

Stoichiometry Part 1

Sh all work using dimensional analysis!



a) How many moles of Sodium would be needed to react with 3.82 moles of oxygen?

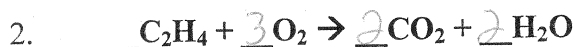
$$\cancel{3.82 \text{ mol O}_2} \times \frac{4 \text{ mol Na}}{1 \text{ mol O}_2} = \boxed{15.28 \text{ mol Na}}$$

b) How many moles of Na₂O can be produced from 13.5 moles Na?

$$\frac{13.5 \text{ mol Na}}{1} \times \frac{2 \text{ mol Na}_2\text{O}}{4 \text{ mol Na}} = \boxed{6.75 \text{ mol Na}_2\text{O}}$$

c) How many moles of O₂ are needed to produce 34.7 grams of Na₂O?

$$\frac{34.7 \text{ g Na}_2\text{O}}{1} \times \frac{1 \text{ mol Na}_2\text{O}}{61.979 \text{ g Na}_2\text{O}} \times \frac{1 \text{ mol O}_2}{2 \text{ mol Na}_2\text{O}} = \boxed{0.280 \text{ mol O}_2}$$



a) When 0.624 moles of O₂ are reacted, how many moles of carbon dioxide are produced?

$$\frac{0.624 \text{ mol O}_2}{1} \times \frac{2 \text{ mol CO}_2}{3 \text{ mol O}_2} = \boxed{0.416 \text{ mol CO}_2}$$

b) How many grams of C₂H₄ are needed to produce 3.7 moles of water?

$$\frac{3.7 \text{ mol H}_2\text{O}}{1} \times \frac{1 \text{ mol C}_2\text{H}_4}{2 \text{ mol H}_2\text{O}} \times \frac{28.054 \text{ g C}_2\text{H}_4}{1 \text{ mol C}_2\text{H}_4} = 51.9 \text{ g C}_2\text{H}_4 = \boxed{52 \text{ g C}_2\text{H}_4}$$

c) How many grams of O₂ are needed to react with 2.56 g of C₂H₄?

$$\frac{2.56 \text{ g C}_2\text{H}_4}{1} \times \frac{1 \text{ mol C}_2\text{H}_4}{28.054 \text{ g C}_2\text{H}_4} \times \frac{3 \text{ mol O}_2}{1 \text{ mol C}_2\text{H}_4} \times \frac{31.998 \text{ g O}_2}{1 \text{ mol O}_2} = \boxed{8.76 \text{ g O}_2}$$



a) When 62.0 g of fluorine are reacted, how many moles of NF₃ will be formed?

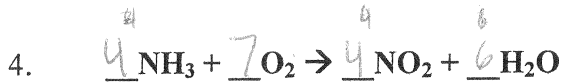
$$\frac{62.0 \text{ g F}_2}{1} \times \frac{1 \text{ mol F}_2}{37.997 \text{ g F}_2} \times \frac{2 \text{ mol NF}_3}{3 \text{ mol F}_2} = \boxed{1.09 \text{ mol NF}_3}$$

b) How many molecules of N₂ are needed to produce 2.85 g of NF₃?

$$\frac{2.85 \text{ g NF}_3}{1} \times \frac{1 \text{ mol NF}_3}{71.002 \text{ g NF}_3} \times \frac{1 \text{ mol N}_2}{2 \text{ mol NF}_3} \times \frac{6.02 \times 10^{23} \text{ molecules N}_2}{1 \text{ mol N}_2} = \boxed{1.21 \times 10^{22} \text{ molecules N}_2}$$

c) 3.54 g of nitrogen will react with how many grams of fluorine?

$$\frac{3.54 \text{ g N}_2}{1} \times \frac{1 \text{ mol N}_2}{28.01348 \text{ g N}_2} \times \frac{3 \text{ mol F}_2}{1 \text{ mol N}_2} \times \frac{37.997 \text{ g F}_2}{1 \text{ mol F}_2} = \boxed{14.4 \text{ g F}_2}$$



a) What mass of NO_2 can be produced from 3.56×10^{22} molecules of oxygen?

$$\frac{3.56 \times 10^{22} \text{ molecules O}_2}{1} \times \frac{1 \text{ mol O}_2}{6.02 \times 10^{23} \text{ molecules O}_2} \times \frac{4 \text{ mol NO}_2}{7 \text{ mol O}_2} \times \frac{46.005 \text{ g NO}_2}{1 \text{ mol NO}_2} = 11.5 \text{ g NO}_2$$

b) 13.8 g of NH_3 would be able to produce how many moles of H_2O ?

$$\frac{13.8 \text{ g NH}_3}{1} \times \frac{1 \text{ mol NH}_3}{17.031 \text{ g NH}_3} \times \frac{6 \text{ mol H}_2\text{O}}{4 \text{ mol NH}_3} \times \frac{18.0153 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 3.65 \text{ mol H}_2\text{O}$$

c) How many grams of O_2 are needed to produce 15.5 g of H_2O ?

$$\frac{15.5 \text{ g H}_2\text{O}}{1} \times \frac{1 \text{ mol H}_2\text{O}}{18.0153 \text{ g H}_2\text{O}} \times \frac{7 \text{ mol O}_2}{6 \text{ mol H}_2\text{O}} \times \frac{31.998 \text{ g O}_2}{1 \text{ mol O}_2} = 37.1 \text{ g O}_2$$

4b) $\frac{13.8 \text{ g NH}_3}{1} \times \frac{1 \text{ mol NH}_3}{17.031 \text{ g NH}_3} \times \frac{6 \text{ mol H}_2\text{O}}{4 \text{ mol NH}_3} = 1.22 \text{ mol H}_2\text{O}$

$$\frac{13.8 \text{ g NH}_3}{1} \times \frac{1 \text{ mol NH}_3}{17.031 \text{ g NH}_3} \times \frac{6 \text{ mol H}_2\text{O}}{4 \text{ mol NH}_3} \times \frac{18.0153 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 21.9 \text{ g H}_2\text{O}$$