

Nomenclature

Objective: determine oxidation states; classify, name and write formulas for various types of compounds.

I. Oxidation States (_____)

A. Defined

B. Location

C. Metals _____

Non-metals _____

II. Ions

Single

Polyatomic

II. Using oxidation numbers in compounds.

III. Naming substances (these notes are supplemented with filler paper)

Nomenclature – Ion Chips

Compd Name	Cmpd type	Cmpd formula
Potassium chloride	_____	_____
Potassium oxide	_____	_____
Potassium sulfate	_____	_____
Potassium nitride	_____	_____
Potassium phosphate	_____	_____
Sodium chloride	_____	_____
Sodium oxide	_____	_____
Sodium sulfate	_____	_____
Sodium nitride	_____	_____
Sodium phosphate	_____	_____
Calcium chloride	_____	_____
Calcium oxide	_____	_____
Calcium sulfate	_____	_____
Calcium nitride	_____	_____
Calcium phosphate	_____	_____
Iron (II) chloride	_____	_____
Iron (II) oxide	_____	_____
Iron (II) sulfate	_____	_____
Iron (II) sulfide	_____	_____
Iron (II) nitride	_____	_____
Iron (II) phosphate	_____	_____
Magnesium sulfate	_____	_____
Magnesium chloride	_____	_____

continue on next page

Magnesium oxide	_____	_____
Magnesium phosphate	_____	_____
Aluminum chloride	_____	_____
Aluminum nitride	_____	_____
Aluminum nitrate	_____	_____
Aluminum nitrite	_____	_____
Aluminum phosphate	_____	_____
Aluminum oxide	_____	_____
Aluminum sulfate	_____	_____
Aluminum hydroxide	_____	_____
Calcium hydroxide	_____	_____
Potassium hydroxide	_____	_____
Sodium hydroxide	_____	_____
Ammonia	_____	_____
Ammonium ion	_____	_____

IV. Exercises

1. Assign oxidation states to **each element** in the following compounds.

KCl CsI H₂O CaF₂ H₂SO₄ KNO₃

NH₄Cl Na₃PO₄ Be(OH)₂ HCl

2. Name the following ions

a. Na⁺ _____ Cs⁺ _____ Sr⁺ _____

b. Pb²⁺ _____ (traditional) Cr³⁺ _____ (trad)

Pb²⁺ _____ (stock) Cr³⁺ _____ (stock)

c. N³⁻ _____ Cl⁻ _____ S²⁻ _____

3. Name the following salts.

LiCl _____ MgO _____

KF _____ CaS _____

SrCl₂ _____ Na₂O _____

BaI₂ _____ BeBr₂ _____

FeCl₃ _____ FeCl₂ _____

CrO _____ Cr₂O₃ _____

4. Write formulas for the following salts.

Potassium Chloride _____ Strontium Oxide _____

Sodium Fluoride _____ Calcium Bromide _____

Stannic Iodide _____ Copper (I) Oxide _____

5. Name the following bases.

KOH_____ NaOH_____

Mg(OH)₂_____ Al(OH)₃_____

6. Write formulas for the following bases.

Cesium hydroxide_____ Strontium hydroxide_____

7. Name the following binary compounds.

N₂O₅_____ (stock) N₂O₅_____ (trad)

N₂O₄_____ (stock) N₂O₄_____ (trad)

NO₂_____ (stock) NO₂_____ (trad)

8. Name the following tertiary salts.

NaClO₄_____ NH₄PO₄_____

KNO₂_____ Li₂(SO₄) _____

CuSO₄_____ Cu₂SO₄_____

9. Write formulas for the following tertiary salts.

Cesium Chlorite_____ Potassium Permanganate_____

Cupric Carbonate_____ Ammonium Nitrate_____

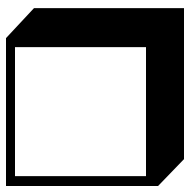
Potassium Chromate_____ Potassium Dichromate_____

What is the Magic Number??

Determine the Magic Number by writing the correct formula for each of the following, write down the number of atoms in each formula and then add up the total number of atoms.

	# of atoms
1. carbon dioxide	_____
2. calcium sulfate	_____
3. ammonium phosphate	_____
4. sodium iodide	_____
5. water	_____

Sum of # of atoms - Magic Number



Mixed Ionic/Covalent Compound Naming

For each of the following questions, determine whether the compound is ionic or covalent and name it appropriately.

- 1) Na_2CO_3 _____
- 2) P_2O_5 _____
- 3) NH_3 _____
- 4) FeSO_4 _____
- 5) SiO_2 _____
- 6) GaCl_3 _____
- 7) CoBr_2 _____
- 8) B_2H_4 _____
- 9) CO _____
- 10) P_4 _____

For each of the following questions, determine whether the compound is ionic or covalent and write the appropriate formula for it.

- 11) dinitrogen trioxide _____
- 12) nitrogen _____
- 13) methane _____
- 14) lithium acetate _____
- 15) phosphorus trifluoride _____
- 16) vanadium (V) oxide _____

- 17) aluminum hydroxide _____
- 18) zinc sulfide _____
- 19) silicon tetrafluoride _____
- 20) silver phosphate _____

Ionic/Covalent Compound Naming **Answers**

For each of the following questions, determine whether the compound is ionic or covalent and name it appropriately.

- 1) Na_2CO_3 **sodium carbonate**
- 2) P_2O_5 **diphosphorus pentoxide**
- 3) NH_3 **ammonia**
- 4) FeSO_4 **iron (II) sulfate**
- 5) SiO_2 **silicon dioxide**
- 6) GaCl_3 **gallium chloride**
- 7) CoBr_2 **cobalt (II) bromide**
- 8) B_2H_4 **diboron tetrahydride**
- 9) CO **carbon monoxide**
- 10) P_4 **phosphorus**

For each of the following questions, determine whether the compound is ionic or covalent and write the appropriate formula for it.

- 11) dinitrogen trioxide **N_2O_3**
- 12) nitrogen **N_2**
- 13) methane **CH_4**
- 14) lithium acetate **$\text{LiC}_2\text{H}_3\text{O}_2$**
- 15) phosphorus trifluoride **PF_3**
- 16) vanadium (V) oxide **V_2O_5**

17) aluminum hydroxide Al(OH)_3

18) zinc sulfide ZnS

19) silicon tetrafluoride SiF_4

20) silver phosphate Ag_3PO_4

Balancing Chemical Equations

I. Process – Primarily based on Trial and Error

1. Write the correct formulas

- Oxidation numbers of each compound must add up to zero (Neutral)
- Oxidation numbers of each ion must add up to the charge given.

2. Once you have written each formula correctly DO NOT ADD, CHANGE OR DELETE ANY SUBSCRIPTS!!!! Only add coefficients to balance the number of atoms on both sides of the equation.

3. Example



What is the sum of the coefficients in the above equation? _____



What is the sum of the coefficients in the above equation? _____



What is the sum of the coefficients in the above equation? _____

Nitrogen + hydrogen $\square$ ammonia (note: you must remember which elements are diatomics)

Write the correct formulas for each material, balance the entire equation and identify the type of reaction it represents - synthesis, decomposition, double or single displacement.(Science Kit)

Type of Reaction

1. calcium + oxygen $\rightarrow$ calcium oxide _____
2. calcium oxide $\rightarrow$ calcium + oxygen _____
3. potassium + sodium chloride $\rightarrow$ potassium chloride + sodium _____
4. potassium + iron (II) chloride $\rightarrow$ potassium chloride + iron _____
5. potassium hydroxide + aluminum chloride $\rightarrow$ potassium chloride + aluminum hydroxide
6. potassium phosphate + calcium sulfate $\rightarrow$ potassium sulfate + calcium phosphate_

Name: _____ Student ID Number: _____ Period: _____
 Date: _____

Unit 2

C.1 Supplement: Keeping Track of Atoms

- A chemical equation is balanced if there are _____ of each kind of _____ on both sides of the equation.
- Accounting for atoms: determine the number of atoms of each kind in each of the following:
 - $\text{CaCO}_3 =$ _____ Ca, _____ C, _____ O
 - $(\text{NH}_4)_2\text{SO}_4 =$ _____ N, _____ H, _____ S, _____ O
 - $3 \text{H}_2 =$ _____ H
 - $4 \text{Mg}(\text{OH})_2 =$ _____ Mg, _____ O, _____ H
 - $\text{Ba}(\text{NO}_3)_2 =$ _____ Ba, _____ N, _____ O
- For each equation, list the number of each type of atom shown on the reactant side and the product side of the arrow. Also indicate whether the overall equation is balanced.



Reactants

Products

_____	Na	_____
_____	H	_____
_____	O	_____

Balanced? Yes _____ No _____

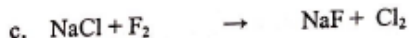


Reactants

Products

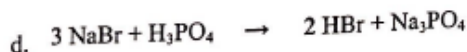
_____	N	_____
_____	H	_____
_____	O	_____

Balanced? Yes _____ No _____



_____	Na	_____
_____	Cl	_____
_____	F	_____

Balanced? Yes _____ No _____



_____	Na	_____
_____	Br	_____
_____	H	_____
_____	P	_____
_____	O	_____

Balanced? Yes _____ No _____

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REGENTS CHEMISTRY

NAME _____

WORKSHEET

BALANCING CHEMICAL EQUATIONS

*Some of these are really tough!! **

1. $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$
2. $\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HCl}$
3. $\text{H}_2 + \text{Cl}_2 \rightarrow \text{HCl}$
4. $\text{Al} + \text{Fe}_2\text{O}_3 \rightarrow \text{Al}_2\text{O}_3 + \text{Fe}$
5. $\text{H}_2 + \text{N}_2 \rightarrow \text{NH}_3$
6. $\text{NaOH} + \text{CO}_2 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$
7. $\text{NH}_4\text{NO}_2 \rightarrow \text{N}_2 + \text{H}_2\text{O}$
8. $\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \rightarrow \text{NaCl} + \text{BaSO}_4$
9. $\text{FeS} + \text{HCl} \rightarrow \text{H}_2\text{S} + \text{FeCl}_2$
10. $\text{ZnCl}_2 + (\text{NH}_4)_2\text{S} \rightarrow \text{NH}_4\text{Cl} + \text{ZnS}$
11. $\text{NH}_3 + \text{O}_2 \rightarrow \text{HNO}_3 + \text{H}_2\text{O}$
12. $\text{Mg} + \text{HNO}_3 \rightarrow \text{Mg(NO}_3)_2 + \text{H}_2$
13. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
14. $\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow \text{Fe} + \text{CO}_2$
15. $\text{Pb(C}_2\text{H}_3\text{O}_2)_2 + \text{H}_2\text{S} \rightarrow \text{PbS} + \text{CH}_3\text{COOH}$
16. $\text{Ca}_3(\text{PO}_4)_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + \text{H}_3\text{PO}_4$
17. $\text{FeCl}_3 + \text{Na}_2\text{CO}_3 \rightarrow \text{NaCl} + \text{Fe}_2(\text{CO}_3)_3$
18. $\text{CaO} + \text{P}_2\text{O}_5 \rightarrow \text{Ca}_3(\text{PO}_4)_2$
19. $\text{CaCO}_3 + \text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$
20. $\text{NaHCO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O} + \text{CO}_2$
21. $\text{Ca(OH)}_2 + \text{H}_3\text{PO}_4 \rightarrow \text{Ca}_3(\text{PO}_4)_2 + \text{H}_2\text{O}$
22. $\text{NH}_3 \rightarrow \text{N}_2 + \text{H}_2$
23. $\text{NCl}_3 \rightarrow \text{N}_2 + \text{Cl}_2$
24. $\text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{HNO}_3 + \text{NO}$
25. $\text{Cu}_2\text{S} + \text{O}_2 \rightarrow \text{Cu}_2\text{O} + \text{SO}_2$
26. $\text{FeS}_2 + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2$

Unit 2

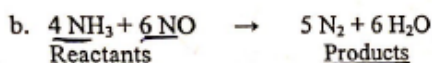
Period: _____

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 - $\text{Ba}(\text{NO}_3)_2 =$ _____ Ba, _____ N, _____ O
- For each equation, list the number of each type of atom shown on the reactant side and the product side of the arrow. Also indicate whether the overall equation is balanced.

ReactantsProducts

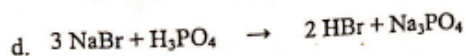
<u>2</u>	Na	<u>2</u>
<u>4</u>	H	<u>4</u>
<u>2</u>	O	<u>2</u>

Balanced? Yes ☒ No _____ReactantsProducts

<u>10</u>	N	<u>10</u>
<u>12</u>	H	<u>12</u>
<u>6</u>	O	<u>6</u>

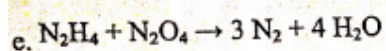
Balanced? Yes ☒ No _____

<u>1</u>	Na	<u>1</u>
<u>1</u>	Cl	<u>2</u>
<u>2</u>	F	<u>1</u>

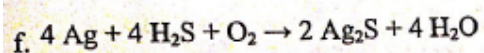
Balanced? Yes _____ No ☒

<u>3</u>	Na	<u>3</u>
<u>3</u>	Br	<u>2</u>
<u>3</u>	H	<u>2</u>
<u>1</u>	P	<u>1</u>
<u>4</u>	O	<u>4</u>

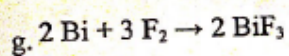
Balanced? Yes _____ No ☒



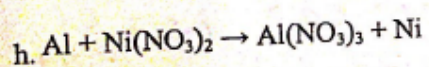
Balanced? Yes ☐ No ☒



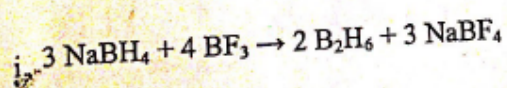
Balanced? Yes ☐ No ☒



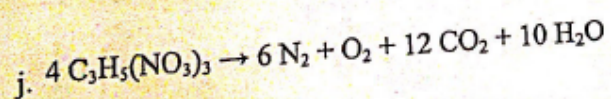
Balanced? Yes ☒ No ☐



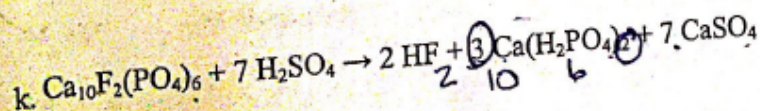
Balanced? Yes ☐ No ☒



Balanced? Yes ☒ No ☐



Balanced? Yes ☐ No ☒



Balanced? Yes ☒ No ☐

RWILB
REAGENTS CHEMISTRY
WORKSHEET

NAME _____
BALANCING CHEMICAL EQUATIONS

1. $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$ already balanced
2. $\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HCl}$ already balanced
3. $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
4. $2\text{Al} + \text{Fe}_2\text{O}_3 \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$
5. $3\text{H}_2 + \text{N}_2 \rightarrow 2\text{NH}_3$
6. $2\text{NaOH} + \text{CO}_2 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$
7. $\text{NH}_4\text{NO}_2 \rightarrow \text{N}_2 + 2\text{H}_2\text{O}$
8. $\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \rightarrow 2\text{NaCl} + \text{BaSO}_4$ assume "1"
9. $\text{FeS} + 2\text{HCl} \rightarrow \text{H}_2\text{S} + \text{FeCl}_2$ sum of coefficients = 5
10. $\text{ZnCl}_2 + (\text{NH}_4)_2\text{S} \rightarrow 2\text{NH}_4\text{Cl} + \text{ZnS}$
11. $\text{NH}_3 + 2\text{O}_2 \rightarrow \text{HNO}_3 + \text{H}_2\text{O}$
12. $\text{Mg} + 2\text{HNO}_3 \rightarrow \text{Mg(NO}_3)_2 + \text{H}_2$
13. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ already balanced
14. $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
15. $\text{Pb(C}_2\text{H}_3\text{O}_2)_2 + \text{H}_2\text{S} \rightarrow \text{PbS} + 2\text{CH}_3\text{COOH}$
16. $\text{Ca}_3(\text{PO}_4)_2 + 3\text{H}_2\text{SO}_4 \rightarrow 3\text{CaSO}_4 + 2\text{H}_3\text{PO}_4$
17. $2\text{FeCl}_3 + 3\text{Na}_2\text{CO}_3 \rightarrow 6\text{NaCl} + \text{Fe}_2(\text{CO}_3)_3$
18. $3\text{CaO} + \text{P}_2\text{O}_5 \rightarrow \text{Ca}_3(\text{PO}_4)_2$
19. $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$
20. $2\text{NaHCO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O} + 2\text{CO}_2$
21. $3\text{Ca(OH)}_2 + 2\text{H}_3\text{PO}_4 \rightarrow \text{Ca}_3(\text{PO}_4)_2 + 6\text{H}_2\text{O}$
22. $2\text{NH}_3 \rightarrow \text{N}_2 + 3\text{H}_2$
23. $2\text{NCl}_3 \rightarrow \text{N}_2 + 3\text{Cl}_2$
24. $3\text{NO}_2 + \text{H}_2\text{O} \rightarrow 2\text{HNO}_3 + \text{NO}$
25. $2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$
26. $4\text{FeS}_2 + 11\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3 + 8\text{SO}_2$

