**Chemistry**

**Packet#11**

***Chemical Equations and Reactions***

***Edmodo Group Code:*** *ozm60q* (http://www.edmodo.com)

***Class Website:*** http://mrgchem.weebly.com

***Mr. Gutierrez’s email:*** gutierrezbr@elizabeth.k12.nj.us

Text Messaging Reminders: Text @aofchem to 23559



*Note: You are expected to work on this packet during the allotted class practice time.*

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| **Packet Points** |
| / | Completed Class Notes |
| / | Writing Name on Every Page |
| / | Handed Packet in on Time  |
| / | Homework |
| / | Followed Classroom Policies |
| / | Classwork Participation |
| / | TOTAL POINTS |

Name of Chemist:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period: \_\_\_\_\_\_\_\_\_\_\_

***DUE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

\*All Class Notes + Questions MUST be finished for HOMEWORK if not done in class.

**Chemical Equations and Reactions**

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**Packet Grading:**

Remember you get TWO types of grades for your packet:

1. Packet participation grade (getting stamps at the end of the period)
2. Each “Class Work” section gets a separate grade

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT describe the signs of a chemical reaction. 2) SWBAT describe the characteristics of a chemical equation 3) SWBAT write a chemical equation from a description of a chemical reaction** |

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| **Class Notes** |
| **Chemical Reactions**A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the process by which \_\_\_\_\_\_\_\_\_ or more substances are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into one or more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**Signs of a Chemical Reaction**1.2.3.4. **Chemical Equation**A chemical equation summarizes a chemical reaction through \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.*Chemical equations must have:*1.2.3.A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ describes a chemical reaction that is represented by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.*Example:* Methane (CH4) reacts with oxygen to produce water and carbon dioxide.CH4 (g) + O2 (g) 🡪 CO2(g) + H2O(g)KEY WORDS:* Combines/Reacts = +
* Heat = add the delta(little triangle) above the arrow
* Combusts/burns = + O2(g)
* Vapor = (g)

***A Few things to keep in mind:**** The halogens (elements in group 17) are *usually* found in pairs. Meaning, chlorine or Cl is usually found as Cl2. (Flourine = F2, Bromine = Br2, Iodine = I2, and Astatine = At2)
* Oxygen is usually found as O2.
* Hydrogen gas is usually found as H2.
* “A solution of…” means aqueous (aq)
* Methane = CH4
* Propane = C3H8
* Sulfuric acid = H2SO4
* Phosphoric acid = H3PO4
* Hydrochloric acid = HCl
* Ammonium = NH4+

**Writing Chemical Equations** *Example#1:*Sentence: Solid sodium reacts with chlorine gas to produce solid sodium chloride.  Equation: *Example#2:*Sentence: When heated, Solid mercury (II) oxide decomposes to liquid mercury and oxygen gas.Equation: *Example#3*:Sentence: Propane gas is burned to produce carbon dioxide gas and water vapor.Equation: |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT describe the signs of a chemical reaction. 2) SWBAT describe the characteristics of a chemical equation 3) SWBAT write a chemical equation from a description of a chemical reaction** |

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| **Class WORK** |
| ***Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework. 1. Jessica foolishly mixed two unknown substances together in a flask. Describe how you can tell if a chemical reaction occurred in the flask.
2. Look at the chemical equation below. Label the equation using the following terms: *products*, *reactants*, *yields*, *gas state*.

CH4(g) + 2O2 🡪 CO2(g) + 2H2O(g)1. What does the little triangle above the arrow in a chemical reaction signify?
2. Fill in the following chart using your notes as a guide.

|  |  |
| --- | --- |
| ***Symbol*** | ***Meaning*** |
|  |  |
|  | Reactants are heated |
|  | Palladium catalyst used to change the rate of reaction |
| (s) |  |
| (aq) |  |
|  |  |
|  | A reaction is reversible |

1. PdCl2(PPh3)2 is a useful CATALYST in a reaction. Describe *where* the chemical formula of PdCl2(PPh3)2 should be written in a *chemical equation.*
2. *Write the chemical equation of the following reaction:* a solution of sodium hydroxide reacts with aluminum sulfate to produce aluminum hydroxide and sodium sulfate.
3. *Write the chemical equation of the following reaction:* Solutions of sodium hydroxide and calcium bromide react to produce a solution of sodium bromide and solid calcium hydroxide.
4. *Write the chemical equation of the following reaction:* When solid copper reacts with aqueous silver nitrate, the products are aqueous copper(II) nitrate and solid silver.
5. *Write the chemical equation of the following reaction:* Hydrogen sulfide gas reacts with oxygen gas to produce gaseous sulfur dioxide and water vapor.
6. *Write the chemical equation of the following reaction:* Tetraphosphorus decoxide and water react to produce phosphoric acid, which has a chemical formula of H3PO4
7. Translate the following chemical equations to sentences:
8. 2K(s) + 2H2O(l) 🡪 2KOH(aq) + H2(g)
9. 2Fe(s) + 3Cl2(g) 🡪 2FeCl3(s)
10. Fe2O3(s) + 3CO­(g) 🡪 2Fe(s) + 3CO2(g)
11. CaCO­3(s) $\rightarrow ^{∆}$ CaO(s) + CO2(g)
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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT describe the Law of the Conservation of Mass. 2) SWBAT determine whether a chemical equation is balanced.** |

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| **Class Notes** |
| **Balancing Chemical Equations****Part I**The Law of the Conservation of Mass states that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cannot be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.To follow this law, chemical equations must be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.BUT, before we can learn how to do that, we must first be able to count the number of atoms of each element in a given compound and decide whether or not a compound is **balanced.***Example#1:*Zn(s) + HCl (aq) 🡪 ZnCl2(aq) + H2(g)

|  |  |
| --- | --- |
| **Left Side of Arrow** | **Right Side of Arrow** |
|  |  |

Is this chemical equation balanced? \_\_\_\_\_\_\_\_\_\_\_\_\_**Sample Problems**Example#2: Is this chemical equation balanced? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_4Al2(SO4)3 + Ca(OH)2 🡪 Al(OH)3 + 3CaSO4

|  |  |
| --- | --- |
| **Left Side of Arrow** | **Right Side of Arrow** |
|  |  |

Example#3:Determine how many atoms of ***each element*** you have in the following compound:Nickel (II) permanganateChemical formula =

|  |  |
| --- | --- |
| Ni |  |
| K |  |
| Mn |  |
| O |  |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT describe the Law of the Conservation of Mass. 2) SWBAT determine whether a chemical equation is balanced.** |

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| **Class WORK** |
| ***Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework. |

1. What is the number in front of a chemical formula called?
2. Determine the number of atoms of each element below.

The first one has been done for you as an example.

* + 1. 2C6H2
			- 1. C: \_\_\_12\_\_\_
				2. H: \_\_\_\_4\_\_
		2. 4CO2
			- 1. C: \_\_\_\_\_\_
				2. O: \_\_\_\_\_\_
		3. MgCl2
			- 1. Mg: \_\_\_\_\_\_
				2. Cl: \_\_\_\_\_\_
		4. Ca3(PO4)2
			- 1. Ca: \_\_\_\_\_\_
				2. P: \_\_\_\_\_\_
				3. O: \_\_\_\_\_\_
		5. 5NaCl
			- 1. Na: \_\_\_\_\_\_
				2. Cl: \_\_\_\_\_\_
		6. 25H2
			- 1. H: \_\_\_\_\_\_
		7. 12Na2O
			- 1. Na: \_\_\_\_\_\_
				2. O: \_\_\_\_\_\_
		8. N2 + **3** H2 🡪 **2** NH3

|  |  |  |
| --- | --- | --- |
|  | Left | Right |
| N |  |  |
| H |  |  |

Is it balanced?

* + 1. KClO3 🡪 KCl + O2

|  |  |  |
| --- | --- | --- |
|  | Left | Right |
| K |  |  |
| Cl |  |  |
| O |  |  |

Is it balanced?

* + 1. **2** NaCl + F2 🡪 **2** NaF + Cl2

|  |  |  |
| --- | --- | --- |
|  | Left | Right |
| Na |  |  |
| Cl |  |  |
|  |  |  |

* + 1. H2 + O2 🡪 H2O

|  |  |  |
| --- | --- | --- |
|  | Left | Right |
| H |  |  |
| O |  |  |

Is it balanced? \_\_\_\_\_\_\_

* + 1. Pb(OH)2 + **2** HCl 🡪 **2** H2O + PbCl2

|  |  |  |
| --- | --- | --- |
|  | Left | Right |
| Pb |  |  |
| O |  |  |
| H |  |  |
| Cl |  |  |

Is it balanced? \_\_\_\_\_\_\_

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT describe the Law of the Conservation of Mass. 2) SWBAT balance a chemical equation by modifying the coefficients.** |

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| **Class Notes** |
| **Balancing Chemical Equations****Part II**In order to follow the Law of the Conservation of \_\_\_\_\_\_\_\_\_\_\_\_\_\_, chemical equations must be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.***How to Balance a Chemical Equation:***1. Count the number of atoms of each element you have in each molecule on both sides of the arrow.
2. If the numbers of atoms of each element are not equal on both sides of the arrow, you must balance the equation by **adding a number in front of the chemical formula**. (This number in front is called the **coefficient**.)
3. Multiply the coefficient by the subscripts of each element to get the number of atoms.
4. If the numbers of atoms are still not equal, try a different coefficient. Balancing equations requires a lot of trial and error.

Example#1: Zn(s) + HCl (aq) 🡪 ZnCl2(aq) + H2(g)

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| **Left Side of Arrow** | **Right Side of Arrow** |
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**Sample Problems**Example#2: Balance the following chemical equation:\_\_\_\_Al4C3 (s) + \_\_\_H2O (l) 🡪 \_\_\_CH4 (g) + \_\_\_Al(OH)3 (s)Example#3:Balance the following chemical equation described below: aluminum sulfate reacts with calcium hydroxide to produce aluminum hydroxide and calcium sulfate.**Practice Problem**Write a balanced chemical equation for the following reaction: Solid sodium combines with chlorine gas to produce solid sodium chloride. |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT describe the Law of the Conservation of Mass. 2) SWBAT balance a chemical equation by modifying the coefficients.** |

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| **Class WORK** |
| ***Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework.Balance the following equations by placing the correct coefficient in front each chemical formula:1. \_\_\_\_\_Na(s) + \_\_\_\_\_Cl2 (g) 🡪 \_\_\_\_NaCl
2. \_\_\_\_\_Cu(s) + \_\_\_\_\_AgNO3(aq) 🡪 \_\_\_\_\_\_\_Cu(NO3)2(aq) + \_\_\_\_\_Ag(s)
3. \_\_\_\_\_Fe2O3(s) + \_\_\_\_\_\_3CO(g) 🡪 \_\_\_\_\_\_\_Fe(s) + \_\_\_\_\_\_\_CO2(g)
4. \_\_\_\_ N2 + \_\_\_\_ H2 🡪 \_\_\_\_ NH3
5. \_\_\_\_ KClO3 🡪 \_\_\_\_ KCl + \_\_\_\_ O2
6. \_\_\_\_ NaCl + \_\_\_\_ F2 🡪 \_\_\_\_ NaF + \_\_\_\_ Cl2
7. \_\_\_\_ H2 + \_\_\_\_ O2 🡪 \_\_\_\_ H2O
8. \_\_\_\_ CH4 + \_\_\_\_ O2 🡪 \_\_\_\_ CO2 + \_\_\_\_ H2O
9. \_\_\_\_ C3H8 + \_\_\_\_ O2 🡪 \_\_\_\_ CO2 + \_\_\_\_ H2O
10. Calcium hydroxide reacting with (NH4)2SO4 to produce calcium sulfate, NH3, and wáter. (Write chemical equation first!)
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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT classify a chemical reaction as decomposition or synthesis.** |

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| **Class Notes** |
| **Types of Chemical Reactions** **Part I****SYNTHESIS****A synthesis or composition reaction** is a reaction in which \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.Examples of a Synthesis Reaction:1. 2Mg(s) + O2(g) –-> 2MgO(s)2.3.4.If an element combines with oxygen, it is said to produce an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of that element.If an element combines sulfur, it is said to produce a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of that element. **DECOMPOSITION****A decomposition reaction** is a reaction in which a single compound \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.Decomposition reactions only occur if \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is added.***Examples of Decomposition Reactions:***1. 2HgO(s) $\rightarrow ^{∆}$ 2Hg(l) + O2(g)2.3.4.The little triangle above the arrow means \_\_\_\_\_\_\_\_\_\_\_\_\_\_ has been added. |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT classify a chemical reaction as decomposition or synthesis.** |

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| **Class WORK** |
| ***Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework. 1. Which of the following chemical equations signify a synthesis (composition) reaction?
2. 2H2O(l) + electricity -🡪2H2(g) + O2(g)
3. CaO(s) + H2O(l) 🡪 Ca(OH)­2(s)
4. 2HgO(s) $\rightarrow ^{∆}$ 2Hg(l) + O2(g)
5. Which of the following chemical equations signify a decomposition reaction?
6. Mg(s) + F2(g) 🡪 MgF­2(s)
7. Sr(s) + Br2(l) 🡪SrB­2(s)
8. CaCO­3(s) $\rightarrow ^{∆}$ CaO(s) + CO2(g)
9. Classify the following chemical equations as either a synthesis or decomposition reaction.
* Ca(OH)2(s) $\rightarrow ^{∆}$ CaO(s) + H­2O(g)
* H­2SO4(aq) $\rightarrow ^{∆}$ SO3(g) + H­2O(l)
* U(s) + 3F2 (g) 🡪 UF6(g)
* 2Na(s) + Br­2 (l) 🡪2NaBr (s)
* SO­2(g) + H­2O(l) 🡪 H­2SO­3(aq)
1. What must be added for a decomposition reaction to occur?

 **Reinforcement**1. What are some signs of a chemical reaction?
2. What does “(g)” signify in a chemical equation?
3. What does the little triangle above an arrow signify?
4. Is the following chemical equation balanced?

CS2(l) + 3O2(g) 🡪 CO2(g) + 2SO2(g)1. Balance the following equation:

Al4C3(s) + H2O(l) 🡪 CH­4(g) + Al(OH)2(s) |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT define and describe single-displacement, double-displacement, and combustion reactions.** |

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| **Class Notes** |
| **Types of Chemical Reactions** **Part II****Single Replacement****A single-displacement (replacement)reaction** is a reaction in which \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.IN GENERAL, a single-displacement reaction has the following format:A + BX 🡪 AX + BORY + BX 🡪 BY + X*Examples of a Single-Displacement Reaction*:1. 2Al(s) + 3Pb(NO3)2(aq) 🡪 3Pb(s) + 2Al(NO3)3(aq)

**Double-Displacement****A double-displacement reaction** is a reaction in which the ions of two compounds switch places in an aqueous solution to form two new compounds. IN GENERAL, a double-displacement reaction has the following format:AX + BY 🡪 AY + BX*Examples of a Double-Displacement Reaction*:1. 2KI(aq) + Pb(NO3)2(aq) 🡪 PbI2(s) + 2KNO­3(aq)2.\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***Combustion****A combustion reaction** is a reaction in which a substance combines with oxygen, releasing energy in the form of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.*Examples of a Combustion*1. 2H2(g) + O2(g) 🡪 2H2O(g)

**Summary of Chemical Reaction Types**

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| **Reaction Type** | **Format** |
| ***Synthesis*** |  |
| ***Decomposition*** |  |
| ***Single-displacement*** |  |
| ***Double-displacement*** |  |
| ***Combustion*** |  |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT define and describe single-displacement, double-displacement, and combustion reactions.** |

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| **Class WORK** |
| ***Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework. 1. Classify the following compounds as a single-displacement (SD), double-displacement (DD), or combustion (C), synthesis (S), or decomposition (D).
2. HCl(aq) + NaOH(aq) 🡪 NaCl(aq) + H2O
3. Mg(s) + 2HCl(aq) 🡪 H2(g) + MgCl2(aq)
4. 2C6H14(l) + 19O2 (g) 🡪 12CO2(g) + 14H2O(l)
5. K2CO3 (aq) + CuSO4 (aq) 🡪 CuCO3 + K2SO4
6. K2CO3 (aq) + AgNO3 (aq) 🡪 Ag2CO3 + KNO3
7. H2SO4 + Zn 🡪 ZnSO4 + H2
8. Co(OH)3 + HNO3 🡪 Co(NO3)3 + HOH
9. KOH + H2SO4 🡪 K2SO4 + HOH
10. KI + Cl2 🡪 KCl + I2
11. H2 + O2 🡪 H2O
12. ZnS + O2 🡪 ZnO + S
 |

Make sure Mr. Gutierrez stamps/signs this by the end of the period. You CANNOT get the stamp/signature for a day later on. It is your responsibility to remind Mr. Gutierrez. You will NOT receive a stamp if you did not follow all classroom policies or actively work on the practice problems during the allotted class time.A stamp means you received all 10 points. No stamps means you’ve received zero points. If you completed some work, I may give you partial credit based on my discretion. ***If you are absent, write the date on the day you were absent and write the word “Absent.” DO NOT LOSE THIS SHEET!!!*** (If you lose this sheet, you will lose all of your participation points. NO EXCEPTIONS.)

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| **Day of Week** | **Followed All Classroom Policies** (Respectful, on time, prepared, engaged…) | **Class work Participation** | **Homework** |
| *Monday* | /10 | /10 | /10 |
| *Tuesday* | /10 | /10 | /10 |
| *Wednesday* | /10 | /10 | /10 |
| *Thursday* | /10 | /10 | /10 |
| *Friday* | /10 | /10 | /10 |

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| **Classroom Policy Violation Codes**P = PhoneC = CursingT = TalkingL = Late to classO.T. = Off TaskH.D. = Head DownN.iP = Did not bring iPadUnp = Unprepared (no pencil, no iPad, no emergency passes, no periodic table, etc.) |

**Teacher Comments:**