Limiting reactants and percentage yield

1. \(2 \text{ Mg} + \text{ O}_2(\text{g}) \rightarrow 2 \text{ MgO}\)
   What is the limiting reactant if 2.2 g of Mg is reacted with 4.5 L of oxygen at STP? What is % yield if 22.3 g of MgO is produced?

2. \(\text{CH}_4 + 2 \text{ H}_2\text{O} \rightarrow 4 \text{ H}_2(\text{g}) + \text{ CO}_2(\text{g})\)
   How many liters of hydrogen can be produced from the reaction of 80.0 g of CH4 and 16.3 g of water? What is the limiting reactant? What is % yield if 50.1 g of H2 is produced?

3. \(2 \text{ NaCl} + \text{ Pb(NO}_3)_2 \rightarrow 2 \text{ NaNO}_3 + \text{ PbCl}_2\)
   How many grams of lead II chloride are produced from the reaction of 15.3 g of NaCl and 60.8 g of Pb(NO3)2? What is the limiting reactant? How much excess is left over? What is % yield if 45.3 g of NaNO3 is produced?
4. CO(g) + 2 H2 → CH3OH
   2.50 g of hydrogen is reacted with 30.0 L of carbon monoxide at STP. What is the limiting reactant? What mass of CH3OH is produced? How much excess is left over? What is % yield if 22g of CH3OH is produced?

Solution Stoichiometry

5. How many grams of silver chromate will precipitate when 150. mL of 0.500 M silver nitrate are added to 100. mL of 0.400 M potassium chromate?
   2 AgNO3(aq) + K2CrO4(aq) → Ag2CrO4(s) + 2 KNO3(aq)

6. How many mL of 0.280 M barium nitrate are required to precipitate as barium sulfate all the sulfate ions from 25.0 mL of 0.350 M aluminum sulfate? (93.8 mL barium nitrate)
   3 Ba(NO3)2(aq) + Al2(SO4)3(aq) → 3 BaSO4(s) + 2 Al(NO3)3(aq)
7. 25.0 mL of 0.350 M NaOH are added to 45.0 mL of 0.125 M copper (II) sulfate. How many grams of copper (II) hydroxide will precipitate?
   \[ 2 \text{NaOH(aq)} + \text{CuSO}_4(aq) \rightarrow \text{Cu(OH)}_2(s) + \text{Na}_2\text{SO}_4(aq) \]

8. What volume of 0.415 M silver nitrate will be required to precipitate all the bromide ion in 35.0 mL of 0.128 M calcium bromide?
   \[ 2 \text{AgNO}_3(aq) + \text{CaBr}_2(aq) \rightarrow \text{Ca(NO}_3)_2(aq) + 2 \text{AgBr(s)} \]

9. What volume of 0.496 M HCl is required to neutralize 20.0 mL of 0.809 M sodium hydroxide?
   \[ \text{HCl(aq)} + \text{NaOH(aq)} \rightarrow \text{NaCl(aq)} + \text{H(OH)}(l) \]
10. How many grams of magnesium hydroxide will precipitate if 25.0 mL of 0.235 M magnesium nitrate are combined with 30.0 mL of 0.260 M potassium hydroxide?
Mg(NO₃)₂(aq) + 2 KOH → 2 KNO₃(aq) + Mg(OH)₂(s)

11. 60.0 mL of 0.322 M potassium iodide are combined with 20.0 mL of 0.530 M lead (II) nitrate. How many grams of lead (II) iodide will precipitate?
2 KI(aq) + Pb(NO₃)₂(aq) → 2 KNO₃(aq) + PbI₂(s)