

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

59c)  $C_6H_{12}O_6$   $(6 \times 12.01) + (12 \times 1.008) + 6(16.00) = 180.16 \text{ amu}$

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

mmol = millimole

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

66b)  $55.93 \text{ Kg } NaHCO_3 \times \frac{1000 \text{ g}}{1 \text{ Kg}} \times \frac{1 \text{ mol}}{84.01 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ funs}}{1 \text{ mol}} = 4.01 \times 10^{26} \text{ funs } NaHCO_3$

69)  $1.8 \times 10^{17} C_{12}H_{22}O_{11} \text{ molecules} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molec}} \times \frac{342.3 \text{ g}}{1 \text{ mol}} \times \frac{1000 \text{ mg}}{1 \text{ g}} = 0.10 \text{ mg}$

73)  $\%N = \frac{14.01 \text{ g/mol N}}{17.03 \text{ g/mol } NH_3} \times 100 = 82.27\%$

$\%N = \frac{2 \times 14.01}{60.06 \text{ CO(NH}_2)_2} \times 100 = 46.65\%$

$\%N = \frac{2 \times 14.01}{80.05 \text{ NH}_4\text{NO}_3} \times 100 = 35.00\%$

$\%N = \frac{2 \times 14.01}{132.15} \times 100 = 21.20\%$

77)  $150 \mu\text{g I} \times \frac{1 \text{ g I}}{1 \times 10^6 \mu\text{g}} \times \frac{100.0 \text{ g KI}}{76.45 \text{ g I}} \times \frac{1 \times 10^6 \mu\text{g KI}}{1 \text{ g KI}} = 196 \mu\text{g KI}$

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)  $0.672 \text{ g Co} \times \frac{1 \text{ mol}}{58.93 \text{ g}} = 0.0114 \text{ mol Co} \div 0.00759 = 1.5 \times 2 = 3 \quad Co_3As_2O_8$

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

$0.486 \text{ g O} \times \frac{1 \text{ mol}}{16.00 \text{ g}} = 0.0304 \text{ mol O} \div " = 4 \times 2 = 8$

89a)

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

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

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



# Ch 3 Sect 8-10 Exercises

$$97) \quad 33.01 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.01 \text{ g}} \times \frac{1 \text{ mol C}}{1 \text{ mol CO}_2} = 0.7501 \text{ mol C} \div 0.7501 = 1$$

$$13.51 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g}} \times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} = 1.499 \text{ mol H} \div \downarrow = 2$$

$\text{CH}_2$  Empirical =

$$99) \quad 8.59 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.01 \text{ g}} \times \frac{1 \text{ mol C}}{1 \text{ mol CO}_2} = 0.195 \text{ mol C} \times \frac{12.01 \text{ g C}}{1 \text{ mol}} = 2.34 \text{ g C} \div 0.0981 = 2$$

$$3.52 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g}} \times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} = 0.390 \text{ mol H} \times \frac{1.008 \text{ g H}}{1 \text{ mol}} = 0.393 \text{ g H} = 4$$

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

$\text{C}_2\text{H}_4\text{O}$

$$113) \quad \frac{25 \text{ g CF}_2\text{Cl}_2}{\text{month}} \times \frac{70.90 \text{ g Cl}_2}{180.91 \text{ g CF}_2\text{Cl}_2} \times \frac{12 \text{ mon}}{1 \text{ yr}} = 1.8 \times 10^2 \text{ g Cl}_2/\text{yr}$$

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

$$122) \quad 2.69 \text{ g CuCl}_2 \times \frac{1 \text{ mol CuCl}_2}{134.45 \text{ g}} = 0.0200 \text{ mol CuCl}_2 \div 0.0200 = 1$$

$$3.41 \text{ g hydrate CuCl}_2 \cdot x \text{ H}_2\text{O} - 2.69 \text{ g CuCl}_2 = 0.72 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g}} = 0.040 \text{ mol H}_2\text{O} \div 0.0200 = 2$$

$\text{CuCl}_2 \cdot 2 \text{ H}_2\text{O}$

$$124) \quad \frac{0.199 \text{ g N}}{2.35 \text{ g sample}} = \frac{x \text{ g N}}{3.54 \text{ g sample}} \quad x = 0.300 \text{ g N}$$

$$\text{Sample } 3.54 \text{ g} - 2.32 \text{ g C} - 0.240 \text{ g H} - 0.300 \text{ g N} = 0.680 \text{ g O}$$

$$0.680 \text{ g O} \times \frac{1 \text{ mol O}}{16.00 \text{ g}} = 0.0425 \text{ mol O}$$

$$0.300 \text{ g N} \times \frac{1 \text{ mol N}}{14.01 \text{ g}} = 0.0214 \text{ mol N}$$

divide all by 0.0214

$$8.49 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.01 \text{ g}} \times \frac{1 \text{ mol C}}{1 \text{ mol CO}_2} = 0.193 \text{ mol C} \times \frac{12.01 \text{ g}}{1 \text{ mol}} = 2.32 \text{ g C}$$

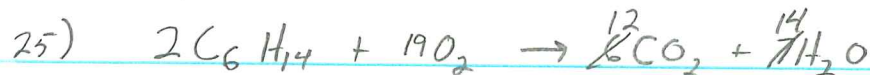
$$2.14 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.01 \text{ g}} \times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} = 0.238 \text{ mol H} \times \frac{1.008 \text{ g}}{1 \text{ mol}} = 0.240 \text{ g H}$$

$$\text{C}_9\text{H}_{11}\text{NO}_2$$

emp = molecular  
 $\frac{165 \text{ g/mol}}{165 \text{ g/mol}} = 1$

$$131) \quad 8.00 \text{ oz bag} \times \frac{454 \text{ g}}{16 \text{ oz}} \times \frac{0.6552 \text{ g NaN}_3}{100.0 \text{ g bag}} \times \frac{22.99 \text{ g Na}}{69.00 \text{ g NaN}_3} \times \frac{1000 \text{ mg Na}}{1 \text{ g Na}} = 41.7 \text{ mg Na}$$

## Ch 4 Exercises



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



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



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

$$3.2 \text{ g } Fe \times \frac{1 \text{ mol } Fe}{55.85 \text{ g}} \times \frac{1 \text{ mol } H_2}{1 \text{ mol } Fe} \times \frac{2.016 \text{ g } H_2}{1 \text{ mol}} = 0.12 \text{ g } H_2$$



a) 7 1 LR

2

c) 4 HCl 5 O<sub>2</sub>

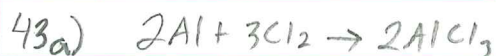
b) 6 3 LR

$$6HCl \times \frac{2Cl_2}{4HCl} = 3Cl_2$$

$$4HCl \times \frac{2Cl_2}{4HCl} = 2Cl_2$$

$$3O_2 \times \frac{2Cl_2}{1O_2} = 6Cl_2$$

$$5O_2 \times \frac{2Cl_2}{1O_2} = 10Cl_2$$



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

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

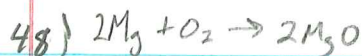


$$LR \ 25.55 \text{ g } Fe_2O_3 \times \frac{1 \text{ mol } Fe_2O_3}{159.7 \text{ g}} \times \frac{2 \text{ mol } Fe}{1 \text{ mol } Fe_2O_3} = 0.2824 \text{ mol } Fe$$

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

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

$$\frac{11.865 \text{ g } CO}{2.91 \text{ g } CO} \times 100 = 71.0\%$$



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

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

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