

Academic Honesty: The answers on this test are my own and I am using only the allowed set of notes as described in the syllabus / test directions. I have not discussed the test questions with anyone before or during the test nor have I seen the test questions prior to the exam. I will not use any online resources except google classroom and any links in the test directions during the test. If you violate any of the preceding items or do not sign, your semester grade is a F.

Signature: _____

Feel free to adjust the amount of spacing between problems to fit your answer.

1. Solve; fill-in the blank. [10 points] 2 pt @

a. $38.0 \div 7.00 = \underline{5.42857} \rightarrow \underline{5.43}$

b. $38 * 7.0 = \underline{266} \rightarrow \underline{2.7 \cdot 10^2}$ or $\underline{2.7 \cdot 10^2}$

c. $3.479 + 5.23 = \underline{8.709} \rightarrow \underline{8.71}$

d. $0.0035702 - 0.0014 = \underline{0.0021702} \rightarrow \underline{0.0022}$

e. One-third of 122 = $\underline{40.666\bar{6}} \rightarrow \underline{40.7}$

2. Solve; fill-in the blank. [20 points]

a. $3.0 \text{ ft}^2 = \underline{\hspace{2cm}} \text{ cm}^2$
3 pt @ : 3 + 2 \swarrow setup \nwarrow sf & units
 $3 \text{ ft}^2 \left(\frac{12 \text{ in}}{1 \text{ ft}} \right)^2 \left(\frac{2.54 \text{ cm}}{1 \text{ in}} \right)^2 = 2.8 \cdot 10^3 \text{ cm}^2$

b. $\frac{125 \text{ km}}{\text{hour}} = \underline{\hspace{2cm}} \frac{\text{meters}}{\text{minute}}$
 $\frac{125 \text{ km}}{h} \cdot \frac{h}{60 \text{ min}} \cdot \frac{10^3 \text{ m}}{1 \text{ km}} = 208 \cdot 10 \text{ or } 2.08 \cdot 10^3$

c. Solve for k (in terms of mole & second), where: $\frac{5.0 \text{ mmol}}{\text{second}} = k (10.0 \text{ mole})^2$
 $5 \cdot 10^{-3} \frac{\text{mol}}{\text{sec}} = k \cdot 10^2 \text{ mol}^2$

$k = \frac{5 \cdot 10^{-3} \text{ mol}}{10^2 \text{ mol}^2} \cdot \frac{\text{mol}}{\text{sec}} = 5.0 \cdot 10^{-5} \frac{\text{mol}}{\text{mol}^2 \text{ sec}}$

d. $3.0 \text{ m}^3 = \underline{\hspace{1cm}} \text{ L}$

$3 \text{ m}^3 \left(\frac{10^2 \text{ cm}}{1 \text{ m}} \right)^3 \cdot \frac{\text{mL}}{\text{cm}^3} \cdot \frac{\text{L}}{10^3 \text{ mL}} = 3.0 \cdot 10^3 \text{ L}$

3. Solve; fill-in the blank. [15 points]

a. 175 millimole of lithium sulfate = _____ grams of lithium sulfate

$175 \text{ mmol } \text{Li}_2\text{SO}_4 \cdot \frac{1 \text{ mol}}{10^3 \text{ mmol}} \cdot \frac{110 \text{ g}}{1 \text{ mol}} = 19.3 \text{ g}$
 $\text{Li} : 2 \cdot 7 = 14$
 $\text{S} : 1 \cdot 32 = 32$
 $\text{O} : 4 \cdot 16 = 64$
 $\text{Total} : 110$

b. 35.0 kilogram of aluminum sulfate = _____ moles of aluminum sulfate

$35 \text{ kg } \text{Al}_2(\text{SO}_4)_3 \cdot \frac{1 \text{ mol}}{342 \text{ g}} = 102 \text{ mol}$
 $\text{Al} : 2 \cdot 27 = 54$
 $\text{S} : 3 \cdot 32 = 96$
 $\text{O} : 12 \cdot 16 = 192$
 $\text{Total} : 342$

c. 88 billion dinitrogen pentasulfide molecules = _____ grams of dinitrogen pentasulfide

$88 \cdot 10^9 \text{ N}_2\text{S}_5 \cdot \frac{1 \text{ mol}}{6.02 \cdot 10^{23}} = 1.46 \cdot 10^{-11} \text{ mol}$
 $\text{N} : 2 \cdot 14 = 28$
 $\text{S} : 5 \cdot 32 = 160$
 $\text{Total} : 188$

4. The combustion of 3.0 grams of an alcohol (hydrocarbon with oxygen; $\text{C}_x\text{H}_y\text{O}_z$) produces 6.6 grams of carbon dioxide and 3.6 grams of water. What is the empirical formula of the alcohol? [15 points]



$2 \text{ (I)} \quad \# \text{ of C} = \frac{\% \text{ of C in } \text{CO}_2}{\% \text{ of C in } \text{C}_x\text{H}_y\text{O}_z} \cdot \# \text{ of } \text{CO}_2 = \frac{12}{44} \cdot \frac{6.6}{3} = 1.2 \text{ g C}$

$2 \quad \# \text{ of H} = \frac{\% \text{ of H in } \text{H}_2\text{O}}{\% \text{ of H in } \text{C}_x\text{H}_y\text{O}_z} \cdot \# \text{ of } \text{H}_2\text{O} = \frac{2}{18} \cdot \frac{3.6}{3} = 0.4 \text{ g H}$

$2 \quad \# \text{ of O} = \frac{\% \text{ of O in } \text{CO}_2 + \% \text{ of O in } \text{H}_2\text{O}}{\% \text{ of O in } \text{C}_x\text{H}_y\text{O}_z} \cdot \# \text{ of } \text{CO}_2 + \# \text{ of } \text{H}_2\text{O}$
 $3 = \frac{2.8 + 0.4}{3} \rightarrow \# \text{ of O} = 0.8 \text{ g O}$

$6 \quad \text{(II)} \quad 0.8 \text{ g O} \cdot \frac{1 \text{ mol}}{16 \text{ g}} = 0.05 \text{ mol O}$

$0.4 \text{ g H} \cdot \frac{1 \text{ mol}}{1 \text{ g}} = 0.4 \text{ mol H}$

$1.2 \text{ g C} \cdot \frac{1 \text{ mol}}{12 \text{ g}} = 0.1 \text{ mol C}$

$3 \quad \text{TV)} \quad \text{C} : 1 \quad \text{H} : 4 \quad \text{O} : 1$
 $0.15 : 0.4 : 0.05 \rightarrow \text{C}_3\text{H}_8\text{O}$
 $3 : 8 : 1$