

3/23/16

Stoichiometry Review:

- | | |
|-----------------------|------------------------|
| 1. B | 11. D |
| 2. B | 12. D |
| 3. C | 13. NO ANS !!
89.6L |
| 4. A | 14. A |
| 5. D | 15. C |
| 6. D | 16. A |
| 7. B | 17. C |
| 8. D | 18. D |
| 9. B (28.02
31mol) | 19. D |
| 10. C | 20. D |

Types:

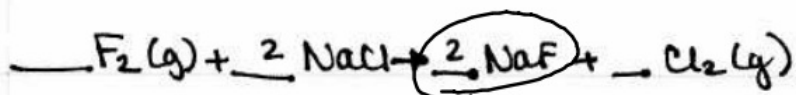
1. mass \rightarrow mass
2. mass \rightarrow vol
3. mol \rightarrow mol
4. mass \rightarrow mass Limiting Factor
5. vol \rightarrow vol

$$\cancel{72.08g H_2O} \times \frac{22.4L H_2O}{18.02g H_2O}$$

$$\cancel{6mol SO_2} \times \frac{3mol O_2}{2mol SO_2} =$$

$$9.2g Cu \times \frac{1mol Cu}{63.55g Cu} \times \frac{1mol Fe}{1mol Cu} \times \frac{55.85g Fe}{1mol Fe} = 8.1g Fe$$

$$3.0L C_2H_4 \times \frac{1mol C_2H_4}{22.4L C_2H_4} \times \frac{2mol O_2}{1mol C_2H_4} \times \frac{22.4L O_2}{1mol O_2} = 6.0L O_2$$



16. given: 0.98 mol F₂ needed: ? mol NaF type: mol → mol

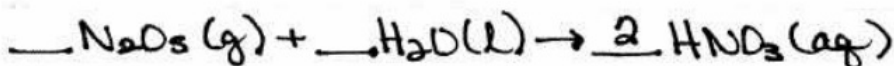
$$0.98 \text{ mol F}_2 \times \frac{2 \text{ mol NaF}}{1 \text{ mol F}_2} = \boxed{1.9 \text{ mol NaF}}$$

17. given: 86.7g F₂ needed: ? g NaCl type: mass → mass

$$86.7 \text{ g F}_2 \times \frac{1 \text{ mol F}_2}{38.00 \text{ g F}_2} \times \frac{2 \text{ mol NaCl}}{1 \text{ mol F}_2} \times \frac{58.45 \text{ g NaCl}}{1 \text{ mol NaCl}} = \boxed{267 \text{ g NaCl}}$$

18. given: 54.2 L F₂ needed: ? L Cl₂ type: vol → vol

$$54.2 \text{ L F}_2 \times \frac{1 \text{ mol F}_2}{22.4 \text{ L F}_2} \times \frac{1 \text{ mol Cl}_2}{1 \text{ mol F}_2} \times \frac{22.4 \text{ L Cl}_2}{1 \text{ mol Cl}_2} = \boxed{54.2 \text{ L Cl}_2}$$



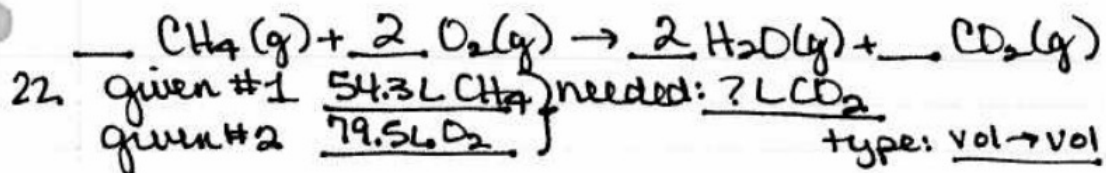
19. given: 142.3g HNO₃ needed: ? mol H₂O type: mass → mol

$$142.3 \text{ g HNO}_3 \times \frac{1 \text{ mol HNO}_3}{63.02 \text{ g HNO}_3} \times \frac{1 \text{ mol H}_2\text{O}}{2 \text{ mol HNO}_3} = \boxed{1.129 \text{ mol H}_2\text{O}}$$

20. given: 65.7g H₂O needed: ? g H₂O
 → oops → can't be done

21. given: 312g HNO₃ needed: ? L N₂O₅ type: mass → vol

$$312 \text{ g HNO}_3 \times \frac{1 \text{ mol HNO}_3}{63.02 \text{ g HNO}_3} \times \frac{1 \text{ mol N}_2\text{O}_5}{2 \text{ mol HNO}_3} \times \frac{22.4 \text{ L N}_2\text{O}_5}{1 \text{ mol N}_2\text{O}_5} = \boxed{55.4 \text{ L N}_2\text{O}_5}$$



$$54.3 \text{ L CH}_4 \times \frac{1 \text{ mol CH}_4}{22.4 \text{ L CH}_4} \times \frac{2 \text{ mol CO}_2}{1 \text{ mol CH}_4} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = 54.3 \text{ L CH}_4$$

$$\boxed{79.5 \text{ L O}_2} \times \frac{1 \text{ mol O}_2}{22.4 \text{ L O}_2} \times \frac{1 \text{ mol CO}_2}{2 \text{ mol O}_2} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = \boxed{39.8 \text{ L CO}_2}$$

limiting factor Theo. yield

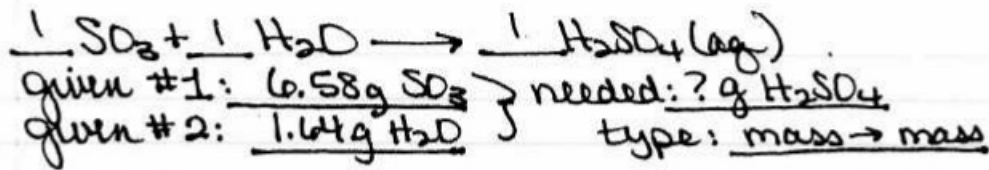
Excess:

$$39.8 \text{ L CO}_2 \times \frac{1 \text{ mol CO}_2}{22.4 \text{ L CO}_2} \times \frac{1 \text{ mol CH}_4}{1 \text{ mol CO}_2} \times \frac{22.4 \text{ L CH}_4}{1 \text{ mol CH}_4} = 39.8 \text{ L CH}_4$$

used in reaction

$$54.3 \text{ L CH}_4 \text{ (starting quant.)} - 39.8 \text{ L CH}_4 \text{ (used)} = \boxed{14.5 \text{ L CH}_4 \text{ left over}}$$

$$\% \text{ yield} = \frac{39.8 \text{ L}}{54.3 \text{ L}} \times 100 = \boxed{73.3\% \text{ yield}}$$



limiting factor

$$\boxed{6.58 \text{ g SO}_2} \times \frac{1 \text{ mol SO}_2}{78.97 \text{ g SO}_2} \times \frac{1 \text{ mol H}_2\text{SO}_4}{1 \text{ mol SO}_2} \times \frac{98.09 \text{ g H}_2\text{SO}_4}{1 \text{ mol H}_2\text{SO}_4} = \boxed{8.17 \text{ g H}_2\text{SO}_4}$$

theor yield

EXCESS Reactant

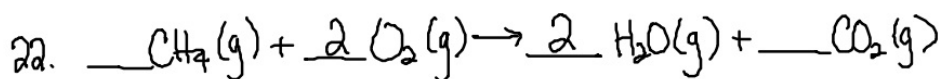
$$1.64 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \times \frac{1 \text{ mol H}_2\text{SO}_4}{1 \text{ mol H}_2\text{O}} \times \frac{98.09 \text{ g H}_2\text{SO}_4}{1 \text{ mol H}_2\text{SO}_4} = 8.93 \text{ g H}_2\text{SO}_4$$

EXCESS:

$$8.17 \text{ g H}_2\text{SO}_4 \times \frac{1 \text{ mol H}_2\text{SO}_4}{98.09 \text{ g H}_2\text{SO}_4} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol H}_2\text{SO}_4} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 1.50 \text{ g H}_2\text{O used}$$

$$1.64 \text{ g} - 1.50 \text{ g} = \boxed{0.14 \text{ g H}_2\text{O left over}}$$

$$\frac{7.99 \text{ g}}{8.17 \text{ g}} \times 100 = \boxed{97.8\% \text{ yield}}$$



$$\begin{array}{l} \text{given \# 1 } \underline{54.3 \text{ L CH}_4} \\ \text{given \# 2 } \underline{79.5 \text{ L O}_2} \end{array} \left. \vphantom{\begin{array}{l} \text{given \# 1} \\ \text{given \# 2} \end{array}} \right\} \text{needed: } \underline{? \text{ L CO}_2} \quad \text{Type: } \underline{\text{vol} \rightarrow \text{vol}}$$

$$\text{Excess } 54.3 \text{ L CH}_4 \times \frac{1 \text{ mol CH}_4}{22.4 \text{ L CH}_4} \times \frac{1 \text{ mol CO}_2}{1 \text{ mol CH}_4} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = 54.3 \text{ L CO}_2$$

$$\text{Limiting factor } \boxed{79.5 \text{ L O}_2} \times \frac{1 \text{ mol O}_2}{22.4 \text{ L O}_2} \times \frac{1 \text{ mol CO}_2}{2 \text{ mol O}_2} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = \boxed{39.8 \text{ L CO}_2} \quad \text{theo. yield}$$

Excess: Theoretical yield \rightarrow excess

$$39.8 \text{ L CO}_2 \times \frac{1 \text{ mol CO}_2}{22.4 \text{ L CO}_2} \times \frac{1 \text{ mol CH}_4}{1 \text{ mol CO}_2} \times \frac{22.4 \text{ L CH}_4}{1 \text{ mol CH}_4} = \underline{39.8 \text{ L CH}_4 \text{ used in reaction}}$$

$$54.3 \text{ L} - 39.8 \text{ L} = \boxed{14.5 \text{ L CH}_4 \text{ left over}}$$

$$\% \text{ yield} \quad \frac{39.8 \text{ L}}{39.8 \text{ L}} \times 100 = 95.0\% \text{ yield}$$