



BONDING AND BALANCING

Physical Science Spring 2017



NAME: _____

CLASS PERIOD: _____

TEACHER: _____

ASSIGNMENT	PAGE NUMBERS	DUE DATE	HW POINTS EARNED	LAB POINTS EARNED
Learning Targets: Chemical Bonding	1-2			
Atomic Structure and Ions WS	3-4			
Baggie Isotopes and Ions Lab	5-6			
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Bonding and Balancing Chemical Equations Review	18-19			
TOTAL				

Learning Targets: Chemical Bonding

Refer to Chapters 6 and 7 in your textbook for assistance.

Answer the following questions to identify your level of understanding:

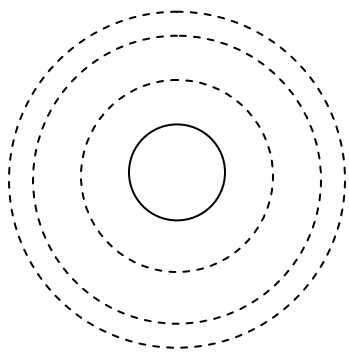
Learning Targets:	1 – Below Standard	2 – Approaching Standard	3 – At Standard	4 – Above Standard																								
<p>A. I can explain how ions and ionic bonds are formed.</p>	<p>What types of elements tend to form negative ions? Positive?</p>	<p>What determines the charge that an ion takes?</p>	<p>What types of elements and ions come together to form ionic bonds? What determines their ratio?</p>	<p>Why don't transition metals have an easy pattern to determine their ion charges?</p>																								
<p>Growth Chart:</p> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>1st</th> <th>2nd</th> <th>3rd</th> </tr> </thead> <tbody> <tr> <td>Lvl 4</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Lvl 3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Lvl 2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Lvl 1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>None</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		1st	2nd	3rd	Lvl 4				Lvl 3				Lvl 2				Lvl 1				None							
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<p>B. I can explain the meaning of a chemical formula for an ionic compound and for a molecule.</p>	<p>What is the difference between a molecule and an ionic compound?</p>	<p>How many atoms are found in the following compounds?</p>	<p>Circle any compounds below that are molecules. Put a square around any ionic compounds.</p>	<p>Explain how changing the chemical formula can change its chemical properties.</p>																								
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<p>C. I can give examples to illustrate that molecules are groups of two or more atoms bonded together, and how these molecules can form bonds.</p>	<p>What is the difference between an element and a compound?</p>	<p>How many types of chemical bonds are there? What is the difference between them?</p>	<p>List the chemical formulas of 3 molecules you come into contact with every day.</p>	<p>Why is N₂ a more stable molecule than O₂?</p>																								
<p>Growth Chart:</p> <table border="1" data-bbox="92 321 447 651"> <thead> <tr> <th></th> <th>1st</th> <th>2nd</th> <th>3rd</th> </tr> </thead> <tbody> <tr> <td>Lvl 4</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Lvl 3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Lvl 2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Lvl 1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>None</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		1st	2nd	3rd	Lvl 4				Lvl 3				Lvl 2				Lvl 1				None							
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<p>D. I can use a chemical equation to illustrate how the atoms in molecules are arranged before and after a reaction.</p>	<p>What are the compounds or elements called if they are present at the beginning of a reaction? At the end?</p>	<p>What are three reactions that you observe occurring every day?</p>	<p>Balance the following equations.</p>	<p>What does a catalyst do when added to a chemical reaction?</p>																								
<p>Growth Chart:</p> <table border="1" data-bbox="92 1044 447 1373"> <thead> <tr> <th></th> <th>1st</th> <th>2nd</th> <th>3rd</th> </tr> </thead> <tbody> <tr> <td>Lvl 4</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Lvl 3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Lvl 2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Lvl 1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>None</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		1st	2nd	3rd	Lvl 4				Lvl 3				Lvl 2				Lvl 1				None						<p>__H₂+__O₂ → __H₂O</p> <p>__Cu+__FeCl₃→__Fe+__CuCl₂</p> <p>__Al + __O₂ → __Al₂O₃</p>	
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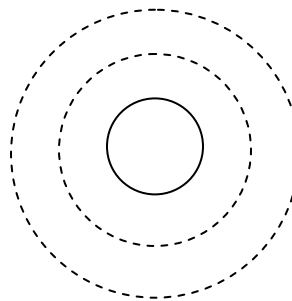
Atomic Structure and Ions Worksheet

Part One: Atomic Structure: Using the mass number given and the atomic number of the element, complete the diagrams. Draw the electrons in their proper energy levels and place the correct number of protons and neutrons in the nucleus.

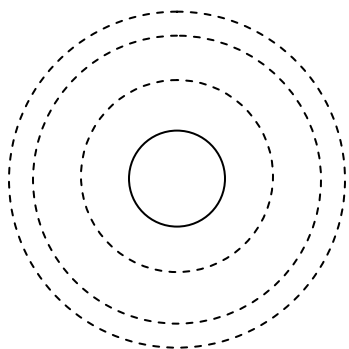
1. Sulfur
mass number =33



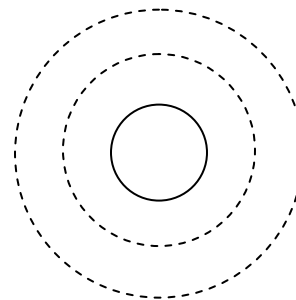
2. Beryllium
mass number =8



3. Sodium
mass number =21



4. Nitrogen
mass number =15



Part Two: Formation of Ions: For each atom above, predict if the atom will lose or gain electrons, and predict the number of electrons it will lose or gain (write this number in the second blank). Then predict the charge on the ion.

5. Sulfur will _____ _____ electrons. The sulfur ion will have a charge of _____.
gain/lose #

6. Beryllium will _____ _____ electrons. The beryllium ion will have a charge of _____.
gain/lose #

7. Sodium will _____ _____ electrons. The sodium ion will have a charge of _____.
gain/lose #

8. Nitrogen will _____ _____ electrons. The nitrogen ion will have a charge of _____.
gain/lose #

Part Three: Dot Diagrams: Draw the electron dot diagram (Lewis dot diagram) for these four elements.

9. Sulfur

10. Beryllium

11. Sodium

12. Nitrogen

Complete the chart below:

Element	Dot Diagram	Ion Charge	Element	Dot Diagram	Ion Charge
Aluminum			Chlorine		
Lithium			Oxygen		
Phosphorus			Arsenic		
Selenium			Calcium		
Neon			Fluorine		
Potassium			Carbon		

Baggie Isotopes Lab

OBJECTIVE – To identify physical models of isotopes

MATERIALS – *14 “isotopes”

PROCEDURE –

1. Obtain 1 bagged isotope. (blue = protons, black = neutrons, green = electrons)
2. Determine the identity of the isotope by recording the necessary data in the data table.
3. Repeat steps 1 and 2 with the other 13 isotopes.

DATA

BAGGIE #	# PROTONS	# NEUTRONS	# ELECTRONS	SYMBOL AND MASS #
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

POINTS TO PONDER: Please answer the following questions using *complete sentences*.

1. What is the same about isotopes of the same element?
2. What is the difference between isotopes of the same element?
3. What is the average atomic mass of the element Nitrogen?
4. Which isotope of Nitrogen is more common: N-14 or N-15? Explain your choice.

Baggie Ion Lab

OBJECTIVE: To identify physical models of ions

MATERIALS: 14 “ions”

PROCEDURE:

1. Obtain 1 bagged ion. (blue = protons, black = neutrons, green = electrons)
2. Count the number of each of the subatomic particles with your partner and record your data in the table below. (You each need to complete one of these papers)
3. Determine the number of valence electrons that element will have. (Use your periodic table if needed)
4. Identify if the ion would lose, gain or share electrons, as well as the charge for that element.
5. Repeat steps 1-4 until you have recorded information for all 14 baggies.

Baggie number	# Protons	# Neutrons	# electrons	Symbol and Mass number	Valence electrons	Lose, gain or share	Charge
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

POINTS TO PONDER: Please answer the following questions using *complete sentences*.

1. Why do atoms form ions?
2. Why did some of the elements have an oxidation state (charge) of 0?
3. How do the oxidations states (charges) compare for isotopes of the same element?
4. What do you notice about the number of electrons for each ion baggie? Why does this occur?

Ionic Bonding with Envelopes

Magnesium and Oxygen

Chemical Formula_____

Name_____

Aluminum and Nitrogen

Chemical Formula_____

Name_____

Magnesium and Chlorine

Chemical Formula_____

Name_____

Aluminum and Chlorine

Chemical Formula_____

Name_____

Sodium and Oxygen

Chemical Formula_____

Name_____

Aluminum and Oxygen

Chemical Formula_____

Name_____

Ionic Bonding Worksheet

Label and complete the following steps for problems 1–6:

- Draw the electron dot diagram for each element given
- Show the transfer of electrons (w/ arrows)
- Write the formula for each compound
- Name the compound
- If no reaction would take place, write “NR” for steps B–D

1. Barium and Oxygen

2. Rubidium and Bromine

3. Aluminum and Fluorine

4. Calcium and Iodine

5. Carbon and Helium

6. Strontium and Phosphorus

Label and complete the following steps for problems 7–12:

- a. Draw the electron dot diagram for each element given
- b. Show the transfer of electrons (w/ arrows)
- c. Write the formula for each compound
- d. Name the compound
- e. If no reaction would take place, write “NR” for steps B–D

7. Aluminum and Chlorine

8. Sodium and Oxygen

9. Phosphorus and Arsenic

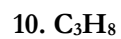
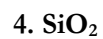
10. Calcium and Selenium

11. Neon and Fluorine

12. Potassium and Nitrogen

Covalent Bonds Worksheet

Using Electron dot diagrams, draw the covalent bonds of the following.



11. What is the difference between the bonds of H₂, O₂ & N₂?

12. What are two ways the covalent bonds are similar to ionic bonds?

-

-

13. What are two ways the covalent bonds are different from ionic bonds?

-

-

14. Are each of the following compounds ionic or covalent? Explain your reasoning for each –

PCl₃ - _____

CaCl₂ - _____

PbI - _____

C₆H₁₂O₆ - _____

15. Write a rule to identify whether a compound is ionic or covalently bonded-

Counting Atoms Worksheet

BACKGROUND INFORMATION: 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. The number of atoms is indicated by the use of small numbers called *subscripts*. Sometimes groups of atoms act as a single atom. Such a group 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 $\text{Fe}(\text{OH})_3$ indicates the combination of one atom of iron, Fe, 3 atoms of oxygen, O, and 3 atoms of hydrogen, H.

INSTRUCTIONS: In the following examples, list each element in the compound and the number of atoms of each element present. An example has been done for you. You may already be familiar with some of the compounds listed below.

NAME	USE	FORMULA	ATOMS IN FORMULA
Calcium carbonate	Limestone	CaCO_3	Ca - calcium - 1 C - carbon - 1 O - oxygen - 3
Aspirin	Pain reliever	$\text{C}_9\text{H}_8\text{O}_4$	
Magnesium hydroxide	Indigestion reliever	$\text{Mg}(\text{OH})_2$	
Paradichlorobenzene	Moth balls	$\text{C}_6\text{H}_4\text{Cl}_2$	
Acetic acid	Vinegar	$\text{C}_2\text{H}_4\text{O}_2$	
Trinitrotoluene (TNT)	Explosive	$\text{C}_7\text{H}_5(\text{NO}_2)_3$	
Calcium dihydrogen phosphate	Fertilizer	$\text{Ca}(\text{H}_2\text{PO}_4)_2$	

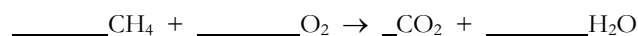
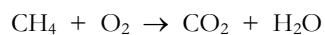
INSTRUCTIONS: In each of the following chemical equations below, list the elements on the left side of the equation and the number of atoms present for each element. Then, record the element and number of atoms present for each element on the right side of the equation. An example has been done for you.

Chemical Equation	Left Side	Right Side
$\text{Al}_2(\text{SO}_4)_3 + 3 \text{BaCl}_2 \rightarrow 2 \text{AlCl}_3 + 3 \text{BaSO}_4$	Al – aluminum – 2 S – sulfur – 3 O – oxygen – 12 Ba – barium – 3 Cl – chlorine – 6	Al – aluminum – 2 Cl – chlorine – 6 Ba – barium – 3 S – sulfur – 3 O – oxygen – 12
$\text{Zn} + 2 \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$		
$\text{MgCO}_3 + 2 \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{CO}_3$		
$2 \text{Na} + \text{MgF}_2 \rightarrow 2 \text{NaF} + \text{Mg}$		
$4 \text{Na} + \text{O}_2 \rightarrow 2 \text{Na}_2\text{O}$		

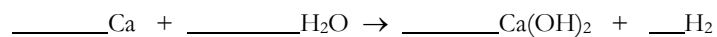
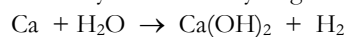
Balancing Chemical Equation with M&Ms

M&M Key	
Hydrogen	White
Nitrogen	Green
Oxygen	Blue
Chlorine	Purple
Carbon	Black
Calcium	Yellow

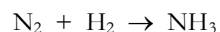
1. methane + oxygen → carbon dioxide + water



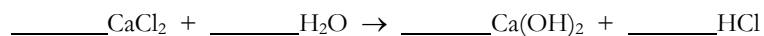
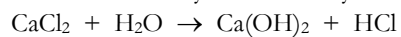
2. calcium + water → calcium hydroxide + hydrogen



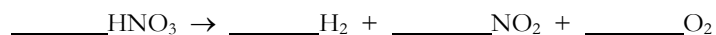
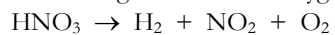
3. nitrogen + hydrogen → ammonia



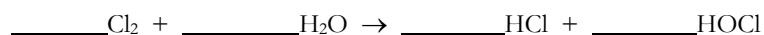
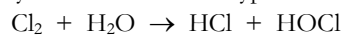
4. calcium chloride + water → calcium hydroxide + hydrochloric acid



5. nitric acid → hydrogen + nitrogen dioxide + oxygen



6. chlorine + water → hydrochloric acid + hypochlorous acid



Balancing Chemical Equations Practice Problems

1. $\text{___ N}_2 + \text{___ H}_2 \rightarrow \text{___ NH}_3$
2. $\text{___ KClO}_3 \rightarrow \text{___ KCl} + \text{___ O}_2$
3. $\text{___ NaCl} + \text{___ F}_2 \rightarrow \text{___ NaF} + \text{___ Cl}_2$
4. $\text{___ H}_2 + \text{___ O}_2 \rightarrow \text{___ H}_2\text{O}$
5. $\text{___ Pb(OH)}_2 + \text{___ HCl} \rightarrow \text{___ H}_2\text{O} + \text{___ PbCl}_2$
6. $\text{___ AlBr}_3 + \text{___ K}_2\text{SO}_4 \rightarrow \text{___ KBr} + \text{___ Al}_2(\text{SO}_4)_3$
7. $\text{___ CH}_4 + \text{___ O}_2 \rightarrow \text{___ CO}_2 + \text{___ H}_2\text{O}$
8. $\text{___ C}_3\text{H}_8 + \text{___ O}_2 \rightarrow \text{___ CO}_2 + \text{___ H}_2\text{O}$
9. $\text{___ FeCl}_3 + \text{___ NaOH} \rightarrow \text{___ Fe(OH)}_3 + \text{___ NaCl}$
10. $\text{___ P} + \text{___ O}_2 \rightarrow \text{___ P}_2\text{O}_5$
11. $\text{___ Na} + \text{___ H}_2\text{O} \rightarrow \text{___ NaOH} + \text{___ H}_2$
12. $\text{___ Ag}_2\text{O} \rightarrow \text{___ Ag} + \text{___ O}_2$
13. $\text{___ S}_8 + \text{___ O}_2 \rightarrow \text{___ SO}_3$
14. $\text{___ CO}_2 + \text{___ H}_2\text{O} \rightarrow \text{___ C}_6\text{H}_{12}\text{O}_6 + \text{___ O}_2$
15. $\text{___ K} + \text{___ MgBr}_2 \rightarrow \text{___ KBr} + \text{___ Mg}$
16. $\text{___ HCl} + \text{___ CaCO}_3 \rightarrow \text{___ CaCl}_2 + \text{___ H}_2\text{O} + \text{___ CO}_2$
17. $\text{___ HNO}_3 + \text{___ NaHCO}_3 \rightarrow \text{___ NaNO}_3 + \text{___ H}_2\text{O} + \text{___ CO}_2$
18. $\text{___ H}_2\text{O} + \text{___ O}_2 \rightarrow \text{___ H}_2\text{O}_2$
19. $\text{___ NaBr} + \text{___ CaF}_2 \rightarrow \text{___ NaF} + \text{___ CaBr}_2$
20. $\text{___ H}_2\text{SO}_4 + \text{___ NaNO}_2 \rightarrow \text{___ HNO}_2 + \text{___ Na}_2\text{SO}_4$

More Balancing Equations

1. $\text{___Ca(OH)}_2 + \text{___HCl} \rightarrow \text{___CaCl}_2 + \text{___H}_2\text{O}$
2. $\text{___SO}_2 + \text{___O}_2 \rightarrow \text{___SO}_3$
3. $\text{___Al} + \text{___H}_2\text{SO}_4 \rightarrow \text{___Al}_2(\text{SO}_4)_3 + \text{___H}_2$
4. $\text{___P}_4\text{O}_{10} + \text{___H}_2\text{O} \rightarrow \text{___H}_3\text{PO}_4$
5. $\text{___AgNO}_3 + \text{___CaCl}_2 \rightarrow \text{___AgCl} + \text{___Ca(NO}_3)_2$
6. $\text{___Pb(NO}_3)_2 \rightarrow \text{___PbO} + \text{___NO}_2 + \text{___O}_2$
7. $\text{___Ag}_2\text{O} \rightarrow \text{___Ag} + \text{___O}_2$
8. $\text{___Br}_2 + \text{___KI} \rightarrow \text{___I}_2 + \text{___KBr}$
9. $\text{___C}_5\text{H}_{12}\text{O} + \text{___O}_2 \rightarrow \text{___CO}_2 + \text{___H}_2\text{O}$
10. $\text{___N}_2 + \text{___O}_2 \rightarrow \text{___N}_2\text{O}_3$
11. $\text{___AsCl}_3 + \text{___H}_2\text{S} \rightarrow \text{___As}_2\text{S}_3 + \text{___HCl}$
12. $\text{___FeCl}_3 + \text{___(NH}_4)_2\text{S} \rightarrow \text{___Fe}_2\text{S}_3 + \text{___NH}_4\text{Cl}$
13. $\text{___Na}_2\text{SO}_4 + \text{___C} \rightarrow \text{___Na}_2\text{S} + \text{___CO}_2$
14. $\text{___Cl}_2 + \text{___H}_2\text{O} \rightarrow \text{___HCl} + \text{___HOCl}$
15. $\text{___PCl}_3 + \text{___H}_2\text{O} \rightarrow \text{___H}_3\text{PO}_3 + \text{___HCl}$
16. $\text{___Mg}_3\text{N}_2 + \text{___H}_2\text{O} \rightarrow \text{___Mg(OH)}_2 + \text{___NH}_3$
17. $\text{___SiCl}_4 + \text{___H}_2\text{O} \rightarrow \text{___HCl} + \text{___SiO}_2$
18. $\text{___SbCl}_5 + \text{___H}_2\text{O} \rightarrow \text{___Sb}_2\text{O}_5 + \text{___HCl}$
19. $\text{___Al}_4\text{C}_3 + \text{___H}_2\text{O} \rightarrow \text{___Al(OH)}_3 + \text{___CH}_4$
20. $\text{___KOH} + \text{___SO}_2 \rightarrow \text{___K}_2\text{SO}_3 + \text{___H}_2\text{O}$
21. $\text{___C}_{10}\text{H}_{16} + \text{___Cl}_2 \rightarrow \text{___HCl} + \text{___C}$
22. $\text{___K}_2\text{SO}_4 + \text{___BaCl}_2 \rightarrow \text{___BaSO}_4 + \text{___KCl}$
23. $\text{___Cl}_2 + \text{___NaBr} \rightarrow \text{___Br}_2 + \text{___NaCl}$
24. $\text{___Pb(NO}_3)_2 + \text{___NaBr} \rightarrow \text{___PbBr}_2 + \text{___NaNO}_3$

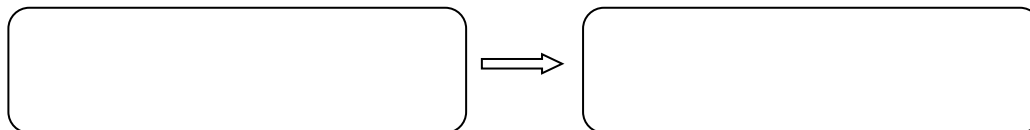
Balancing Chemical Equations Online Simulator

Google: PhET Balancing Chemical Equations, click on the 1st link. Run in HTML 5. Start with the intro. On the drop down menu at the top right corner choose the scale.

1. Use the simulation to adjust the coefficients and balance the following equation. Select the balance scales and bar charts to help. Fill in the proper coefficients when you are successful (yellow smiley face).



2. Draw the particle view of the balanced equation as shown in the simulation.



3. Describe the purpose of the balance scales in the simulation.

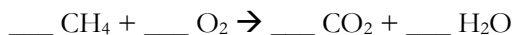
4. In order for a chemical equation to be properly balanced, what must be true?

5. Balance the other two examples.

Separate water



Combust methane



6. The number placed in front of a formula is called a coefficient. The small number within a chemical formula is called a subscript. Why do we adjust coefficients when balancing chemical equations and not subscripts?

7. Play each level of the game. Play the first game until you can get a 10/10. Keep trying! Each partner should have a chance to try on their own. Once you finish the first level, work on the second. Your quiz on Friday will be on balancing. PRACTICE PRACTICE PRACTICE!!!

Bonding and Balancing Chemical Equations Review

Answer the following questions and review your learning targets for the test. STUDY STUDY STUDY.

1. Draw the Lewis Structure for the following atoms.

a. Sulfur

c. Strontium

b. Aluminum

d. Nitrogen

2. Identify if the following atoms become ions by gaining or losing electrons, how many, and their charge.

a. Sulfur:

i. Gain or lose?

ii. How many?

iii. Charge?

c. Strontium:

i. Gain or lose?

ii. How many?

iii. Charge?

b. Aluminum:

i. Gain or lose?

ii. How many?

iii. Charge?

d. Nitrogen:

i. Gain or lose?

ii. How many?

iii. Charge?

3. Show the electron transfer for the following pairs of elements. Then write the name and the formula of the compound formed.

Potassium and oxygen

Aluminum and nitrogen

Formula:

Formula:

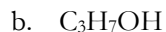
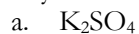
Name:

Name:

4. Draw the Lewis Structure for the following molecules.



5. Identify how many of each type of atom are in the following compounds.



6. Identify if the following compounds would bond ionically or covalently.

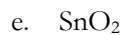
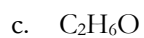
a. Sodium and chloride

b. Phosphorous and oxygen

c. Nitrogen and carbon

d. Strontium and sulfur.

7. Identify if the following compounds are ionic compounds or molecules.



8. Balance the following chemical equations.

