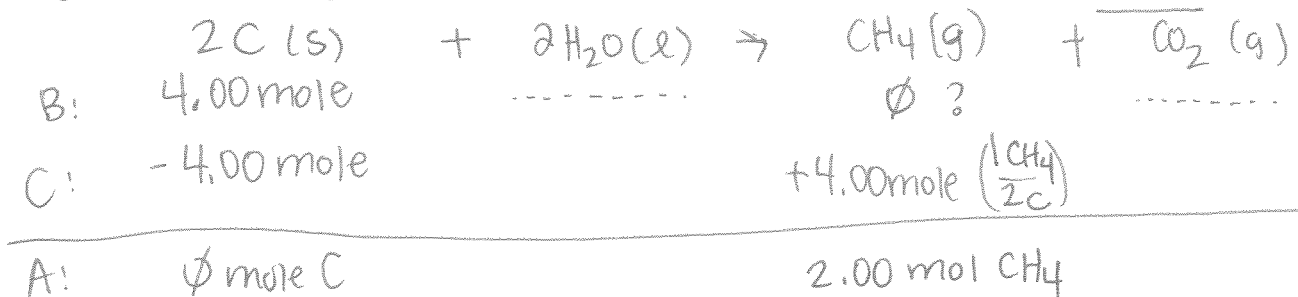


Stoichiometry: BCA Table vs. Dimensional Analysis - Two methods to solve.

Both require the mole ratio from the balanced equation.

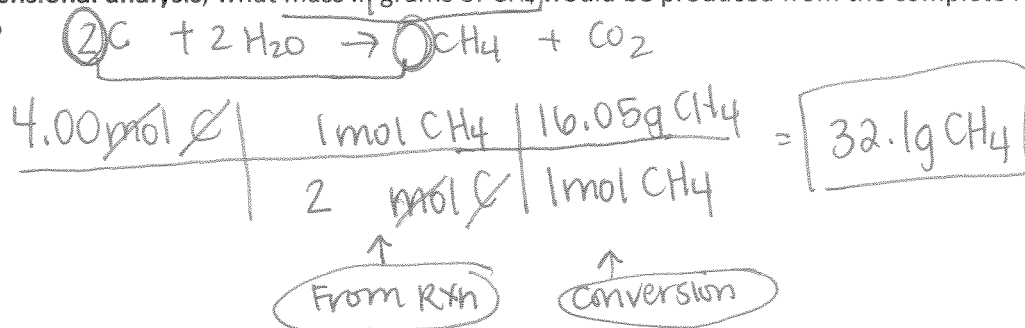
Use the following balanced equation to answer Questions 1-4. $2\text{C (s)} + 2\text{H}_2\text{O (l)} \rightarrow \text{CH}_4\text{ (g)} + \text{CO}_2\text{ (g)}$

1. Using **B-C-A**, what mass in grams of CH_4 would be produced from the complete reaction of 4.00 mole of carbon?



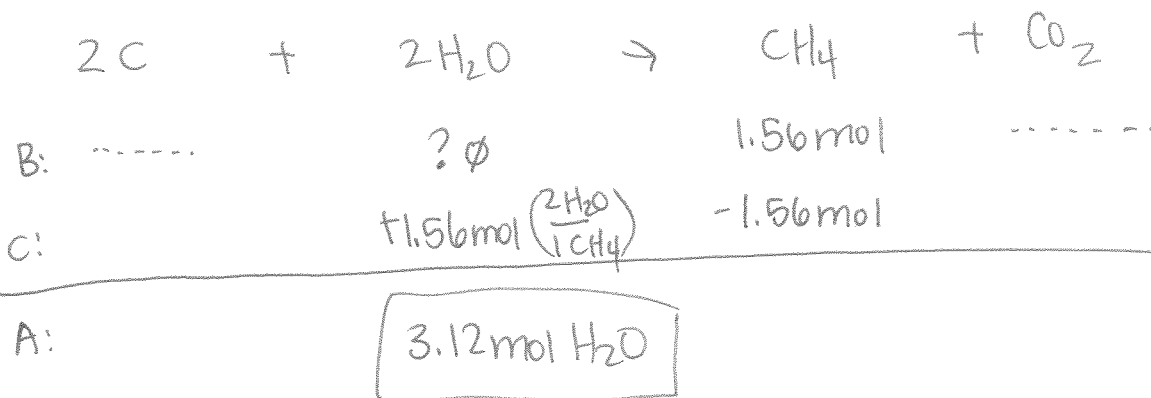
$$\frac{2.00 \text{ mol CH}_4}{1 \text{ mole CH}_4} \times \frac{16.05 \text{ g CH}_4}{1 \text{ mole CH}_4} = \boxed{32.1 \text{ g CH}_4}$$

2. Using **dimensional analysis**, what mass in grams of CH_4 would be produced from the complete reaction of 4.00 mole of carbon?



3. Using **B-C-A**, how many moles of H_2O are needed to produce 25.0 grams of CH_4 ?

$$\frac{25.0 \text{ g CH}_4}{16.05 \text{ g CH}_4} \times \frac{1 \text{ mole CH}_4}{1 \text{ mole CH}_4} = 1.56 \text{ mol CH}_4$$



4. Using dimensional analysis, how many moles of H₂O are needed to produce 25.0 grams of CH₄?



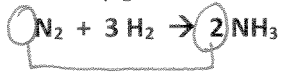
$$\frac{25.0 \cancel{\text{g CH}_4}}{16.05 \cancel{\text{g CH}_4}} \times \frac{1 \text{ mol CH}_4}{1 \text{ mol CH}_4} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol CH}_4} = 3.12 \text{ mol H}_2\text{O}$$

↑
Conversion
↑
From Rxn

Dimensional Analysis Conclusion Set- Up

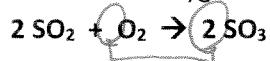
Number with unit & start substance formula from problem	Conversion 1 mole with start substance formula	From Rxn Coefficients from rxn mole with end substance formula	Conversion conversion value desired unit with end substance formula
	conversion value of with start substance formula	Coefficients from rxn mole with start substance formula	1 mole with end substance formula

5. How many grams of ammonia, NH₃, are produced when 3.6 x 10²³ molecules of nitrogen react with hydrogen?



$$\frac{3.6 \times 10^{23} \text{ molecules N}_2}{6.02 \times 10^{23} \text{ molecules N}_2} \times \frac{1 \text{ mole N}_2}{1 \text{ mole N}_2} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \times \frac{17.04 \text{ g NH}_3}{1 \text{ mol NH}_3} = 20.0 \text{ g NH}_3$$

6. When sulfur dioxide reacts with oxygen at STP, how many molecules of oxygen are needed to produce 19.8 L of sulfur trioxide?



$$\frac{19.8 \text{ L SO}_3}{22.4 \text{ L SO}_3} \times \frac{1 \text{ mol SO}_3}{1 \text{ mol SO}_3} \times \frac{1 \text{ mol O}_2}{2 \text{ mol SO}_3} \times \frac{6.02 \times 10^{23} \text{ molecule O}_2}{1 \text{ mol O}_2}$$

$$2.66 \times 10^{23} \text{ molecule O}_2$$

4. Using dimensional analysis, how many moles of H₂O are needed to produce 25.0 grams of CH₄?

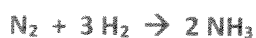
$$\frac{25.0 \text{ g CH}_4}{16.05 \text{ g CH}_4} \times \frac{1 \text{ mole CH}_4}{1 \text{ mole CH}_4} \times \frac{2 \text{ mole H}_2\text{O}}{1 \text{ mole CH}_4}$$

↑ Conversion ↑ ratio from Rxn

Dimensional Analysis Conclusion Set-Up

	Conversion	Ratio from Rxn	Conversion
Number with unit & start substance formula from problem	1 mole with start substance formula	Coefficients from rxn mole with end substance formula	conversion value desired unit with end substance formula
	conversion value of with start substance formula	Coefficients from rxn mole with start substance formula	1 mole with end substance formula

5. How many grams of ammonia, NH₃, are produced when 3.6 x 10²³ molecules of nitrogen react with hydrogen?



$$\frac{3.6 \times 10^{23} \text{ molecules N}_2}{6.02 \times 10^{23} \text{ molecules N}_2} \times \frac{1 \text{ mole N}_2}{1 \text{ mole N}_2} = 0.6 \text{ mole N}_2$$

$$\begin{array}{r} \text{N}_2 + 3 \text{H}_2 \rightarrow 2 \text{NH}_3 \\ \text{B: } 0.6 \text{ mole} \quad \quad \quad ? \\ \text{C: } -0.6 \text{ mole} \quad \quad \quad + 0.6 \text{ mole} \left(\frac{2}{1} \right) \\ \hline \quad \quad \quad \quad \quad \quad \quad 1.2 \text{ mole} \\ \text{Ø} \end{array}$$

$$\frac{1.2 \text{ mole NH}_3}{1 \text{ mole}} \times \frac{17.04 \text{ g NH}_3}{1 \text{ mole}} = \boxed{20.4 \text{ g NH}_3}$$

6. When sulfur dioxide reacts with oxygen at STP, how many molecules of oxygen are needed to produce 19.8 L of sulfur trioxide? $2 \text{SO}_2 + \text{O}_2 \rightarrow 2 \text{SO}_3$

$$\frac{19.8 \text{ L}}{22.4 \text{ L}} \times \frac{1 \text{ mole}}{1 \text{ mole}} = 0.884 \text{ mol SO}_3$$

$$\begin{array}{r} 2 \text{SO}_2 + \text{O}_2 \rightarrow 2 \text{SO}_3 \\ \quad \quad \quad ? \quad \quad \quad 0.884 \text{ mol} \\ \text{+ } 0.884 \left(\frac{1}{2} \right) \quad \quad \quad - 0.884 \\ \hline 0.442 \text{ mole O}_2 \end{array}$$

$$\frac{0.442 \text{ mole O}_2}{1 \text{ mole}} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mole}} = \boxed{2.66 \times 10^{23} \text{ molecules O}_2}$$

