

I. Mole ↔ Mole Calculations

- 1) Given the balanced equation, $6 \text{ AgI (aq)} + \text{Fe}_2(\text{CO}_3)_3 \text{ (aq)} \rightarrow 2 \text{ FeI}_3 \text{ (aq)} + 3 \text{ Ag}_2\text{CO}_3 \text{ (s)}$:
- How many moles of AgI would be required to form 10. moles of FeI₃?
 - How many moles of Ag₂CO₃ would be formed from the reaction of 4.0 moles of Fe₂(CO₃)₃ with enough AgI?
- 2) Given the chemical equation,
- $$\text{___ H}_2\text{SO}_4 \text{ (aq)} + \text{___ B(OH)}_3 \text{ (s)} \rightarrow \text{___ B}_2(\text{SO}_4)_3 \text{ (s)} + \text{___ H}_2\text{O (l)}$$
- Balance the equation
 - How many moles of B(OH)₃ would be required to completely react with 4.65 moles of H₂SO₄?
 - How many moles of H₂SO₄ would be needed, given enough B(OH)₃, to produce 11.8 moles of B₂(SO₄)₃?
- 3) When propane (C₃H₈) gas burns in oxygen gas, it forms carbon dioxide gas and water vapor:
- Write and balance the equation
 - How many moles of water would be formed in the reaction where 3.19 mol of carbon dioxide are formed?
 - How many moles of carbon dioxide would be produced by the reaction of 23.4 moles of oxygen, with sufficient propane?

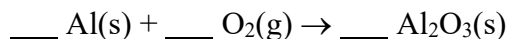
II. Mass ↔ Mole and Mass ↔ Mass Calculations

For the following problems, use the flowchart **Mass → Mole → Mole → Mass**

- 4) Titanium is a transition metal used in many alloys because it is extremely strong and lightweight. Titanium(IV) chloride (TiCl₄) is extracted from titanium oxide using chlorine and coke (carbon):
- $$\text{TiO}_2\text{(s)} + \text{C(s)} + 2 \text{ Cl}_2\text{(g)} \rightarrow \text{TiCl}_4\text{(s)} + \text{CO}_2\text{(g)}$$
- If you begin with 1.25 mol TiO₂, what mass of Cl₂ gas is needed?

b. How many moles of C must be used in the formation of 82.5 g of TiCl_4 ?

5) Aluminum oxidizes according the following unbalanced equation:



a. Balance the equation

b. How many grams of Al_2O_3 would be formed by the reaction of 29.75 grams of Al with enough O_2 ?

c. How many grams of O_2 would be required to form 65.32 grams of Al_2O_3 ?

6) Dinitrogen pentoxide is an acidic gas that reacts with water to forms aqueous nitric acid:

a. Write and balance the chemical equation.

b. How many grams of dinitrogen pentoxide would be required to completely react with 13.44 grams of water?

c. How many grams of dinitrogen pentoxide would be needed, given enough water, to produce 105.65 grams of nitric acid?

Answers: 1a) 30. mol AgI; 1b) 12 mol Ag_2CO_3 ; 2a) 3.2, 1.6; 2b) 3.10 mol B(OH)₃; 2c) 35.4 mol H_2SO_4 ; 3a) 1.5, 3.4; 3b) 4.25 mol H_2O ; 3c) 14.0 mol CO_2 ; 4a) 177 g Cl_2 ; 4b) 0.435 mol C; 5a) 4.3, 2; 5b) 56.21 g Al_2O_3 ; 5c) 30.75 g O_2 ; 6a) 1, 1.2; 6b) 80.56 g N_2O_5 ; 6c) 90.557 g N_2O_5