Ch 3, 3.8 - 3.10 Calcs with Chemical Formulas + Equations

59c) $C_6H_{12}O_6$ $(6\times12.01)+(12\times1.008)+6(16.00) = 180.16\text{ amu}$

~~61c)~~ $25.2\text{ Kg } C_2H_2 \times \frac{1000\text{ g } C_2H_2}{1\text{ Kg}} \times \frac{1\text{ mol } C_2H_2}{26.036\text{ g}} = 968\text{ mol } C_2H_2$

62c) $72.1\text{ mmol } SO_2 \times \frac{1\text{ mol}}{1000\text{ mmol}} \times \frac{64.07\text{ g}}{1\text{ mol}} = 4.62\text{ g } SO_2$ mmol = milli mole

66b) $55.93\text{ Kg } NaHCO_3 \times \frac{1000\text{ g}}{1\text{ Kg}} \times \frac{1\text{ mol}}{84.01\text{ g}} \times \frac{6.02\times10^{23}\text{ fums}}{1\text{ mol}} = 4.01\times10^{26}\text{ fums } NaHCO_3$

69) $1.8\times10^{17}\frac{C_{12}H_{22}O_{11}}{\text{molecules}} \times \frac{1\text{ mol}}{6.02\times10^{23}\text{ molec}} \times \frac{342.3\text{ g}}{1\text{ mol}} \times \frac{1000\text{ mg}}{1\text{ g}} = 0.10\text{ mg}$

73) $\%N = \frac{14.01\text{ g/mol N}}{17.03\text{ g/mol } NH_3} \times 100 = 82.27\%$ $\quad \%N = \frac{2\times14.01}{60.06\ CO(NH_2)_2} \times 100 = 46.65\%$

$\%N = \frac{2\times14.01}{80.05\ NH_4NO_3} \times 100 = 35.00\%$ $\quad \%N = \frac{2\times14.01}{132.15} \times 100 = 21.20\%$

77) $150\,\mu g\ I \times \frac{1\text{ g I}}{1\times10^6\,\mu g} \times \frac{100.0\text{ g KI}}{76.45\text{ g I}} \times \frac{1\times10^6\,\mu g\text{ KI}}{1\text{ g KI}} = 196\,\mu g\text{ KI}$

83d) $8.5\text{ g } Na_2C_6H_6O_7 \times \frac{1\text{ mol}}{236.1\text{ g}} \times \frac{2\text{ mol Na}}{1\text{ mol } Na_2C_6H_6O_7} \times \frac{22.99\text{ g Na}}{1\text{ mol}} = 1.7\text{ g Na}$

87b) $0.672\text{ g Co} \times \frac{1\text{ mol}}{58.93\text{ g}} = 0.0114\text{ mol Co} \div 0.00759 = 1.5\times2 = 3$ $\quad Co_3As_2O_8$

$0.569\text{ g As} \times \frac{1\text{ mol}}{74.92\text{ g}} = 0.00759\text{ mol As} \div$ " $= 1\times2 = 2$ $\quad Co_3(AsO_4)_2$

$0.486\text{ g O} \times \frac{1\text{ mol}}{16.00\text{ g}} = 0.0304\text{ mol O} \div$ " $= 4\times2 = 8$

89a)

$74.03\text{ g C} \times \frac{1\text{ mol}}{12.01\text{ g}} = 6.164\text{ mol C} \div 6.164\text{ mol} = 5$ $\quad C_5H_7N$

$8.70\text{ g H} \times \frac{1\text{ mol}}{1.008\text{ g}} = 8.63\text{ mol H} \div \quad = 7$

$17.27\text{ g N} \times \frac{1\text{ mol}}{14.01\text{ g}} = 1.233\text{ mol N} \div \quad = 1$

Ch 3 Sect 8-10 Exercises

97) $33.01\,g\,CO_2 \times \frac{1\,mol\,CO_2}{44.01\,g} \times \frac{1\,mol\,C}{1\,mol\,CO_2} = 0.7501\,mol\,C \div 0.7501 = 1$

$13.51\,g\,H_2O \times \frac{1\,mol\,H_2O}{18.02\,g} \times \frac{2\,mol\,H}{1\,mol\,H_2O} = 1.499\,mol\,H \div \downarrow = 2$

CH_2 empirical

99) $8.59\,g\,CO_2 \times \frac{1\,mol\,CO_2}{44.01\,g} \times \frac{1\,mol\,C}{1\,mol\,CO_2} = 0.195\,mol\,C \times \frac{12.01\,g\,C}{1\,mol} = 2.34\,g\,C$ $\div 0.0981 = 2$

$3.52\,g\,H_2O \times \frac{1\,mol\,H_2O}{18.02\,g} \times \frac{2\,mol\,H}{1\,mol\,H_2O} = 0.390\,mol\,H \times \frac{1.008\,g\,H}{1\,mol} = 0.393\,g\,H$ $= 4$

Sample $4.30\,g - 2.34\,g - 0.393\,g = 1.57\,g\,O \times \frac{1\,mol}{16.00\,g} = 0.0981\,mol\,O$ $= 1$

C_2H_4O

113) $\frac{25\,g\,CF_2Cl_2}{month} \times \frac{70.90\,g\,Cl_2}{120.91\,g\,CF_2Cl_2} \times \frac{12\,mon}{1\,yr} = 1.8 \times 10^2\,g\,Cl_2/yr$

116) $16.99\,g\,O \times \frac{1\,mol\,O}{16.00\,g} \times \frac{2\,mol\,M}{1\,mol\,O} = 2.124\,mol\,M$ $\frac{83.01\,g\,M}{2.124\,mol} = 39.08\,g/mol$ (K)

122) $2.69\,g\,CuCl_2 \times \frac{1\,mol\,CuCl_2}{134.45\,g} = 0.0200\,mol\,CuCl_2$ $\div 0.0200 = 1$

$3.41\,g$ hydrate $CuCl_2 \cdot x\,H_2O - 2.69\,g\,CuCl_2 = 0.72\,g\,H_2O \times \frac{1\,mol\,H_2O}{18.02\,g} = 0.040\,mol\,H_2O \div 0.0200$ $= 2$

$CuCl_2 \cdot 2\,H_2O$

Sample $3.54\,g - 2.32\,g\,C - 0.240\,g\,H - 0.300\,g\,N = 0.680\,g\,O$

124) $\frac{0.199\,g\,N}{2.35\,g\,sample} = \frac{x\,g\,N}{3.54\,g\,sample}$ $x = 0.300\,g\,N$ $0.680\,g\,O \times \frac{1\,mol\,O}{16.00\,g} = 0.0425\,mol\,O$ $\div 2$

$0.300\,g\,N \times \frac{1\,mol\,N}{14.01\,g} = 0.0214\,mol\,N$ $\div$ divide all by 0.0214

$8.49\,g\,CO_2 \times \frac{1\,mol\,CO_2}{44.01\,g} \times \frac{1\,mol\,C}{1\,mol\,CO_2} = 0.193\,mol\,C \times 9 \times \frac{1\,mol\,C}{12.01\,g} = 2.32\,g\,C$

$2.14\,g\,H_2O \times \frac{1\,mol\,H_2O}{18.01\,g} \times \frac{2\,mol\,H}{1\,mol\,H_2O} = 0.238\,mol\,H \times 11 \times \frac{1\,mol\,H}{1.008\,g} = 0.240\,g\,H$

$(C_9H_{11}NO_2)$

emp = molecular

$\frac{165\,g/mol}{165\,g/mol} = 1$

131) $8.00\,oz\,bag \times \frac{454\,g}{16\,oz} \times \frac{0.0552\,g\,NaNO_2}{100.0\,g\,bag} \times \frac{22.99\,g\,Na}{69.00\,g\,NaNO_2} \times \frac{1000\,mg\,Na}{1\,g\,Na} = 41.7\,mg\,Na$

Ch 4 Exercises

25) $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O$

$7.2\,mol\ C_6H_{14} \times \frac{19\,mol\ O_2}{2\,mol\ C_6H_{14}} = 68\,mol\ O_2$

33d) $4Al + 3O_2 \rightarrow 2Al_2O_3$

$3.67_g\ Al \times \frac{1\,mol\ Al}{26.98_g} \times \frac{2\,mol\ Al_2O_3}{4\,mol\ Al} \times \frac{101.96_g\ Al_2O_3}{1\,mol} = 6.93_g\ Al_2O_3$

31) $Fe + 2HBr \rightarrow FeBr_2 + H_2$

$3.2_g\ Fe \times \frac{1\,mol\ Fe}{55.85_g} \times \frac{2\,mol\ HBr}{1\,mol\ Fe} \times \frac{80.91_g\ HBr}{1\,mol} = 9.3_g\ HBr$

$3.2_g\ Fe \times \frac{1\,mol\ Fe}{55.85_g} \times \frac{1\,mol\ H_2}{1\,mol\ Fe} \times \frac{2.016_g\ H_2}{1\,mol} = 0.12_g\ H_2$

37) $4HCl + O_2 \rightarrow 2H_2O + 2Cl_2$ — Cl_2 molecules?

a) 7 — 1 LR — 2 — c) 4 HCl — $5O_2$

b) 6 — 3 LR — $6HCl \times \frac{2Cl_2}{4HCl} = 3Cl_2$ — $3O_2 \times \frac{2Cl_2}{1O_2} = 6Cl_2$

LR $4HCl \times \frac{2Cl_2}{4HCl} = 2Cl_2$ — $5O_2 \times \frac{2Cl_2}{1O_2} = 10Cl_2$

43a) $2Al + 3Cl_2 \rightarrow 2AlCl_3$

ER $2.0_g\ Al \times \frac{1\,mol\ Al}{26.98_g} \times \frac{2\,mol\ AlCl_3}{2\,mol\ Al} \times \frac{133.3_g\ AlCl_3}{1\,mol} = 9.9_g\ AlCl_3$

LR $2.0_g\ Cl_2 \times \frac{1\,mol\ Cl_2}{70.90_g} \times \frac{2\,mol\ AlCl_3}{3\,mol\ Cl_2} \times \frac{133.3_g\ AlCl_3}{1\,mol} = 2.5_g\ AlCl_3$

45) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

LR $25.55_g\ Fe_2O_3 \times \frac{1\,mol\ Fe_2O_3}{159.7_g} \times \frac{2\,mol\ Fe}{1\,mol\ Fe_2O_3} = 0.2824\,mol\ Fe$

ER $14.78_g\ CO \times \frac{1\,mol\ CO}{28.01_g} \times \frac{2\,mol\ Fe}{3\,mol\ CO} = 0.3518\,mol\ Fe$

$22.55_g\ Fe_2O_3 \times \frac{1\,mol\ Fe_2O_3}{159.7_g} \times \frac{3\,mol\ CO}{1\,mol\ Fe_2O_3} \times \frac{28.01_g\ CO}{1\,mol} = 11.865_g\ used$

$14.78_g\ CO$

$2.91_g\ left$

48) $2Mg + O_2 \rightarrow 2MgO$

LR $10.1_g\ Mg \times \frac{1\,mol\ Mg}{24.31_g} \times \frac{2\,mol\ MgO}{2\,mol\ Mg} \times \frac{40.31_g\ MgO}{1\,mol} = 16.75_g\ MgO$

$10.5_g\ O_2 \times \frac{1\,mol\ O_2}{32.00_g} \times \frac{2\,mol\ MgO}{1\,mol\ O_2} \times \downarrow = 26.5_g\ MgO$

$\frac{11.9_g\ MgO}{16.75_g} \times 100 = 71.0\ \%$