

Chapter 8

p. 241:

$$41. a) 1.271 \text{ g } C_2H_5OH \times \frac{1 \text{ mol } C_2H_5OH}{46.0694 \text{ g } C_2H_5OH} \times \frac{2 \text{ mol } C}{1 \text{ mol } C_2H_5OH} = \boxed{0.05518 \text{ mol } C}$$

$$b) 3.982 \text{ g } C_6H_4Cl_2 \times \frac{1 \text{ mol } C_6H_4Cl_2}{147.0036 \text{ g } C_6H_4Cl_2} \times \frac{6 \text{ mol } C}{1 \text{ mol } C_6H_4Cl_2} = \boxed{0.1625 \text{ mol } C}$$

$$c) 0.4438 \text{ g } C_3O_2 \times \frac{1 \text{ mol } C_3O_2}{68.033 \text{ g } C_3O_2} \times \frac{3 \text{ mol } C}{1 \text{ mol } C_3O_2} = \boxed{0.01957 \text{ mol } C}$$

$$d) 2.910 \text{ g } CH_2Cl_2 \times \frac{1 \text{ mol } CH_2Cl_2}{84.9328 \text{ g } CH_2Cl_2} \times \frac{1 \text{ mol } C}{1 \text{ mol } CH_2Cl_2} = \boxed{0.03426 \text{ mol } C}$$

$$45. a) \% (H) \text{ in } HClO_3 = \frac{1 \text{ mol } H}{1 \text{ mol } HClO_3} \times \frac{1.0079 \text{ g } H}{1 \text{ mol } H} \times \frac{1 \text{ mol } HClO_3}{84.4609 \text{ g } HClO_3} = 0.01193 \approx \boxed{1.193\% H}$$

$$\% (Cl) \text{ in } HClO_3 = \frac{35.453 \text{ g } Cl \text{ in } HClO_3}{84.4609 \text{ g } HClO_3} = 0.4198 \approx \boxed{41.98\% Cl}$$

$$\% (O) \text{ in } HClO_3 = 1 - (0.01193 + 0.4198) = 0.5683 \approx \boxed{56.83\% O}$$

$$b) \% (U) \text{ in } UF_4 = \frac{238.03 \text{ g } U / \text{mol } UF_4}{314.03 \text{ g } UF_4 / \text{mol } UF_4} = \frac{0.7580 \text{ g } U}{1 \text{ g } UF_4} \approx \boxed{75.80\% U}$$

$$\% (F) \text{ in } UF_4 = 1 - (0.7580) = 0.2420 \approx \boxed{24.20\% F}$$

$$c) \% (Ca) \text{ in } CaH_2 = \frac{40.08 \text{ g } Ca / \text{mol } CaH_2}{42.0958 \text{ g } CaH_2 / \text{mol } CaH_2} = \frac{0.9521 \text{ g } Ca}{1 \text{ g } CaH_2} \approx \boxed{95.21\% Ca}$$

$$\% (H) \text{ in } CaH_2 = 1 - (0.9521) = 0.0479 \approx \boxed{4.79\% H}$$

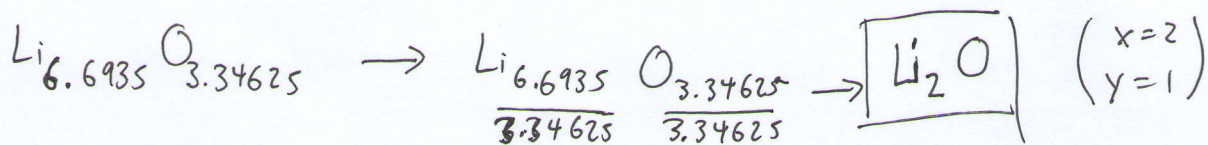
p. 242

	<u>Molecular Formula</u>	<u>Empirical Formula</u>
55. a)	Na_2O_2	NaO
b)	$\text{C}_8\text{H}_6\text{O}_4$	$\text{C}_4\text{H}_3\text{O}_2$
c)	$\text{C}_{12}\text{H}_{12}\text{N}_2\text{O}_3$	$\text{C}_{12}\text{H}_{12}\text{N}_2\text{O}_3$
d)	$\text{C}_4\text{H}_6\text{Cl}_2$	$\text{C}_2\text{H}_3\text{Cl}$

57. Assume you have 100g of compound Li_xO_y .

$$100\text{g Li}_x\text{O}_y \times 46.46\% = 46.46\text{g Li} \times \frac{1\text{mol Li}}{6.941\text{g Li}} = 6.6935\text{ mol Li}$$

$$100\text{g Li}_x\text{O}_y \times 53.54\% = 53.54\text{g O} \times \frac{1\text{mol O}}{16\text{g O}} = 3.34625\text{ mol O}$$



59. First, check that total mass of new compound (0.5998g) is accounted for by masses of carbon, hydrogen, and oxygen:

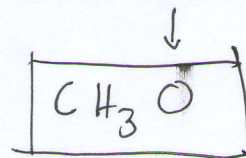
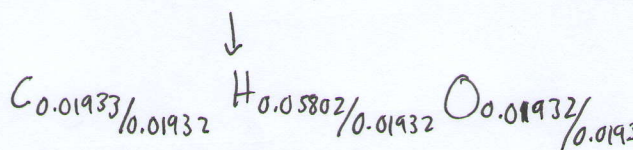
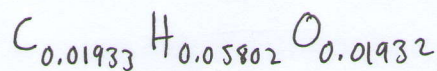
$$\text{mass (C)} + \text{mass (H)} + \text{mass (O)} = 0.2322\text{g} + 0.05848\text{g} + 0.3091\text{g} = 0.59978\text{g}$$

So, only C, H, and O is in new compound. It is a hydrocarbon $\text{C}_x\text{H}_y\text{O}_z$.

$$0.2322\text{g C} \times \frac{1\text{mol C}}{12.011\text{g C}} = 0.01933\text{ mol C}$$

$$0.05848\text{g H} \times \frac{1\text{mol H}}{1.0079\text{g H}} = 0.05802\text{ mol H}$$

$$0.3091\text{g O} \times \frac{1\text{mol O}}{16\text{g O}} = 0.01932\text{ mol O}$$



$$x=1, y=3, z=1$$

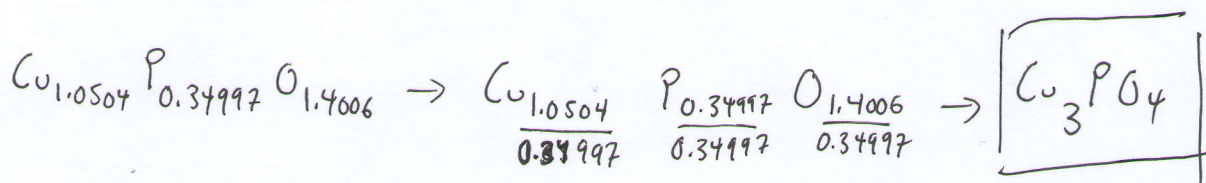
p. 243

71. Assume you have 100g of compound Cu_xPyO_z .

$$100g Cu_xPyO_z \times 66.75\% = 66.75g Cu \times \frac{1 \text{ mol } Cu}{63.55g Cu} = 1.0504 \text{ mol } Cu$$

$$100g Cu_xPyO_z \times 10.84\% = 10.84g P \times \frac{1 \text{ mol } P}{30.97g P} = 0.34997 \text{ mol } P$$

$$100g Cu_xPyO_z \times 22.41\% = 22.41g O \times \frac{1 \text{ mol } O}{16g O} = 1.4006 \text{ mol } O$$



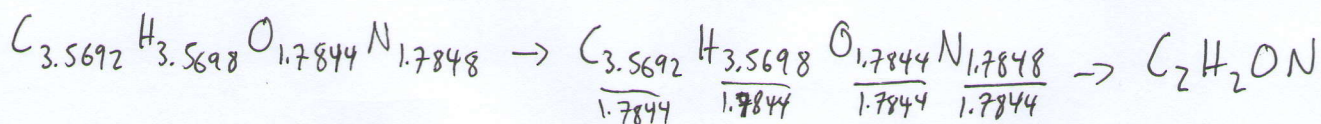
81. Assume you have 100g of compound $C_xH_yO_zN_q$.

$$100g \text{ unknown} \times 42.87\% = 42.87g C \times \frac{1 \text{ mol } C}{12.011g C} = 3.5692 \text{ mol } C$$

$$100g \text{ unknown} \times 3.598\% = 3.598g H \times \frac{1 \text{ mol } H}{1.0079g H} = 3.5698 \text{ mol } H$$

$$100g \text{ unknown} \times 28.55\% = 28.55g O \times \frac{1 \text{ mol } O}{16.00g O} = 1.7844 \text{ mol } O$$

$$100g \text{ unknown} \times 25.00\% = 25.00g N \times \frac{1 \text{ mol } N}{14.007g N} = 1.7848 \text{ mol } N$$



Empirical formula: C_2H_2ON (empirical molar mass = $2(12.01) + 2(1.0079) + 16 + 14.007 = 56.045g/mol$)

$$\frac{\text{molecular molar mass}}{\text{empirical molar mass}} = \frac{(165g \text{ to } 170g)/mol}{56.045g/mol} = 2.94407 \text{ to } 3.0333 \approx 3$$

