

$$1a. \text{C}_2\text{H}_6 = 2(12.0) + 6(1.0) = 30.0 \text{ g/mol}$$

$$\% \text{H} = \frac{6.0}{30.0} = 20.0\% \text{H} \quad \% \text{C} = \frac{24.0}{30.0} = 80.0\% \text{C}$$

$$b. \text{FeCl}_2 = 1(55.8) + 2(35.5) = 126.8 \text{ g/mol}$$

$$\% \text{Fe} = \frac{55.8}{126.8} = 44.0\% \text{Fe} \quad \% \text{Cl} = \frac{71.0}{126.8} = 56.0\% \text{Cl}$$

$$c. \text{FeCl}_3 = 1(55.8) + 3(35.5) = 162.3 \text{ g/mol}$$

$$\% \text{Fe} = \frac{55.8}{162.3} = 34.4\% \text{Fe} \quad \% \text{Cl} = \frac{106.5}{162.3} = 65.6\% \text{Cl}$$

$$d. \text{C}_2\text{H}_4\text{O}_2 = 2(12.0) + 4(1.0) + 2(16.0) = 60.0 \text{ g/mol}$$

$$\% \text{C} = \frac{24.0}{60.0} = 40.0\% \text{C} \quad \% \text{H} = \frac{4.0}{60.0} = 6.7\% \text{H} \quad \% \text{O} = \frac{32.0}{60.0} = 53.3\% \text{O}$$

$$e. \text{CaCO}_3 = 1(40.1) + 1(12.0) + 3(16.0) = 100.1 \text{ g/mol}$$

$$\% \text{Ca} = \frac{40.1}{100.1} = 40.0\% \text{Ca} \quad \% \text{C} = \frac{12.0}{100.1} = 12.0\% \text{C} \quad \% \text{O} = \frac{48.0}{100.1} = 48.0\% \text{O}$$

$$f. \text{NaOH} = 1(23.0) + 1(16.0) + 1(1.0) = 40.0 \text{ g/mol}$$

$$\% \text{Na} = \frac{23.0}{40.0} = 57.5\% \text{Na} \quad \% \text{O} = \frac{16.0}{40.0} = 40.0\% \text{O} \quad \% \text{H} = \frac{1.0}{40.0} = 2.5\% \text{H}$$

$$g. \text{CaCl}_2 \cdot 2\text{H}_2\text{O} = 1(40.1) + 2(35.5) + 4(1.0) + 2(16.0) = 147.1 \text{ g/mol}$$

$$\% \text{Ca} = \frac{40.1}{147.1} = 27.3\% \text{Ca} \quad \% \text{Cl} = \frac{71.0}{147.1} = 48.3\% \text{Cl}$$

$$\% \text{H} = \frac{4.0}{147.1} = 2.7\% \text{H} \quad \% \text{O} = \frac{32.0}{147.1} = 21.8\% \text{O}$$

$$h. (\text{NH}_4)_3\text{PO}_4 = 3(14.0) + 12(1.0) + 1(31.0) + 4(16.0) = 149.0 \text{ g/mol}$$

$$\% \text{N} = \frac{42}{149.0} = 28.2\% \text{N} \quad \% \text{H} = \frac{12.0}{149.0} = 8.0\% \text{H}$$

$$\% \text{P} = \frac{31.0}{149.0} = 20.8\% \text{P} \quad \% \text{O} = \frac{64.0}{149.0} = 43.0\% \text{O}$$

$$2a. \text{CaCl}_2 \cdot 2\text{H}_2\text{O} = 1(40.1) + 2(35.5) + 4(1.0) + 2(16.0) = 147.1 \text{ g/mol}$$

$$\% \text{H}_2\text{O} = \frac{36.0}{147.1} = 24.5\% \text{H}_2\text{O}$$

$$b. \text{CuSO}_4 \cdot 5\text{H}_2\text{O} = 1(63.5) + 1(32.1) + 4(16.0) + 5(18.0) = 249.6$$

$$\% \text{H}_2\text{O} = \frac{90.0}{249.6} = 36.0\% \text{H}_2\text{O}$$

$$c \quad \text{Cr}(\text{NH}_3)_6 \text{Cl}_3 \cdot \text{H}_2\text{O} = 1(52.0) + 6(17) + 3(35.5) + (18.0) = 278.5$$

$$\% \text{NH}_3 = \frac{102.0}{278.5} = 36.6 \% \text{NH}_3$$

$$3a. \quad 77.7 \% \text{Fe} \quad 22.3 \% \text{O}$$

$$77.7 \text{g Fe} \times \frac{1 \text{ mol Fe}}{55.8 \text{g Fe}} = 1.39 \text{ mol Fe} \rightarrow 1$$

$$22.3 \text{g O} \times \frac{1 \text{ mol O}}{16.0 \text{g O}} = 1.39 \text{ mol O} \rightarrow 1$$

$\text{FeO}$

$$b. \quad 70.2 \% \text{Fe} \quad 30.0 \% \text{O}$$

$$70.2 \text{g Fe} \times \frac{1 \text{ mol Fe}}{55.8 \text{g Fe}} = 1.25 \text{ mol Fe} \rightarrow 1$$

$$30.0 \text{g O} \times \frac{1 \text{ mol O}}{16.0 \text{g O}} = 1.875 \text{ mol O} \rightarrow 1.5$$

$\text{Fe}_2\text{O}_3$

$$c. \quad 72.4 \% \text{Fe} \quad 27.6 \% \text{O}$$

$$72.4 \text{g Fe} \times \frac{1 \text{ mol Fe}}{55.8 \text{g Fe}} = 1.30 \text{ mol Fe} \rightarrow 1$$

$$27.6 \text{g O} \times \frac{1 \text{ mol O}}{16.0 \text{g O}} = 1.725 \text{ mol O} \rightarrow 1.3$$

$\text{Fe}_3\text{O}_4$

$$d. \quad 46.3 \% \text{Li} \quad 53.7 \% \text{O}$$

$$46.3 \text{g Li} \times \frac{1 \text{ mol Li}}{6.9 \text{g Li}} = 6.71 \text{ mol Li} \rightarrow 2$$

$$53.7 \text{g O} \times \frac{1 \text{ mol O}}{16.0 \text{g O}} = 3.36 \text{ mol O} \rightarrow 1$$

$\text{Li}_2\text{O}$

$$e. \quad 26.6 \% \text{K} \quad 35.4 \% \text{Cr} \quad 38.0 \% \text{O}$$

$$26.6 \text{g K} \times \frac{1 \text{ mol}}{39.1 \text{g K}} = 0.680 \text{ mol K} \rightarrow 1$$

$$35.4 \text{g Cr} \times \frac{1 \text{ mol}}{52.0 \text{g Cr}} = 0.681 \text{ mol Cr} \rightarrow 1$$

$$38.0 \text{g O} \times \frac{1 \text{ mol O}}{16.0 \text{g O}} = 2.38 \text{ mol O} \rightarrow 3.5$$

$\text{K}_2\text{Cr}_2\text{O}_7$

$$f. \quad 21.8 \% \text{Mg} \quad 27.9 \% \text{P} \quad 50.3 \% \text{O}$$

$$21.8 \text{g Mg} \times \frac{1 \text{ mol Mg}}{24.3 \text{g Mg}} = 0.897 \text{ mol Mg} \rightarrow 1$$

$$27.9 \text{g P} \times \frac{1 \text{ mol P}}{31.0 \text{g P}} = 0.900 \text{ mol P} \rightarrow 1$$

$$50.3 \text{g O} \times \frac{1 \text{ mol O}}{16.0 \text{g O}} = 3.14 \text{ mol O} \rightarrow 3.5$$

$\text{Mg}_2\text{P}_2\text{O}_7$

$$4a. \quad 5.5g \text{ Ca} \times \frac{1 \text{ mol}}{40.1g} = 0.137 \text{ mol Ca} \rightarrow 1$$

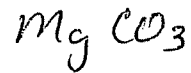
$$9.7g \text{ Cl} \times \frac{1 \text{ mol}}{35.5g} = 0.273 \text{ mol Cl} \rightarrow 2$$



$$8.8g \text{ O} \times \frac{1 \text{ mol}}{16.0g} = 0.55 \rightarrow 4$$

$$b. \quad 2.4g \text{ Mg} \times \frac{1 \text{ mol}}{24.3g} = 0.0988 \text{ mol Mg} \rightarrow 1$$

$$1.2g \text{ C} \times \frac{1 \text{ mol}}{12.0g} = 0.1 \text{ mol C} \rightarrow 1$$



$$4.7g \text{ O} \times \frac{1 \text{ mol}}{16.0g} = 0.294 \text{ mol O} \rightarrow 3$$

$$c. \quad 11.24g \text{ Na} \times \frac{1 \text{ mol}}{23.0g} = 0.489 \text{ mol Na} \rightarrow 1$$

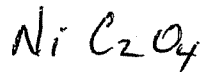
$$17.34g \text{ Cl} \times \frac{1 \text{ mol}}{35.5g} = 0.488 \text{ mol Cl} \rightarrow 1$$



$$7.82g \text{ O} \times \frac{1 \text{ mol}}{16.0g} = 0.489 \text{ mol O} \rightarrow 1$$

$$d. \quad 25.5g \text{ Ni} \times \frac{1 \text{ mol}}{58.7g} = 0.434 \text{ mol Ni} \rightarrow 1$$

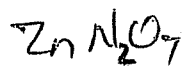
$$10.4g \text{ C} \times \frac{1 \text{ mol}}{12.0g} = 0.867 \text{ mol C} \rightarrow 2$$



$$27.8g \text{ O} \times \frac{1 \text{ mol}}{16.0g} = 1.74 \text{ mol O} \rightarrow 4$$

$$e. \quad 6.54g \text{ Zn} \times \frac{1 \text{ mol}}{65.4g} = 0.10 \text{ mol Zn} \rightarrow 1$$

$$2.80g \text{ N} \times \frac{1 \text{ mol}}{14.0g} = 0.20 \rightarrow 2$$



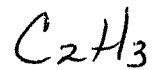
$$11.20g \text{ O} \times \frac{1 \text{ mol}}{16.0g} = 0.7 \rightarrow 7$$

$$\%C = \frac{12}{44} = 27.2 \times 23.8 = 6.477 \times \frac{1 \text{ mol}}{12} = 0.54 \text{ mol} \rightarrow 1 \rightarrow 2$$

$$\%H = \frac{2}{18} = 11.1 \times 7.30 = 0.81 \times \frac{1 \text{ mol}}{1} = 0.81 = 1.5 \rightarrow 3$$

$$5. \quad 23.8 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.0 \text{ g CO}_2} \times \frac{1 \text{ mol C}}{1 \text{ mol CO}_2} = 0.54 \text{ mol C} \rightarrow 1 \rightarrow 2$$

$$7.30 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} = 0.81 \text{ mol H} \rightarrow 1.5 \rightarrow 3$$



$$6. \textcircled{A} \quad 13.4 \text{ g Fe} \times \frac{1 \text{ mol}}{55.8 \text{ g}} = 0.240 \text{ mol Fe} \rightarrow 1$$

$$7.4 \text{ g P} \times \frac{1 \text{ mol}}{31.0 \text{ g}} = 0.239 \text{ mol P} \rightarrow 1 \quad \text{FePO}_4$$

$$15.4 \text{ g O} \times \frac{1 \text{ mol}}{16.0 \text{ g}} = 0.963 \text{ mol O} \rightarrow 4$$

$$\textcircled{B} \quad 14.23 \text{ g Fe} \times \frac{1 \text{ mol}}{55.8 \text{ g}} = 0.255 \text{ mol Fe} \rightarrow 1.5$$

$$5.27 \text{ g P} \times \frac{1 \text{ mol}}{31.0 \text{ g}} = 0.17 \text{ mol P} \rightarrow 1 \quad \text{Fe}_3\text{P}_2\text{O}_8$$

$$10.88 \text{ g O} \times \frac{1 \text{ mol}}{16.0 \text{ g}} = 0.68 \rightarrow 4$$

ferrous phosphate  $\text{Fe}_3(\text{PO}_4)_2$   $\therefore$  B

$$7a. \quad 4.32 \text{ g O} \times \frac{1 \text{ mol O}}{16.0 \text{ g O}} = 0.27 \text{ mol O} \rightarrow 1$$

$$3.24 \text{ g C} \times \frac{1 \text{ mol C}}{12.0 \text{ g C}} = 0.27 \text{ mol C} \rightarrow 1 \quad \text{CH}_2\text{O}$$

$$0.54 \text{ g H} \times \frac{1 \text{ mol H}}{1.0 \text{ g H}} = 0.54 \text{ mol H} \rightarrow 2$$

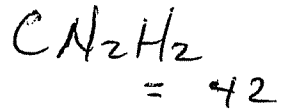
$$\text{CH}_2\text{O} = 1(12.0) + 2(1.0) + 1(16.0) = 30.0 \text{ g}$$

$$\frac{\text{mm}}{\text{EFM}} = \frac{90.0 \text{ g/mol}}{30.0 \text{ g/mol}} = 3 \quad \text{C}_3\text{H}_6\text{O}_3$$

$$b. 27.0g C \times \frac{1mol}{12.0g} = 2.25mol C \rightarrow 1$$

$$63.0g N \times \frac{1mol}{14.0g} = 4.5mol N \rightarrow 2$$

$$4.5g H \times \frac{1mol}{1.0g} = 4.5mol H \rightarrow 2$$



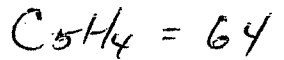
$$\frac{126}{42} = 3$$



$$c. 168.0g C \times \frac{1mol}{12.0g} = 14mol C \rightarrow 1.25 \rightarrow 5$$

$$11.2g H \times \frac{1mol}{1.0g} = 11.2mol H \rightarrow 1 \rightarrow 4$$

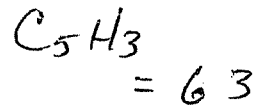
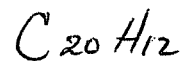
$$\frac{128}{64} = 2 \quad C_{10}H_8$$



$$d. 76.8g C \times \frac{1mol}{12.0g} = 6.4mol C \rightarrow 1.67 \rightarrow 5$$

$$3.84g H \times \frac{1mol}{1.0g} = 3.84mol H \rightarrow 1 \rightarrow 3$$

$$252/63 = 4$$

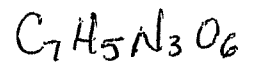


$$8a. 37.0g C \times \frac{1mol}{12.0g} = 3.08mol C \rightarrow 2.33 \rightarrow 7$$

$$2.20g H \times \frac{1mol}{1.0g} = 2.2mol H \rightarrow 1.67 \rightarrow 5$$

$$18.5g N \times \frac{1mol}{14.0g} = 1.32mol N \rightarrow 1 \rightarrow 3$$

$$42.3g O \times \frac{1mol}{16.0g} = 2.64mol O \rightarrow 2 \rightarrow 6$$



$$= 227$$

$$b. \frac{227}{227} = 1$$

