STOICHIOMETRY

13. $.750\text{g } Al(OH)_3 \times \frac{1\text{mol } Al(OH)_3}{78.01\text{g } Al(OH)_3} \times \frac{3\text{mol HCl}}{1\text{mol } Al(OH)_3} \times \frac{36.46\text{g HCl}}{1\text{mol HCl}} = \boxed{1.05\text{g HCl}}$

$.750\text{g } Al(OH)_3 \times \frac{1\text{mol } Al(OH)_3}{78.01\text{g } Al(OH)_3} \times \frac{3\text{mol } H_2O}{1\text{mol } Al(OH)_3} \times \frac{18.02\text{g } H_2O}{1\text{mol } H_2O} = .5197\text{g } H_2O$

$\boxed{.520\text{g } H_2O}$

15. $10.0\text{g C} + 26.6\text{g } O_2 \longrightarrow \boxed{36.6\text{g } CO_2}$

17. (a) $454\text{g } Fe_2O_3 \times \frac{1\text{mol } Fe_2O_3}{159.7\text{g } Fe_2O_3} \times \frac{2\text{mol Fe}}{1\text{mol } Fe_2O_3} \times \frac{55.85\text{g Fe}}{1\text{mol Fe}} = \boxed{318\text{g Fe}}$

(b) $454\text{g } Fe_2O_3 \times \frac{1\text{mol } Fe_2O_3}{159.7\text{g } Fe_2O_3} \times \frac{3\text{mol CO}}{1\text{mol } Fe_2O_3} \times \frac{28.01\text{g CO}}{1\text{mol CO}} = \boxed{239\text{g CO}}$

19. (a) Sulfur dioxide SO_2 { calcium carbonate $CaCO_3$ } { oxygen gas O_2 } { calcium sulfate $CaSO_4$ } { carbon dioxide CO_2 }

(b) $155\text{g } SO_2 \times \frac{1\text{mol } SO_2}{64.07\text{g } SO_2} \times \frac{2\text{mol } CaCO_3}{2\text{mol } SO_2} \times \frac{100.1\text{g } CaCO_3}{1\text{mol } CaCO_3} = \boxed{242\text{g } CaCO_3}$

(c) $155\text{g } SO_2 \times \frac{1\text{mol } SO_2}{64.07\text{g } SO_2} \times \frac{2\text{mol } CaSO_4}{2\text{mol } SO_2} \times \frac{136.2\text{g } CaSO_4}{1\text{mol } CaSO_4} = \boxed{329\text{g } CaSO_4}$

21. $95\text{mg urea} \times \frac{1\text{g urea}}{1000\text{mg}} \times \frac{1\text{mol urea}}{60.06\text{g urea}} \times \frac{1\text{mol Ag.}}{1\text{mol urea}} \times \frac{174.2\text{g arg.}}{1\text{mol Ag.}} = \boxed{.276\text{g arginine}}$

$95\text{mg urea} \times \frac{1\text{g urea}}{1000\text{mg}} \times \frac{1\text{mol urea}}{60.06\text{g urea}} \times \frac{1\text{mol orn.}}{1\text{mol urea}} \times \frac{132.2\text{g orn.}}{1\text{mol orn.}} = \boxed{.209\text{g ornithine}}$

23. $995\text{ g } CH_4 \times \frac{1\text{ mol } CH_4}{16.04\text{ g } CH_4} \times \frac{3\text{ mol } H_2}{1\text{ mol } CH_4} \times \frac{2.02\text{ g } H_2}{1\text{ mol } H_2} = \boxed{375.9\text{ g } H_2}$ ← compare ↓

$2510\text{ g } H_2O \times \frac{1\text{ mol } H_2O}{18.02\text{ g } H_2O} \times \frac{3\text{ mol } H_2}{1\text{ mol } H_2O} \times \frac{2.02\text{ g } H_2}{1\text{ mol } H_2} = 844.1\text{ g } H_2$

25. Lim. React. → $32.0\text{ g } S_8 \times \frac{1\text{ mol } S_8}{256.6\text{ g } S_8} \times \frac{4\text{ mol } S_2Cl_2}{1\text{ mol } S_8} \times \frac{135.0\text{ g } S_2Cl_2}{1\text{ mol } S_2Cl_2} = \boxed{67.3\text{ g } S_2Cl_2}$ ← compare ↓

$71.0\text{ g } Cl_2 \times \frac{1\text{ mol } Cl_2}{70.91\text{ g } Cl_2} \times \frac{4\text{ mol } S_2Cl_2}{4\text{ mol } Cl_2} \times \frac{135.0\text{ g } S_2Cl_2}{1\text{ mol } S_2Cl_2} = 135.2\text{ g } S_2Cl_2$

$32.0\text{ g } S_8 \times \frac{1\text{ mol } S_8}{256.6\text{ g } S_8} \times \frac{4\text{ mol } Cl_2}{1\text{ mol } S_8} \times \frac{70.91\text{ g } Cl_2}{1\text{ mol } Cl_2} = 35.4\text{ g } Cl_2 \text{ required}$

$71.0\text{ g } Cl_2 - 35.4\text{ g } Cl_2 = \boxed{35.6\text{ g } Cl_2 \text{ remains}}$

27. L.R. → $100.\text{ g } C_7H_6O_3 \times \frac{1\text{ mol } C_7H_6O_3}{138.1\text{ g } C_7H_6O_3} \times \frac{1\text{ mol } C_9H_8O_4}{1\text{ mol } C_7H_6O_3} \times \frac{180.1\text{ g } C_9H_8O_4}{1\text{ mol } C_9H_8O_4} = \boxed{130.4\text{ g}}$

$100.\text{ g } C_4H_6O_3 \times \frac{1\text{ mol } C_4H_6O_3}{102.1\text{ g } C_4H_6O_3} \times \frac{1\text{ mol } C_9H_8O_4}{1\text{ mol } C_4H_6O_3} \times \frac{180.1\text{ g } C_9H_8O_4}{1\text{ mol } C_9H_8O_4} = 176.4$

29. $1.203\text{ g } NaBH_4 \times \frac{1\text{ mol } NaBH_4}{37.84\text{ g } NaBH_4} \times \frac{1\text{ mol } B_2H_6}{2\text{ mol } NaBH_4} \times \frac{27.67\text{ g } B_2H_6}{1\text{ mol } B_2H_6} = .4398\text{ g } B_2H_6$

$\% \frac{.295}{.4398} \times 100 = \boxed{67.1\ \%}$

31. $5.23\,g\,SCl_2 \times \frac{1\,mol\,SCl_2}{103.0\,g\,SCl_2} \times \frac{1\,mol\,S_2Cl_2}{3\,mol\,SCl_2} \times \frac{135.0\,g\,S_2Cl_2}{1\,mol\,S_2Cl_2} = 2.28\,g\,S_2Cl_2$

↑ THEORETICAL YIELD

$\frac{1.19\,g\,S_2Cl_2}{2.28\,g\,S_2Cl_2} \times 100 = \boxed{52.1\,\%}$