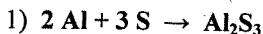


Key

Limiting Reagents and Theoretical Yield



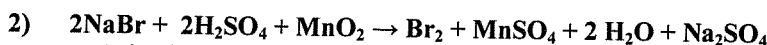
a. What is the limiting reactant if 3 moles of Al react with 3 moles of S? Which reactant is in excess?

$$\frac{3 \text{ mol Al}}{2 \text{ Al}} \cdot \frac{1 \text{ Al}_2\text{S}_3}{1 \text{ Al}_2\text{S}_3} = 1.5 \text{ mol Al}_2\text{S}_3 \quad \frac{3 \text{ mol S}}{3 \text{ S}} \cdot \frac{1 \text{ Al}_2\text{S}_3}{1 \text{ Al}_2\text{S}_3} = 1 \text{ mol Al}_2\text{S}_3$$

S is limiting produces less product so Al is excess

b. How many grams (theoretical yield) of aluminum sulfide can form?

$$\frac{3 \text{ mol S}}{3 \text{ S}} \cdot \frac{1 \text{ Al}_2\text{S}_3}{1 \text{ Al}_2\text{S}_3} \cdot \frac{150.14 \text{ g Al}_2\text{S}_3}{1 \text{ mol Al}_2\text{S}_3} = 150.14 \text{ g Al}_2\text{S}_3$$



a. What is the limiting reactant when 2.10g of NaBr and 9.42g of H₂SO₄ react? Which reactant is in excess?

$$\frac{2.10 \text{ g NaBr}}{102.89 \text{ g NaBr}} \cdot \frac{1 \text{ mol NaBr}}{2 \text{ NaBr}} \cdot \frac{1 \text{ Br}_2}{1 \text{ Br}_2} = 0.010 \text{ mol Br}_2 \cdot \frac{159.8 \text{ g Br}_2}{1 \text{ mol Br}_2} = 1.63 \text{ g Br}_2$$

$$\frac{9.42 \text{ g H}_2\text{SO}_4}{98 \text{ g H}_2\text{SO}_4} \cdot \frac{1 \text{ mol H}_2\text{SO}_4}{2 \text{ H}_2\text{SO}_4} \cdot \frac{1 \text{ Br}_2}{1 \text{ Br}_2} = 0.048 \text{ mol Br}_2 \cdot \frac{159.8 \text{ g Br}_2}{1 \text{ mol Br}_2} = 7.67 \text{ g Br}_2$$

b. What is the theoretical yield of bromine could be produced?

3) a. If 4.44 grams of CaO are mixed with 7.77 grams of water, how many grams (theoretical yield) of calcium hydroxide form? (You will need to write the balanced equation first; HINT: synthesis reaction) then (HINT, HINT: Determine which reactant is the limiting)

$$\frac{7.77 \text{ g H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \cdot \frac{1 \text{ mol H}_2\text{O}}{1 \text{ H}_2\text{O}} \cdot \frac{1 \text{ Ca(OH)}_2}{1 \text{ Ca(OH)}_2} = 0.432 \text{ mol Ca(OH)}_2 \cdot \frac{74 \text{ g Ca(OH)}_2}{1 \text{ mol Ca(OH)}_2} = 31.9 \text{ g Ca(OH)}_2$$

$$\frac{4.44 \text{ g CaO}}{56 \text{ g CaO}} \cdot \frac{1 \text{ mol CaO}}{1 \text{ CaO}} \cdot \frac{1 \text{ Ca(OH)}_2}{1 \text{ Ca(OH)}_2} = 0.0792 \text{ mol Ca(OH)}_2 \cdot \frac{74 \text{ g Ca(OH)}_2}{1 \text{ mol Ca(OH)}_2} = 5.86 \text{ g Ca(OH)}_2$$

$$\frac{4.44 \text{ g CaO}}{56 \text{ g CaO}} \cdot \frac{1 \text{ mol CaO}}{1 \text{ CaO}} \cdot \frac{1 \text{ H}_2\text{O}}{1 \text{ H}_2\text{O}} \cdot \frac{18 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 1.43 \text{ g H}_2\text{O} \leftarrow \text{used}$$

LR → ER

$$7.77 - 1.43 \text{ g} = 6.34 \text{ g H}_2\text{O excess}$$

have used