22. Which has the highest electronegativity? F Ne Cl Ar | | <u>more protons</u> | <u>less levels</u> | <u>both</u> |
| 23. Which has the lowest electronegativity? Cs Rb Na Li | | <u>less protons</u> | <u>more levels</u> | <u>both</u> |
| 24. Which has the highest electronegativity? Rb Cs Sr Ba | | <u>less protons</u> | <u>more levels</u> | <u>neither</u> |



4 - 8 Cumulative & Reteaching**4 Atomic Structure**

Problem Number	Symbol	Isotope Name	Avg Atomic Mass	Mass Number	Atomic Number =	Neutrons	Electrons	Protons
1.	45 ? 21	Scandium-?	44.9			=		

Directions: Look at the above tables & highlight all appropriate answers (**all, some or none are correct**).

- Isotopes of the same element the same number of: _____ protons, electrons, neutrons,
- Elements are always Identified by the same: _____ protons, neutrons, atomic mass
- Ions are formed because of a losing or gaining _____ protons, neutrons, electrons

25 Nuclear Chemistry

5.	Proton	6.		7.	Beta	8.	
Mass	1 amu						
Letter	P		He			Y	
Charge	+1						

Fill in all missing numbers	Reaction type	Radioisotope	Reactants	Reacts To Produce	Products	Fission Or Fusion
9.	Alpha decay	Thorium	^{209}Po	\rightarrow	^2He +	

- Which results in a decrease in the atomic number and atomic mass? (Alpha decay, beta decay, Alpha Capture)
- Alpha decay results in a loss of ___ a.m.u's and a loss of ___ positive nuclear charge. (4,2 or 2,1 or neither)

5&6 Electron Configuration

	Element	Electron Configuration	Noble Gas Shorthand	Highest Energy Level with Electrons	# electrons in highest level	Lewis Dot
12.		$1s^2 2s^2 2p^6 3s^2 3p^6$				

- In " $3s^2$ ", the 3 represents which 3 \rightarrow (column, group, family, period, row or energy level).
- In " $3s^2$ ", the s^2 represents which one? (alkalis, alkali earth, halogens, noble gas).
- In " $3s^2$ ", the s^2 represents which 3 \rightarrow (column, group, family, period, row or energy level).

7 Ions and Bonding

- Which 2 have 1 valence electron? (sodium, magnesium, Group 1A, Group 3A)
- Magnesium's charge after reacting would be (1-, 0, 1+, 2+)
- Cation** means (a positive ion, a neutral ion, a negative ion) while the **Cation** is always written (first, last).
- Which Lewis Dot is correct for Magnesium after it becomes an ion? (Mg, Mg., Mg:, none correct)
- Which formula is correct? (MgCl, MgCl₂, MgCl₃)

8 Covalent Bonding

- What type of bond is Na Cl? (covalent, ionic, metallic)
- What type of bond is in H₂O? (covalent, ionic, metallic)
- Why is H₂O polar? (H & O share e- evenly, they share unevenly, they don't share)
- Why are ionic bonds stronger than covalent? (ions are + & - charges which attract, covalent share, neither)
- Which have higher melting points? (ionic bonds, polar bonds, neither) **corrected by: _____**



First Name, Last

Period

SCORE: /10 pts

8 Covalent & Ionic Bonding Formative Assessment 5

Directions:

Use your Periodic Table and help sheets. Circle the best answer.

- Ionic bonds are made from: Metals Non-metals Both
- Diatomic covalent bonds are made from:
2 Metal atoms (Cu₂) 2 identical Non-metals atoms (H₂)
- In Flourine F₂, there are (is) _____ shared Covalent single bonds(1, 2, 3).
- A molecule is made of: a metal & a nonmetal (NaCl) 2 Non-metals (H₂O)
- A crystal is made of: a metal & a nonmetal (NaCl) 2 Non-metals (H₂O)
- If Na₁₀₀Cl₁₀₀ is the Crystal Formula what is NaCl?
Molecular Formula Formula Unit Neither

True or False

- ____ Br, I, N, Cl, H, O & F are diatomic molecules and should be written as "X₂".
- ____ Solids and liquids tend to be ionic and polar covalent with the positive and Negative charges causing the atoms and molecules to stick together having High boiling and melting points.
- ____ Gases tend to be formed by molecules with + & - dipole causing them to hold together as gases.
- Below, draw the Lewis Structure with bonds and valence electrons for SCl₂.



Ionic Dot Structure Practice

<p>1 Potassium & Fluorine</p> <p>.. K.--> .F: ..</p> <p>Charges: $K^{+1} F^{-1}$ Formula: KF Name: Potassium Fluoride</p>	<p>6 Strontium & Bromine</p> <p>Charges _____ Formula _____ Name _____</p>	<p>11 Calcium & Nitrogen</p> <p>Charges _____ Formula _____ Name _____</p>
<p>2 Calcium & Oxygen</p> <p>Charges _____ Formula _____ Name _____</p>	<p>7 Cesium & Oxygen</p> <p>Charges _____ Formula _____ Name _____</p>	<p>12 Aluminum & Sulfur</p> <p>Charges _____ Formula _____ Name _____</p>
<p>3 Aluminum & Phosphorus</p> <p>Charges _____ Formula _____ Name _____</p>	<p>8 Calcium & Iodine</p> <p>Charges _____ Formula _____ Name _____</p>	<p>13 Iron (III) & Oxygen</p> <p>Charges _____ Formula _____ Name _____</p>
<p>4 Barium & Oxygen</p> <p>Charges _____ Formula _____ Name _____</p>	<p>9 Lithium & Phosphorus</p> <p>Charges _____ Formula _____ Name _____</p>	<p><u>Covalent Structure Practice</u> Follow CNOF 4321 Valence- rules</p> <p>14 H_3P</p> <p>15 Cl_2O</p> <p>16 H_3COH</p> <p>17 NF_3</p>
<p>5 Barium & Chlorine</p> <p>Charges _____ Formula _____ Name _____</p>	<p>10 Magnesium & Silicon</p> <p>Charges _____ Formula _____ Name _____</p>	



8 Covalent Bonds		___ / ___ pts	First Last Name ___ Per ___
			Cornell Question & Ans
			Directions: Make 5 questions & answers that are different than the Anticipatory Response
Anticipatory Response			
1. Covalent bonds are between two non-metals? Y N			1.
2. Double bonds have 2 shared electrons between 2 atoms? Y N			
3. Water has a polar covalent bond bcuz /2.5-2.1/=0.4? Y N			
4. CNOF says Carbon makes 4 bonds, nitrogen 3...? Y N			2.
5. When building molecules C Goes on the sides? Y N			
			3.
			4.
Anticipatory Response			
1. Oxygen makes 2 bonds & has six valence electrons? Y N			
2. Nitrogen makes 3 bonds & Has 3 valence electrons? Y N			5.
3. Hydrogen & Halogens are on Molecules edges bcuz they Make only 1 bond? Y N			
4. Oxygen often has 4 unpaired Electrons? Y N			
5. Gas molecules are polar because they stick together? Y N			
Summary Section:			

