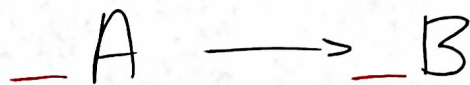


Noteset 7C - Mass Stoichiometry

Stoichiometry Chart



Step 1

Mass A $\rightarrow$ mol A

Step 2

mol A $\rightarrow$ mol B

Step 3

mol B $\rightarrow$ Mass B

$$\frac{\text{Start Ag} | 1 \text{ mol A}}{\text{MM Ag}}$$

$$= \text{— mol A}$$

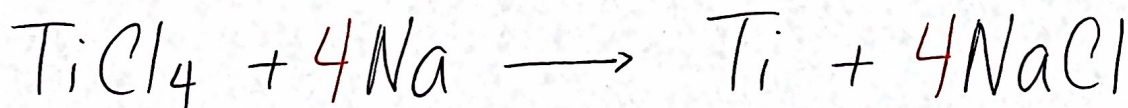
$$\left[\frac{\cancel{\text{mol A}} | \text{ratio mol B}}{\text{ratio mol A}} \right]$$

$$= \text{— mol B}$$

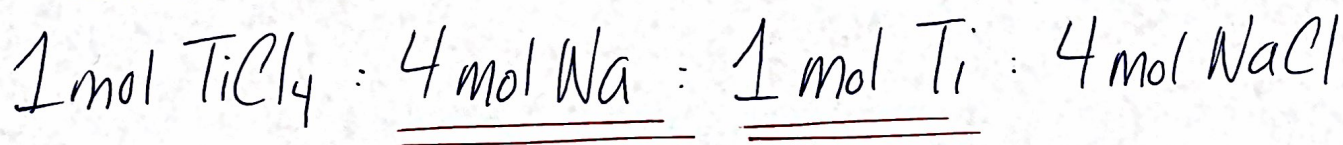
$$\left[\frac{\cancel{\text{mol B}} | \text{MM B g}}{1 \text{ mol B}} \right]$$

$$= \text{— g B}$$

One step (mol A $\rightarrow$ mol B) [step 2]



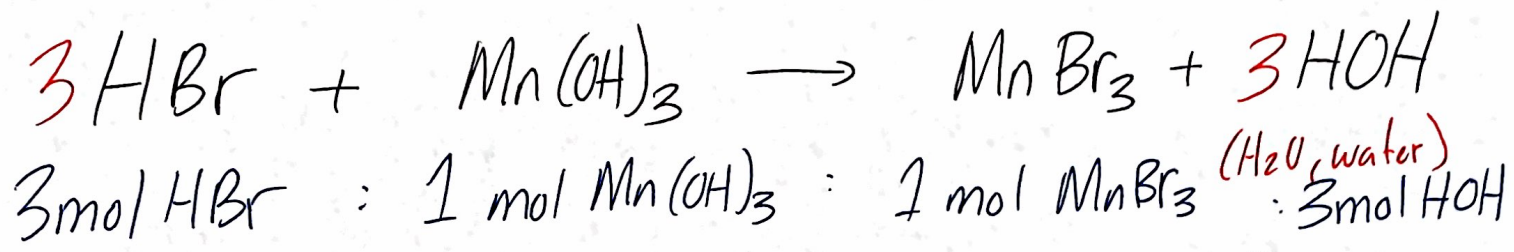
3.50 mol Na, convert to mol Ti



$$\frac{3.50 \cancel{\text{mol Na}} | 1 \text{ mol Ti (B)}}{4 \cancel{\text{mol Na}} (\text{A})} = \underline{0.88 \text{ mol Ti}}$$

ratio B on top ratio A on bottom

Two Step (mol A $\rightarrow$ mol B $\rightarrow$ mass B)
(steps 2 and 3)



2.30 mol Mn(OH)₃, Convert to mass MnBr₃

Steps (1) 2.30 mol Mn(OH)₃ $\rightarrow$ mol Mn^{Br₃}(OH)₃
(2) mol MnBr₃ $\rightarrow$ mass MnBr₃

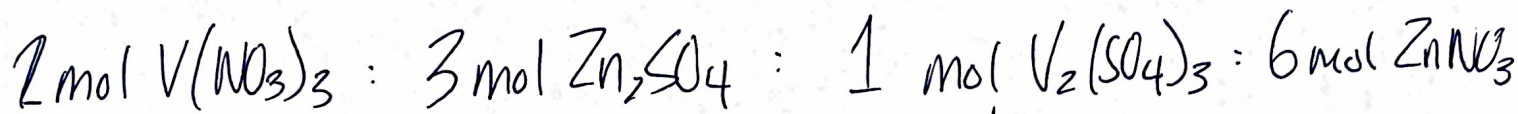
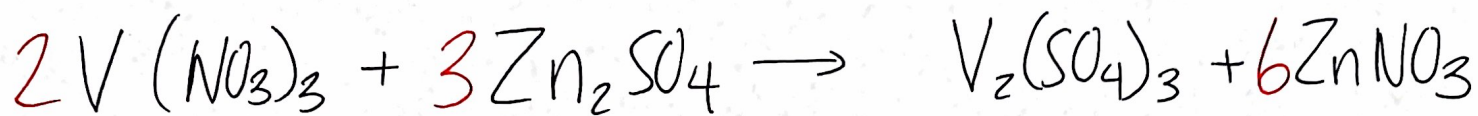
$$(1) \quad \frac{2.30 \cancel{\text{mol Mn(OH)}_3} \mid 1 \text{ mol MnBr}_3}{1 \cancel{\text{mol Mn(OH)}_3}} = \underline{2.30 \text{ mol MnBr}_3}$$

$$(2) \quad \frac{2.30 \cancel{\text{mol MnBr}_3} \mid 294.64 \text{ g MnBr}_3}{1 \cancel{\text{mol MnBr}_3}} = \underline{677.67 \text{ g MnBr}_3}$$

$$(\text{MM}_{\text{MnBr}_3} = 294.64 \text{ g/mol})$$

HBr + Mn(OH)₃ is an acid / base neutralization
acid (H⁺) base (OH⁻) reaction, always producing
an ionic salt and water (H₂O)

Two step (mass $A \rightarrow$ mol $A \rightarrow$ mol B)
(step 1 and step 2)



140.3 g V(NO₃)₃, convert to mol ZnNO₃

Steps (1) 140.3 g V(NO₃)₃ $\rightarrow$ mol V(NO₃)₃
(2) mol V(NO₃)₃ $\rightarrow$ mol ZnNO₃

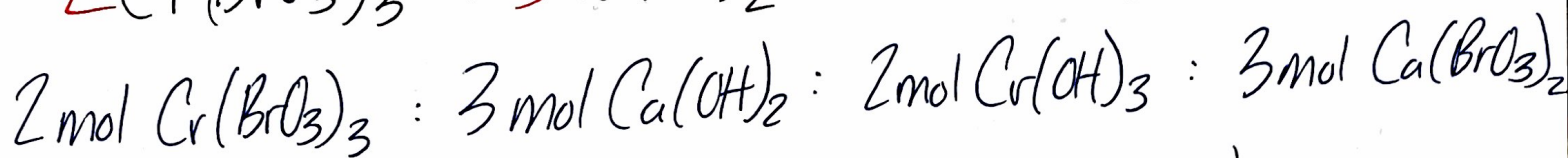
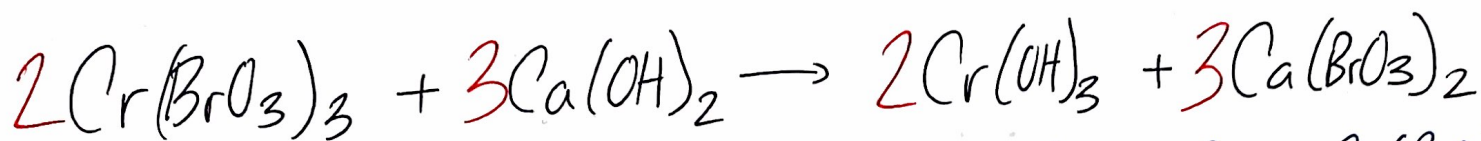
$$(1) \frac{140.3 \text{ g } \cancel{\text{V}(\text{NO}_3)_3}}{236.97 \text{ g } \cancel{\text{V}(\text{NO}_3)_3}} \times 1 \text{ mol V}(\text{NO}_3)_3 = \underline{0.59 \text{ mol V}(\text{NO}_3)_3}$$

$$(\text{MNI V}(\text{NO}_3)_3 = 236.97 \text{ g/mol})$$

$$(2) \frac{0.59 \text{ mol } \cancel{\text{V}(\text{NO}_3)_3}}{2 \text{ mol } \cancel{\text{V}(\text{NO}_3)_3}} \times 6 \text{ mol ZnNO}_3 = \underline{1.77 \text{ mol ZnNO}_3}$$

Two step problems are rare. Most stoichiometry problems are three step (mass $A \rightarrow$ mass B) or just the mol ratio (one step, mol $A \rightarrow$ mol B)

Three Step (mass $A \rightarrow \text{mol } A \rightarrow \text{mol } B \rightarrow \text{mass } B$)
(step 1, 2, and 3)



310.6g Ca(OH)₂, convert to mass Cr(OH)₃

Steps

(1) $310.6\text{g Ca}(\text{OH})_2 \rightarrow \text{mol Ca}(\text{OH})_2$
(2) $\text{mol Ca}(\text{OH})_2 \rightarrow \text{mol Cr}(\text{OH})_3$
(3) $\text{mol Cr}(\text{OH})_3 \rightarrow \text{mass Cr}(\text{OH})_3$

$$(1) \quad \frac{310.6\cancel{\text{g Ca}(\text{OH})_2}}{74.10\cancel{\text{g Ca}(\text{OH})_2}} \times \frac{1\text{mol Ca}(\text{OH})_2}{1} = \underline{4.19\text{mol Ca}(\text{OH})_2}$$

(MM Ca(OH)₂ = 74.10 g/mol)

$$(2) \quad \frac{4.19\cancel{\text{mol Ca}(\text{OH})_2}}{3\cancel{\text{mol Ca}(\text{OH})_2}} \times \frac{2\text{mol Cr}(\text{OH})_3}{2} = \underline{2.79\text{mol Cr}(\text{OH})_3}$$

$$(3) \quad \frac{2.79\cancel{\text{mol Cr}(\text{OH})_3}}{1\cancel{\text{mol Cr}(\text{OH})_3}} \times \frac{103.03\text{g Cr}(\text{OH})_3}{1} = \underline{287.45\text{g Cr}(\text{OH})_3}$$

$$(\text{MM Cr}(\text{OH})_3 = 103.03\text{g/mol})$$

Mass to Mass Stoichiometry is only one variant of three step
you can start or end w/ Molarity (solution), mass (Molar Mass),
particles (Avogadro's #) or Volume gas (@STP) (standard T and P)