**Chemistry**

**Packet#12**

***Stoichiometry***

***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:

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

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

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

**Chemical Equations and Reactions**

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| 2. Mole Ratios | 12 - 18 | 304 - 305 |  |
| 3. Mass A to Mole A to Mole B Conversions | 19 - 24 | 306 - 309 |  |
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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: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT use molar mass to convert between grams and moles.** |

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| **Class Notes** |
| **REVIEW: Mass to Mole Conversions****Mass (grams)****# of Moles**Molar mass Mass**Conversion Between Mass and Moles**Example#1:How many moles are there in 25 grams of Na2CO3?Example#2:How many grams are there in 3.5 moles of water?**Practice Samples***You may try Sample A with a partner if you still do not feel comfortable. Complete Samples B and C INDEPENDENTLY. SHOW ALL YOUR WORK.*

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| **Practice Sample A** | How many grams are there in 5.3 x 102 moles of sodium acetate? |
| **Practice Sample B** | How many moles are there in 339 grams of MgI2? |
| **Practice Sample C** | How many grams are there in 9.73 moles of H2O2? |

**Once you are finished, have Mr. Gutierrez check your work before continuing to the next question.****Avogadro’s Number**1 mole of a substance = 6.022 x 1023 particles (particles = either atoms or molecules)**Conversion Between Moles and Particles** **# Particles****# of Moles**Avogadro’s #Example#1:How many molecules are there in 3.54 moles of CO2?Example#2:How many moles are present in 7.90 x 1029 molecules of sulfur dioxide? **Conversion Between Mass, Moles, and Particles****Mass (grams)****# Particles****# of Moles**Avogadro’s #Molar mass Mass**Example#1**How many grams are there in 4.5 x 1023 molecules of KCl?**Example#2**How many molecules are there in 88 grams of carbon dioxide?**Practice Samples****Mass (grams)****# Particles****# of Moles**Avogadro’s #Molar mass Mass*You may try Sample A with a partner if you still do not feel comfortable. Complete Samples B and C INDEPENDENTLY. SHOW ALL YOUR WORK.*

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| **Practice Sample A** | Convert 35 grams of CO2 to molecules. |
| **Practice Sample B** | How many grams of water are there in 3.5 x 1023 molecules? |
| **Practice Sample C** | Express 4.23 x 1018 molecules of Flourine in grams. |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT use molar mass to convert between grams and moles.** |

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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.  |
| Convert. SHOW ALL YOUR WORK. You will not receive credit if you do not show your work.1. How many grams are there in 9 moles of potassium chromate ?

2. How many moles are there in 30 grams of Na2CO3 ?1. How many moles are there in 54.3 grams of CuSO4 ?
2. What is the mass of 7.43 moles of Mg(OH)2 ?
3. Calculate the number of moles in 200 grams of Ba(NO3)2
4. How many grams are there in 6 moles of lithium fluoride?
5. How many moles are there in 300 grams of sodium phosphide?
6. How many moles are there in 235 grams of potassium chlorate?
7. Convert 300 grams of magnesium phosphate to moles.
8. How many grams are there in 4.28 moles of Nickel (II) chloride?
9. What is the mass of 4 moles calcium nitride?
10. How many grams are there in 9.5 x 1020 molecules of NaHCO3 ?

13. How many molecules are there in 40 grams of Na2CO3 ?14. How many grams are there in 5.3 x 1020 molecules of CuSO4 ?15. How many particles are there in 80 grams of Mg(OH)2 ?16. How many grams are there in 3.5 x 1020 particles of Ba(NO3)2 |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: 1) SWBAT define stoichiometry. 2) SWBAT perform conversions involving mole ratios.** |

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| **CLASS NOTES** |
| ***STOICHIOMETRY******Moles A 🡨🡪 Moles B*****Stoichiometry** is the branch of chemistry that deals with the study of the calculations between the masses of \_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_.In simpler terms, it is the \_\_\_\_\_\_\_\_\_\_\_ of chemistry.**Before we dive into the chemistry…**http://www.polyvore.com/cgi/img-thing?.out=jpg&size=l&tid=985961**Stoichiometry and pizza!**1. Given the recipe

 1 crust + 2 cheese + 3 tomato sauce 🡪 1 slice of pizza, how many slices of pizza could you make from 8 crusts?

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| --- | --- |
| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the same recipe above, how many moles of pizza could you make from 100 moles of cheese?

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| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the same recipe above, how many moles of pizza could you make from 900 moles of tomato sauce?

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| --- | --- |
| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the balanced chemical equation, Br2 + 2NaI → 2NaBr + I2, how many moles of sodium bromide (NaBr) could be produced from 4 moles of bromine (Br2)?

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| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the balanced equation, 2SO2 + O2 → 2SO3, how many moles of SO2 would be needed to produce 2 moles of SO3?

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| Start: |  |
| End: |  |
| Plan |  |
| Molar masses needed? |  |
| Solve: |  |

**IMPORTANT!!!****You MUST make sure that the chemical equation is BALANCED.** |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT perform conversions involving mole ratios.** |

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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. Using the balanced chemical equation: 3H2(g) + N­2(g) 🡪 2NH3(g).
2. How many moles of nitrogen gas are required to produce 8 moles of ammonia (NH3).
3. How many moles of NH3 are produced when 7 moles of hydrogen gas are used?
4. Using the balanced chemical equation: 2Na(s) + Br­2 (l) 🡪2NaBr (s)
5. How many moles of sodium are needed to produce 9 moles of sodium bromide?
6. How many moles of sodium bromide are produced if you react 3 moles of Bromine liquid with sodium?
7. How many moles of bromine liquid do you need to produce 15 moles of sodium bromide?
8. Using the following equation: CaO(s) + H2O(l) 🡪 Ca(OH)­2(s)
9. How many moles of CaO are needed to make 5.5 moles of calcium hydroxide?
10. How many moles of water are needed to make 3.5 moles of calcium hydroxide?

4. Carbon dioxide gas reacts with lithium hydroxide to produce lithium carbonate and water.1. Write a BALANCED chemical reaction using the information above.
2. How many moles of lithium hydroxide are required to make 12.34 moles of lithium carbonate?
3. How many moles of carbon dioxide gas are required to react with lithium hydroxide?
4. How many moles of lithium carbonate are produced with 3.8 moles of lithium hydroxide?
5. Consider the chemical reaction involving glucose:

6H2O(l) + 6CO2(g) 🡪 C6H12O6(s) + 6O2(g) 1. If 8.00 moles of water react with carbon dioxide, how many moles of glucose are produced?
2. If 6.00 moles of oxygen were produced, how many moles of carbon dioxide were needed to react?

6. 3Hf + 2N2 → Hf3N41. If you have 2.5 mol Hf, how many moles of product will be made according to the reaction below?

 b. How many moles of nitrogen gas will be needed to create 9.3 moles of hafnium nitride? 7. According to the reaction below, if 26 moles CO2 were produced, how many moles of C2H6 were reacted? 2C2H6 + 7O2 → 4CO2 + 6H2O |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the mass of a reactant or product from the amount in moles of a different reactant or product.** |

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| **CLASS NOTES** |
| **STOICHIOMETRY****Moles A 🡨🡪 Moles B 🡨🡪 Grams B**http://www.polyvore.com/cgi/img-thing?.out=jpg&size=l&tid=985961**Stoichiometry and pizza!**1. Given the recipe 1 crust + 2 cheese + 3 tomato sauce 🡪 1 slice of pizza, how many grams of pizza could you make from 12 moles tomato sauce if the “molar mass” of pizza is 100 g/mol?

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| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the same recipe above, how grams of pizza could you make from 100 moles of cheese?

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| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the same recipe above, how many grams of pizza could you make from 900 moles of tomato sauce?

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| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the balanced chemical equation, Br2 + 2NaI → 2NaBr + I2, how many grams of sodium bromide (NaBr) could be produced from 10 moles of bromine (Br2)?

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| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the balanced equation, 2SO2 + O2 → 2SO3, how many grams of SO2 would be needed to produce 2 moles of SO3?

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| Start: |  |
| End: |  |
| Plan |  |
| Molar masses needed? |  |
| Solve: |  |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the mass of a reactant or product from the amount in moles of a different reactant or product.** |

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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.  |
| Solve the following stoichiometry problem. **Show all your work.** You will NOT receive credit if you do not show your work.1. Using the following chemical equation: 2Mg(s) + O2(g) 🡪 2MgO(s)  What mass in grams of oxygen combines with 2 moles of magnesium in the reaction above? Use your notes from above before asking for help. 2. Using the following chemical equation: 2NaOH + CO2 🡪 Na2CO3 + H2O a. How many moles of NaOH are needed to react with 925.0 g of CO2?  b. How many moles of Na2CO3 will be formed if 925.0 g of CO2 is used?3. Using the following chemical equation: Fe2O3(s) + CO(g) 🡪 Fe(s) + CO2(g) (MAKE SURE THE EQUATION IS BALANCED BEFORE YOU DO ANYTHING ELSE!!!) a. If you react 3.5 moles Fe2O3, how many grams of CO do you need?  b. How many grams of carbon dioxide gas are formed using the mass of Fe2O34. Copper reacts with silver nitrate through a single-replacement reaction.a. Write the chemical equation that corresponds to the chemical reaction described above. Make sure to include the predicted products of the reaction. Hint: You will need to do some charge swapping.b. Ensure that the chemical equation above is balanced. If it’s not, balance it by placing the correct coefficients in front of each chemical formula.c. If 3.4 moles of silver are produced from the reaction, how many grams of copper (II) nitrate are also produced?d. How many moles of silver nitrate are needed in this reaction?1. Consider the reaction:

C(s) + SO2(g) 🡪 CS2(l) + CO(g) a. If 10.93 moles of SO2 reacts, how many grams of each product are formed?  |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the amount in moles of a reactant or product from the mass of a different reactant or product.** |

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| **CLASS NOTES** |
|  **STOICHIOMETRY****Grams A 🡨🡪 Moles A 🡨🡪 Moles B**http://www.polyvore.com/cgi/img-thing?.out=jpg&size=l&tid=985961**Stoichiometry and pizza!**1. Given the recipe 1crust + 2 cheese + 3 tomato sauce 🡪 1 slice of pizza, how many moles of pizza could you make from 50 grams of tomato sauce (molar mass of tomato sauce = 150 g/mol) and the “molar mass” of pizza is 100 g/mol?

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| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the balanced chemical equation, Br2 + 2NaI → 2NaBr + I2, how many moles of sodium bromide (NaBr) could be produced from 54 grams of bromine (Br2)?

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| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the balanced equation, 2SO2 + O2 → 2SO3, how many moles of SO2 would be needed to produce 25.4 grams of SO3?

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| Start: |  |
| End: |  |
| Plan |  |
| Molar masses needed? |  |
| Solve: |  |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the amount in moles of a reactant or product from the mass of a different reactant or product.** |

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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. Using the following chemical equation:K2PtCl4(aq) + 2NH3(aq) 🡪 2KCl(aq) + PtCl2(NH3)2(aq)a. How many moles of K2PtCl4 must react in order to produce 30.0 g of PtCl2(NH3)2? Show all your work.b. How many moles of NH3 are needed to produce 30.0 g of PtCl2(NH3)2? Show all your work.1. Hydrogen and oxygen react under a specific set of conditions to produce water according to the following reaction:

2H2(g) + O2(g) 🡪 2H2O(g) 1. How many moles of water are produced if 40 grams of oxygen are used?
2. How many moles of oxygen are needed to produce 90 grams of water?

3.Consider the following chemical equation: CaC2(s) + 2H2O(l) 🡪 C2H2(g) + Ca(OH)2(aq) a. If 32 g of CaC2 are consumed in this reaction, how many moles of water do you need to add to the reaction? b. How many moles of calcium hydroxide will be created with 10 moles of water?4. Consider the following chemical equation: C2H2(g) + O2(g) 🡪 4CO2 + 2H2O(g)  How many moles of carbon dioxide are produced if you react 100 grams of C­2H2 with oxygen gas? (Reminder: Balance the chemical equation if it’s NOT balanced!!!)5. Milk of magnesia, a suspension of Mg(OH)2 in water, reacts with stomach acid, HCl, in a neutralization reaction as shown by the following chemical equation:Mg(OH)2(s) + 2HCl(aq) 🡪 2H2O(l) + MgCl2(aq) 1. How many moles of magnesium hydroxide do you need to neutralize (react) with 50 grams of HCl?
2. How many moles of water will you create with 183 grams of magnesium hydroxide?
3. How many moles of HCl do you need to create 90 grams of magnesium chloride?
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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the mass of a reactant or product from the mass of a different reactant or product.** |

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| **CLASS NOTES** |
|  **STOICHIOMETRY****Grams A 🡨🡪 Moles A 🡨🡪 Moles B 🡨🡪Grams B**1. Given the balanced chemical equation, Br2 + 2NaI → 2NaBr + I2, how many grams of sodium bromide (NaBr) could be produced from 45 grams of bromine (Br2)?

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| Start: |  |
| End: |  |
| Plan: |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the balanced equation, 2SO2 + O2 → 2SO3, how many grams of SO2 would be needed to produce 90 grams of SO3?

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| Start: |  |
| End: |  |
| Plan |  |
| Molar masses needed? |  |
| Solve: |  |

1. Given the balanced equation, 2SO2 + O2 → 2SO3, how many grams of O2 would be needed to produce 90 grams of SO3?

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| Start: |  |
| End: |  |
| Plan |  |
| Molar masses needed? |  |
| Solve: |  |

4. Consider the reaction between hydrogen gas and oxygen gas to produce water. How many grams of water will be produced if 95 grams of oxygen gas are used? |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the mass of a reactant or product from the mass of a different reactant or product.** |

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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. Given the following equation: 8 Fe + S8 🡪 8 FeS A) What mass of iron is needed to react with 16.0 grams of sulfur? B) How many grams of FeS are produced?2. The average human requires 120.0 grams of glucose (C6H12O6) per day. How many grams of CO2 (in the photosynthesis reaction) are required for this amount of glucose? The photosynthetic reaction is: 6 CO2 + 6 H2O ---> C6H12O6 + 6 O21. Consider the reaction:

 C(s) + SO2(g) 🡪 CS2(l) + CO(g) 1. How many grams of carbon monoxide are produced from the reaction of 16.0 g of SO2 with carbon?

 1. What mass of solid carbon is needed to produce 94.3 grams of CS2
2. Consider the reaction:

CaC2(g) + 2H2O(l) 🡪 C2H2(g) + Ca(OH)2(aq) If 27.0 g of CaC2 are used up in this reaction, how many moles of water are needed? How many moles of C2H2 would be formed?1. Consider the reaction:

2C2H2(g) + 5O2(g) 🡪 4CO2(g) + 2H2O(aq) 1. How many grams of CO2 would be formed when 76.2g of acetylene (C2H2(g)) burns completely?
2. How many moles of H2O would be formed?
3. How many grams of O2 are needed to react?
4. Consider the reaction:

Al4C3(s) + H2O(l) 🡪 CH4(g) + Al(OH)3(s) 1. How many moles of water are needed to react with 105g of aluminum carbide?
2. How many grams of methane (CH4(g)) are produced?
3. How many grams of aluminum hydroxide are produced?

8. Given the reaction: NH4NO3 (s) 🡪 N2O (g) + 2H2O (l)a. How many grams of N2O will be produced if 150 grams of NH4NO3 is used in the reaction?b. How many grams of NH4NO3 will be needed to make 489 grams of water?9. Given the reaction:Al2O3 🡪 Al + O2a. How many grams of aluminum will be produced if you start off with 1000 grams of Al2O3?b. How many grams of oxygen gas will be produced if you have 145 grams of Al2O3 decomposing?10. *Challenge:* When copper metal is added to silver nitrate (AgNO3) in solution, silver metal and copper (II) nitrate are produced. What mass of silver is produced from 100 grams of copper?11. According to the reaction below, how many grams of FeCl3 would be needed to fully react 68.2 g NaOH? FeCl3 + 3NaOH → Fe(OH)3 + 3NaCl |

**HOUSE of STOICHIOMETRY**



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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT determine the mass, moles, or particles using various stoichiometric relationships.** |

**Stoichiometry Summary**

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| **Type of Stoichiometry Problem** | **Keywords** | **Example** |
| *Mass-Mole* | *Grams and moles* | *Determine the mass of 5 moles of CO2* |
| Mole-Mole |  |  |
| Mass A- Mole A-Mole B |  |  |
| Mole A-Mole B – Mass B |  |  |
| Mass A –Mole A–Mole B – Mass B |  |  |
| Mole-Particles |  |  |
| Mass-Particles |  |  |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT determine the mass, moles, or particles using various stoichiometric relationships.** |

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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.  |
| **Mixed Review**1. Consider the reaction: H2(g) + O2(g) 🡪 H2O(g)
2. How many moles of water are produced if you use 24.5 moles of oxygen gas?
3. Determine the mass of the hydrogen gas needed to create 8.35 moles of water.
4. If 40 grams of hydrogen gas are available, how many molecules of water will be produced?
5. How many grams of oxygen gas will be needed to create 8.5 x 1027 molecules of water?
6. a. Write and completed balanced equation that describes a single displacement reaction involving potassium nitrate and zirconium metal.

b. Determine the mass of zirconium metal needed to create 7.34 moles of product.1. How many moles of product will be created if you react 94.5 grams of potassium nitrate?
2. What is the mass of zirconium nitrate if you react 54.3 grams of potassium nitrate with zirconium metal?
3. The Haber process is a very important process that converts atmospheric nitrogen to useful ammonia. This process is described as nitrogen gas reacting with hydrogen gas to produce ammonia. Write a chemical equation below that describes this process:
4. How many grams of nitrogen are required to react with 43.5 moles of oxygen gas?
5. What mass of the product will you get if you react 90 grams of nitrogen gas?
6. How many moles of product will you make if you add 54 grams of oxygen gas?
7. How many moles of nitrogen gas do you need to make 34 grams of product?
8. Write a complete and balanced equation that describes the following reaction: propane combusts to produce water and carbon dioxide.
9. How many grams of propane will you need to create 40 moles of carbon dioxide?
10. How many grams of water will you produce if you burn 90 grams of propane?
11. How many molecules of water will you produce if you burn 90 grams of propane?
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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:**