**Help Solving Mass-Mass Stoichiometry Problems**

This is the most common type of stoichiometric problem.

Here are the steps involved in solving these problems:

1. Make sure you are working with a properly balanced equation.
2. Start with what you know.
3. Convert grams of the substance given in the problem to moles.
4. Mole ratio between what you were given to what you are trying to find.
5. Convert moles of the substance just solved for into grams.
6. Do the calculations.

Comments

1. Double check the equation. Make sure it is correctly balanced
2. DON'T use the same molar mass in steps two and four.
3. Don't multiply the molar mass of a substance by the coefficient in the problem BEFORE using it in one of the steps above. For example, if the formula says 2 H2O, DON'T use 36.0 g/mol, use 18.0 g/mol.
4. Don't round off until the very last answer. In other words, don't clear your calculator after step two and write down a value of 3 or 4 significant figures to use in the next step. Round off only once after all calculations are done.

Each of the example problems below has an associated image which lays out the solution. Reading from left to right:

1. Grams given
2. The conversion of the grams given in the problem to moles.
3. the molar ratio used in the problem's solution.
4. The conversion of moles of unknown to mass of unknown

Mole Ratio

|  |  |  |  |
| --- | --- | --- | --- |
| Grams of Given | 1 mole of given | # of Moles of unknown | Molar mass of unknown |
|  | Molar mass of given | # of Moles of given | 1 Mole of unknown |

= mass of unknown

**Example #1** - How many grams of chlorine can be liberated from the decomposition of 64.0 g. of AuCl3 by this reaction: 2 AuCl3 ---> 2 Au + 3 Cl2

|  |  |  |  |
| --- | --- | --- | --- |
| 64.0g AuCl3 | 1 mole AuCl3 | 3 moles Cl2 | 71 g Cl2 |
|  | 303 g | 2 moles AuCl3 | 1 mole Cl2 |

= 22.5 g Cl2

**Example #2** - Calculate the mass of AgCl that can be prepared from 200. g of AlCl3 and sufficient AgNO3, using this equation: 3 AgNO3 + AlCl3 --> 3 AgCl + Al(NO3)3

|  |  |  |  |
| --- | --- | --- | --- |
| 200 g AlCl3 | 1 mole AlCl3 | 3 moles AgCl | 143 g |
|  | 134 g | 1 mole AlCl3 | 1 mole AgCl |

=640 g AgCl

**Example #3** - Given this equation: 2 KI + Pb(NO3)2 --> PbI2 + 2 KNO3 calculate mass of PbI2 produced by reacting of 30.0 g KI with excess Pb(NO3)2

|  |  |  |  |
| --- | --- | --- | --- |
| 30 g KI | 1 mole KI | 1 mole PbI2 | 461 g |
|  | 166 g | 2 moles KI | 1 mole PbI2 |

= 41.7 g PbI2

**Example #4** - How many grams of AuCl3 can be made from 100.0 grams of chlorine by this reaction:

2 Au + 3 Cl2 ---> 2 AuCl3

|  |  |  |  |
| --- | --- | --- | --- |
| 100.0 g Cl2 | 1 mole Cl2 | 2 moles AuCl3 | 133 g |
|  | 70 g | 3 moles Cl2 | 1 mole AuCl3 |

= 127 g AuCl3

**Example #5** - How many grams of Na are required to react completely with 75.0 grams of chlorine using this reaction: 2 Na + Cl2 ---> 2 NaCl

|  |  |  |  |
| --- | --- | --- | --- |
| 75 g Cl2 | 1 mole Cl2 | 2 moles Na | 23 g |
|  | 70 g | 1 mole Cl2 | 1 mole Na |

= 49.3 g Na