

$$\begin{array}{ll}
 \text{1) a) } \frac{40.00 \text{ g NaOH}}{\text{mol NaOH}} & \text{f) } \frac{122.13 \text{ g C}_6\text{H}_5\text{CO}_2\text{H}}{\text{mol C}_6\text{H}_5\text{CO}_2\text{H}} \\
 \text{b) } \frac{275.75 \text{ g Ag}_2\text{CO}_3}{\text{mol Ag}_2\text{CO}_3} & \text{g) } \frac{180.18 \text{ g C}_6\text{H}_{12}\text{O}_6}{\text{mol C}_6\text{H}_{12}\text{O}_6} \\
 \text{c) } \frac{152.00 \text{ g Cr}_2\text{O}_3}{\text{mol Cr}_2\text{O}_3} & \text{h) } \frac{368.37 \text{ g K}_4\text{Fe(CN)}_6}{\text{mol K}_4\text{Fe(CN)}_6} \\
 \text{d) } \frac{96.11 \text{ g (NH}_4)_2\text{CO}_3}{\text{mol (NH}_4)_2\text{CO}_3} & \text{i) } \frac{1321.54 \text{ g Bi}_3(\text{AsO}_4)_5}{\text{mol Bi}_3(\text{AsO}_4)_5} \\
 \text{e) } \frac{146.35 \text{ g Mg(HCO}_3)_2}{\text{mol Mg(HCO}_3)_2} &
 \end{array}$$

$$\begin{array}{l}
 \text{2) a) } 25.0 \text{ g NaOH} \times \frac{1 \text{ mol NaOH}}{40.00 \text{ g NaOH}} = 0.625 \text{ mol NaOH} \\
 \text{b) } 44.0 \text{ g Br}_2 \times \frac{1 \text{ mol Br}_2}{159.80 \text{ g Br}_2} = 0.275 \text{ mol Br}_2 \\
 \text{c) } 0.684 \text{ g MgCl}_2 \times \frac{1 \text{ mol MgCl}_2}{95.21 \text{ g MgCl}_2} = 0.00718 \text{ mol MgCl}_2 \\
 \text{d) } 14.8 \text{ g CH}_3\text{OH} \times \frac{1 \text{ mol CH}_3\text{OH}}{32.05 \text{ g CH}_3\text{OH}} = 0.462 \text{ mol CH}_3\text{OH} \\
 \text{e) } 2.88 \text{ g Na}_2\text{SO}_4 \times \frac{1 \text{ mol Na}_2\text{SO}_4}{142.05 \text{ g Na}_2\text{SO}_4} = 0.0203 \text{ mol Na}_2\text{SO}_4 \\
 \text{f) } 4.20 \text{ lb ZnI}_2 \times \frac{453.59 \text{ g ZnI}_2}{1 \text{ lb ZnI}_2} \times \frac{1 \text{ mol ZnI}_2}{319.18 \text{ g ZnI}_2} = 5.97 \text{ mol ZnI}_2
 \end{array}$$

$$\begin{array}{l}
 \text{3) a) } 4.25 \times 10^{-4} \text{ mol H}_2\text{SO}_4 \times \frac{98.09 \text{ g H}_2\text{SO}_4}{1 \text{ mol H}_2\text{SO}_4} = 0.0417 \text{ g H}_2\text{SO}_4 \\
 \text{b) } 4.50 \times 10^{22} \text{ molecule CCl}_4 \times \frac{1 \text{ mol CCl}_4}{6.022 \times 10^{23} \text{ molecule CCl}_4} \times \frac{153.81 \text{ g CCl}_4}{1 \text{ mol CCl}_4} = 11.5 \text{ g CCl}_4 \\
 \text{c) } 0.00255 \text{ mol Ti} \times \frac{47.90 \text{ g Ti}}{1 \text{ mol Ti}} = 0.122 \text{ g Ti} \\
 \text{d) } 1.5 \times 10^{16} \text{ atom S} \times \frac{1 \text{ mol S}}{6.022 \times 10^{23} \text{ atom S}} \times \frac{32.06 \text{ g S}}{1 \text{ mol S}} = 8.0 \times 10^{-7} \text{ g S}
 \end{array}$$

- 4) a) $1.75 \text{ mol Cl}_2 \times \frac{6.022 \times 10^{23} \text{ molecule Cl}_2}{1 \text{ mol Cl}_2} = 1.05 \times 10^{24} \text{ molecule Cl}_2$
- b) $0.27 \text{ mol C}_2\text{H}_6\text{O} \times \frac{6.022 \times 10^{23} \text{ molecule C}_2\text{H}_6\text{O}}{1 \text{ mol C}_2\text{H}_6\text{O}} = 1.6 \times 10^{23} \text{ molecule C}_2\text{H}_6\text{O}$
- c) $12.0 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.01 \text{ g CO}_2} \times \frac{6.022 \times 10^{23} \text{ molecules CO}_2}{1 \text{ mol CO}_2} = 1.64 \times 10^{23} \text{ molecules CO}_2$
- d) $1000. \text{ g CH}_4 \times \frac{1 \text{ mol CH}_4}{16.05 \text{ g CH}_4} \times \frac{6.022 \times 10^{23} \text{ molecules CH}_4}{1 \text{ mol CH}_4} = 3.754 \times 10^{25} \text{ molecules CH}_4$

- 5) a) 1 molecule C₂H₅OH = 2 atoms C + 6 atoms H + 1 atom O = 9 total atoms

$$11 \text{ molecule C}_2\text{H}_5\text{OH} \times \frac{9 \text{ atoms total}}{1 \text{ molecule C}_2\text{H}_5\text{OH}} = 99 \text{ atoms total}$$

b) $25.0 \text{ g Ag} \times \frac{1 \text{ mol Ag}}{107.87 \text{ g Ag}} \times \frac{6.022 \times 10^{23} \text{ atom Ag}}{1 \text{ mol Ag}} = 1.40 \times 10^{23} \text{ atom Ag}$

c) $0.0986 \text{ g Xe} \times \frac{1 \text{ mol Xe}}{131.60 \text{ g Xe}} \times \frac{6.022 \times 10^{23} \text{ atom Xe}}{1 \text{ mol Xe}} = 4.51 \times 10^{20} \text{ atom Xe}$

- d) 1 molecule CHCl₃ = 1 atoms C + 1 atoms H + 3 atom Cl = 5 total atoms

$$72.5 \text{ g CHCl}_3 \times \frac{1 \text{ mol CHCl}_3}{119.37 \text{ g CHCl}_3} \times \frac{6.022 \times 10^{23} \text{ molecule CHCl}_3}{1 \text{ mol CHCl}_3} \times \frac{5 \text{ atom total}}{1 \text{ molecule CHCl}_3} = 1.83 \times 10^{24} \text{ atom total}$$

6) a) $284 \text{ g S} \times \frac{1 \text{ mol S}}{32.06 \text{ g S}} = 8.86 \text{ mol S}$

b) $2.50 \text{ kg NaCl} \times \frac{1 \times 10^3 \text{ g NaCl}}{1 \text{ kg NaCl}} \times \frac{1 \text{ mol NaCl}}{58.44 \text{ g NaCl}} = 42.8 \text{ mol NaCl}$

c) $42.4 \text{ g Mg} \times \frac{1 \text{ mol Mg}}{24.31 \text{ g Mg}} \times \frac{6.022 \times 10^{23} \text{ atom Mg}}{1 \text{ mol Mg}} = 1.05 \times 10^{24} \text{ atom Mg}$

d) $485 \text{ mL Br}_2 \times \frac{3.12 \text{ g Br}_2}{1 \text{ mL Br}_2} \times \frac{1 \text{ mol Br}_2}{159.80 \text{ g Br}_2} = 9.47 \text{ mol Br}_2$

$$7) \text{ a) } 1 \text{ mol NH}_4\text{NO}_3 \times \frac{6.022 \times 10^{23} \text{ form. unit NH}_4\text{NO}_3}{1 \text{ mol NH}_4\text{NO}_3} = 6.022 \times 10^{23} \text{ form. unit NH}_4\text{NO}_3$$

$$\text{b) } 1 \text{ mol NH}_4\text{NO}_3 \times \frac{2 \text{ mol N}}{1 \text{ mol NH}_4\text{NO}_3} \times \frac{6.022 \times 10^{23} \text{ atom N}}{1 \text{ mol N}} = 1.204 \times 10^{24} \text{ atom N}$$

$$\text{c) } 1 \text{ mol NH}_4\text{NO}_3 \times \frac{4 \text{ mol H}}{1 \text{ mol NH}_4\text{NO}_3} \times \frac{6.022 \times 10^{23} \text{ atom H}}{1 \text{ mol H}} = 2.409 \times 10^{24} \text{ atom H}$$

$$\text{d) } 1 \text{ mol NH}_4\text{NO}_3 \times \frac{3 \text{ mol O}}{1 \text{ mol NH}_4\text{NO}_3} \times \frac{6.022 \times 10^{23} \text{ atom O}}{1 \text{ mol O}} = 1.807 \times 10^{24} \text{ atom O}$$

$$\text{e) } 1.204 \times 10^{24} + 2.409 \times 10^{24} + 1.807 \times 10^{24} = 5.420 \times 10^{24} \text{ total atoms}$$

$$8) \text{ a) } 5.0 \text{ mol MnO}_2 \times \frac{6.022 \times 10^{23} \text{ mol MnO}_2}{1 \text{ MnO}_2} \times \frac{3 \text{ atom total}}{1 \text{ mol MnO}_2} = 9.0 \times 10^{24} \text{ atom total}$$

$$\text{b) } 255 \text{ g MgCO}_3 \times \frac{1 \text{ mol MgCO}_3}{84.32 \text{ g MgCO}_3} \times \frac{6.022 \times 10^{23} \text{ form. unit MgCO}_3}{1 \text{ mol MgCO}_3} \times \frac{5 \text{ atom total}}{1 \text{ form. unit MgCO}_3} = 9.11 \times 10^{24} \text{ atom total}$$

$$\text{c) } 5.0 \times 10^{18} \text{ molecule H}_2\text{O} \times \frac{3 \text{ atom total}}{1 \text{ molecule H}_2\text{O}} = 1.5 \times 10^{19} \text{ atom total}$$

$$9) \text{ a) } 25.0 \text{ g AgBr} \times \frac{1 \text{ mol AgBr}}{187.77 \text{ g AgBr}} \times \frac{1 \text{ mol Ag}}{1 \text{ mol AgBr}} \times \frac{107.87 \text{ g Ag}}{1 \text{ mol Ag}} = 14.4 \text{ g Ag}$$

$$\text{b) } 6.34 \text{ g (NH}_4)_3\text{PO}_4 \times \frac{1 \text{ mol (NH}_4)_3\text{PO}_4}{149.12 \text{ g (NH}_4)_3\text{PO}_4} \times \frac{3 \text{ mol N}}{1 \text{ mol (NH}_4)_3\text{PO}_4} \times \frac{14.01 \text{ g N}}{1 \text{ mol N}} = 1.79 \text{ g N}$$

$$\text{c) } 8.45 \times 10^{22} \text{ molecule SO}_3 \times \frac{1 \text{ mol SO}_3}{6.022 \times 10^{23} \text{ molecule SO}_3} \times \frac{3 \text{ mol O}}{1 \text{ mol SO}_3} \times \frac{16.00 \text{ g O}}{1 \text{ mol O}} = 6.74 \text{ g O}$$

$$10) \text{ a) } 67.33 \text{ mL C}_2\text{H}_5\text{OH} \times \frac{1 \text{ cm}^3 \text{ C}_2\text{H}_5\text{OH}}{1 \text{ mL C}_2\text{H}_5\text{OH}} \times \frac{0.789 \text{ g C}_2\text{H}_5\text{OH}}{1 \text{ cm}^3 \text{ C}_2\text{H}_5\text{OH}} \times \frac{1 \text{ mol C}_2\text{H}_5\text{OH}}{46.08 \text{ g C}_2\text{H}_5\text{OH}} \times \frac{2 \text{ mol C}}{1 \text{ mol C}_2\text{H}_5\text{OH}} \times \frac{12.01 \text{ g C}}{1 \text{ mol C}} = 27.7 \text{ g C}$$

$$\text{b) } 3.35 \times 10^{25} \text{ atom Cl} \times \frac{1 \text{ mol Cl}}{6.022 \times 10^{23} \text{ atom Cl}} \times \frac{1 \text{ mol CCl}_4}{4 \text{ mol Cl}} \times \frac{153.81 \text{ g CCl}_4}{1 \text{ mol CCl}_4} \times \frac{1 \text{ mL CCl}_4}{1.5842 \text{ g CCl}_4} \times \frac{1 \times 10^{-3} \text{ L CCl}_4}{1 \text{ mL CCl}_4} = 1.35 \text{ L CCl}_4$$

$$\text{c) } 9.662 \times 10^{20} \text{ form. unit Hg(BrO}_4)_2 \times \frac{8 \text{ atoms O}}{1 \text{ form. unit Hg(BrO}_4)_2} = 7.730 \times 10^{21} \text{ atoms O}$$

$$\text{d) } 0.04417 \text{ g (NH}_4)_2\text{SO}_4 \times \frac{1 \text{ mol (NH}_4)_2\text{SO}_4}{132.17 \text{ g (NH}_4)_2\text{SO}_4} \times \frac{2 \text{ mol N}}{1 \text{ mol (NH}_4)_2\text{SO}_4} \times \frac{14.01 \text{ g N}}{1 \text{ mol N}} = 9.364 \times 10^{-3} \text{ g N}$$

$$\text{e) } 6.77 \text{ g (Hg}_2)_3(\text{PO}_4)_2 \times \frac{1 \text{ mol (Hg}_2)_3(\text{PO}_4)_2}{1393.48 \text{ g (Hg}_2)_3(\text{PO}_4)_2} \times \frac{6 \text{ mol Hg}}{1 \text{ mol (Hg}_2)_3(\text{PO}_4)_2} = 0.0292 \text{ mol Hg}$$

$$\text{f) } 34 \text{ g Sb(C}_2\text{H}_3\text{O}_2)_5 \times \frac{1 \text{ mol Sb(C}_2\text{H}_3\text{O}_2)_5}{416.98 \text{ g Sb(C}_2\text{H}_3\text{O}_2)_5} \times \frac{10 \text{ mol O}}{1 \text{ mol Sb(C}_2\text{H}_3\text{O}_2)_5} \times \frac{16.00 \text{ g O}}{1 \text{ mol O}} = 13 \text{ g O}$$