

Intro Chemistry  
Quiz3  
Fall 2010

Name KEY  
print clearly

\_\_\_\_\_/50 pt

(10 pt) 1. Convert the following. Show all work.

0.133 mols carbonic acid into grams

$$0.133 \text{ mol H}_2\text{CO}_3 \left( \frac{62.03 \text{ g H}_2\text{CO}_3}{1 \text{ mol H}_2\text{CO}_3} \right) = \boxed{8.25 \text{ g H}_2\text{CO}_3}$$

3

$3.66 \times 10^{24}$  molecules  $\text{C}_6\text{H}_{12}$  into grams

$$3.66 \times 10^{24} \text{ molecules C}_6\text{H}_{12} \left( \frac{1 \text{ mol C}_6\text{H}_{12}}{6.02 \times 10^{23} \text{ molecules}} \right) \left( \frac{84.18 \text{ g C}_6\text{H}_{12}}{1 \text{ mol C}_6\text{H}_{12}} \right) = \boxed{512 \text{ g C}_6\text{H}_{12}}$$

3

44.6 grams  $\text{CH}_4$  into atoms H

$$44.6 \text{ g CH}_4 \left( \frac{1 \text{ mol CH}_4}{16.05 \text{ g CH}_4} \right) \left( \frac{6.02 \times 10^{23} \text{ molecules CH}_4}{1 \text{ mol CH}_4} \right) \left( \frac{4 \text{ atoms H}}{1 \text{ molecule CH}_4} \right) = \boxed{6.69 \times 10^{24} \text{ atoms H}}$$

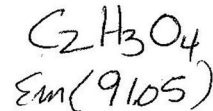
4

(12 pt) 3. A compound is analyzed to contain 26.38% C, 3.33% H, and 70.29% O by mass. The molar mass of the compound is 273.15 g/mol.

a. Determine the empirical formula for the compound. Show all work, as done in class.

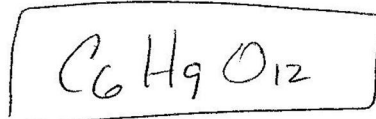
assume 100.0g compd.

$$\begin{aligned} 26.38 \text{ g C} \left( \frac{1 \text{ mol C}}{12.01 \text{ g C}} \right) &= 2.197 \text{ mol C} / 2.197 = 1 \times 2 = 2\text{C} \\ 3.33 \text{ g H} \left( \frac{1 \text{ mol H}}{1.01 \text{ g H}} \right) &= 3.30 \text{ mol H} / 2.197 = 1.5 \times 2 = 3\text{H} \\ 70.29 \text{ g O} \left( \frac{1 \text{ mol O}}{16.00 \text{ g O}} \right) &= 4.393 \text{ mol O} / 2.197 = 2 \times 2 = 4\text{O} \end{aligned}$$



b. Determine the molecular formula for the compound.

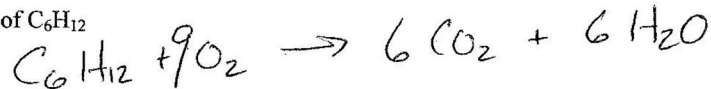
$$\frac{MM}{EM} = \frac{273.15 \text{ g/mol}}{91.05 \text{ g/mol}} = 3$$



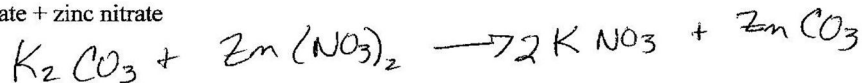
(10 pt) 4. Complete and balance the following equations.  
aluminum + sulfur



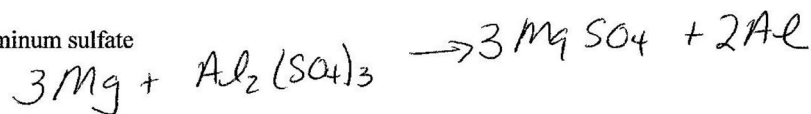
the combustion of  $\text{C}_6\text{H}_{12}$



potassium carbonate + zinc nitrate



magnesium + aluminum sulfate



chlorous acid + calcium hydroxide



Questions 5-7 are based on the following equation. Diagram each problem. Write all identities.



(6 pt) 5. How many grams of Sc are required to react with 136 g  $\text{HNO}_3$ ?

$$136 \text{ g HNO}_3 \left( \frac{1 \text{ mol HNO}_3}{63.02 \text{ g HNO}_3} \right) \left( \frac{2 \text{ mol Sc}}{6 \text{ mol HNO}_3} \right) \left( \frac{44.96 \text{ g Sc}}{1 \text{ mol Sc}} \right) = \boxed{32.3 \text{ g Sc}}$$

(6 pt) 6. How many liters of  $\text{H}_2$  would be formed at STP along with 98.3 g  $\text{Sc}(\text{NO}_3)_3$ ?

$$98.3 \text{ g Sc}(\text{NO}_3)_3 \left( \frac{1 \text{ mol Sc}(\text{NO}_3)_3}{230.99 \text{ g Sc}(\text{NO}_3)_3} \right) \left( \frac{3 \text{ mol H}_2}{2 \text{ mol Sc}(\text{NO}_3)_3} \right) \left( \frac{22.4 \text{ L H}_2}{1 \text{ mol}} \right) = \boxed{14.3 \text{ L H}_2 \text{ @ STP}}$$

(6 pt) 7. How many grams of  $\text{HNO}_3$  must react to release 109 kJ of heat?

$$-109 \text{ kJ} \left( \frac{6 \text{ mol HNO}_3}{-288 \text{ kJ}} \right) \left( \frac{63.02 \text{ g HNO}_3}{1 \text{ mol HNO}_3} \right) = \boxed{143 \text{ g HNO}_3}$$