STOICHIOMETRY: GRAMS TO GRAMS NOTES

 **Vocabulary:**

*Stoichiometry***-** Greek,"stoiechion" meaning "element," and "metron" meaning "to measure.” The process of calculating substance quantities in a reaction using the balanced equation.

*Balanced Equation***-** An equation that upholds mass conservation and equal element counts on both sides of an equation.

*Coefficient***-** a whole number put before a formula in a chemical equation to achieve equilibrium.

*Conversion factor***-** a numeric ratio of equal measurements used to convert quantities between different units.

*Moles(mol)***-** the quantity of an element or compound containing 6.02 x 1023(Avagadro’s number) particles (ex. atoms, ions, etc.) of that element/compound.

*Molar (Molecular) Mass***-**the weight (in grams) of a single mole of particles (atoms, ions, or molecules) of an element/compound.

# Steps:

1. Balance the equation.
2. Convert grams A given in the problem to moles of A by dividing by the molar(molecular) mass of A from the periodic table.
3. Determine the mole to mole ratio between A and B.
4. Convert moles of B to the mass of B by multiplying the molecular mass of B.
5. Multiply across, divide bottom.

| *# g A* | *# mol A* | *Ratio from coefficient mol B* | *Molar mass from periodic table g B* | *= grams of B* |
| --- | --- | --- | --- | --- |
|  |  *Molar mass from periodic table g A* | *Ratio from coefficient mol A* |  |

**ketzbook’s Stoichiometry Tricks Video:**

*Problem:* How many grams of carbon dioxide are produced when 2800 grams of octane are burned in excess air?

1. Balance reaction:

2C₄H18 + 25O₂ → 16CO₂ + 18H₂O

1. Mass of A(C₄H18) given: *2800 g C₄H18*
2. Molar mass of A(C₄H18): *114.2 g C₄H18*
3. Mole to mole ratio of A and B: *2 mol of A to 16 mol of B (2:16)*
4. Molar Mass of B(CO₂): *44.01g*
5. Use the given information to solve the problem:

|  |  |  |  |
| --- | --- | --- | --- |
| *2800 g C₄H18* | *1 mol C₄H18* | *16 mol CO₂* | *44.01 g*  |
|  | *114.2 g C₄H18* | *2 mol C₄H18* | *1 mol CO₂*  |

1. Answer: *8,632.43g CO₂*

**Practice Problem:**

*Problem:* If 14 grams of H2 and excess O2 react to produce water. How many grams of H2O are produced?

1. Balance the equation:

2H2 + 1 O2 -> 2H2O

1. Mass A given: *14 g H2*
2. Molar mass of A: *2.02* *g H2*
3. Mole to mole ratio of A and B: *2:2*
4. Molar Mass of B(CO₂): *18.02 g H2O*
5. Using the given information to solve the problem:

|  |  |  |  |
| --- | --- | --- | --- |
| *14 g H2*  | *1 mol H2*  | *2 mol H2O* | *18.02 g H2O* |
|  | *2.02 g H2*  | *2 mol H2*  | *1 mol H2O* |

1. Answer: *124.89 g H2O*

*Adapted from:*

*Foundation, C.-12. (n.d.). 12 foundation. CK. https://flexbooks.ck12.org/cbook/ck-12-chemistry-flexbook-2.0/section/12.1/primary/lesson/everyday-stoichiometry-chem/*

*Foundation, C.-12. (n.d.-a). 12 foundation. CK. https://flexbooks.ck12.org/cbook/ck-12-chemistry-flexbook-2.0/section/10.4/primary/lesson/conversions-between-moles-and-mass-chem/*

*Foundation, C.-12. (n.d.-a). 12 foundation. CK. https://flexbooks.ck12.org/cbook/ck-12-chemistry-flexbook-2.0/section/10.2/primary/lesson/conversions-between-moles-and-atoms-chem/*