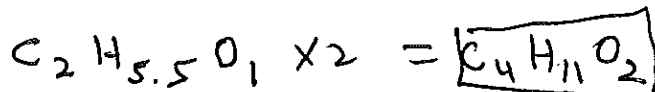


AP Chemistry BLM (11th)  
 CHap 3 Test Review



Name \_\_\_\_\_

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

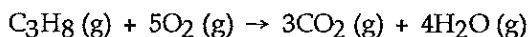
1. Combustion of a 0.9835-g sample of a compound containing only carbon, hydrogen, and oxygen produced 1.900 g of CO<sub>2</sub> and 1.070 g of H<sub>2</sub>O. What is the empirical formula of the compound?

$C = \frac{0.43}{0.022} = 2$   
 $H = \frac{0.119}{0.022} = 5.5$   
 $O = \frac{0.022}{0.022} = 1$

A) C<sub>2</sub>H<sub>5</sub>O  
 B) C<sub>4</sub>H<sub>10</sub>O<sub>2</sub>  
 C) C<sub>4</sub>H<sub>11</sub>O<sub>2</sub>  
 D) C<sub>4</sub>H<sub>10</sub>O  
 E) C<sub>2</sub>H<sub>5</sub>O<sub>2</sub>

$\frac{1.900 \text{ g CO}_2}{44 \text{ g CO}_2} \times \frac{1 \text{ mole CO}_2}{1 \text{ mole CO}_2} \times \frac{1 \text{ mole C}}{1 \text{ mole C}} \times 12.01 \text{ g} = 0.518 \text{ g C} = 0.043 \text{ mol C}$   
 $\frac{1.070 \text{ g H}_2\text{O}}{18 \text{ g H}_2\text{O}} \times \frac{1 \text{ mole H}_2\text{O}}{1 \text{ mole H}_2\text{O}} \times \frac{2 \text{ mol H}}{1 \text{ mole H}} \times 1.01 \text{ g H} = 0.119 \text{ g H} = 0.119 \text{ mol H}$   
 $0.9835 - (0.518 \text{ g} + 0.119 \text{ g}) = 0.3475 \text{ g O} \times \frac{1}{16} = 0.022 \text{ mol O}$

2. The combustion of propane (C<sub>3</sub>H<sub>8</sub>) in the presence of excess oxygen yields CO<sub>2</sub> and H<sub>2</sub>O:

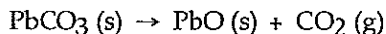


When 2.5 mol of O<sub>2</sub> are consumed in their reaction, \_\_\_\_\_ mol of CO<sub>2</sub> are produced.

A) 1.5  
 B) 3.0  
 C) 5.0  
 D) 6.0  
 E) 2.5

$\frac{2.5 \text{ mol O}_2}{5 \text{ mol O}_2} \times \frac{3 \text{ mol CO}_2}{1 \text{ mole CO}_2} = \boxed{1.5 \text{ mol CO}_2}$

3. Lead (II) carbonate decomposes to give lead (II) oxide and carbon dioxide:

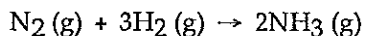


How many grams of lead (II) oxide will be produced by the decomposition of 2.50 g of lead (II) carbonate?

A) 0.41  
 B) 2.50  
 C) 0.00936  
 D) 2.09  
 E) 2.61

$\frac{2.50 \text{ g PbCO}_3}{267.1 \text{ g PbCO}_3} \times \frac{1 \text{ mole PbCO}_3}{1 \text{ mole PbCO}_3} \times \frac{1 \text{ mole PbO}}{1 \text{ mole PbO}} \times 223.2 \text{ g} = \boxed{2.09 \text{ g}}$

4. Under appropriate conditions, nitrogen and hydrogen undergo a combination reaction to yield ammonia:

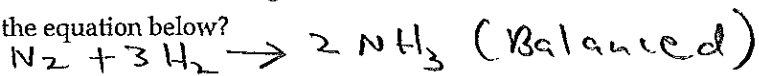


A 7.1-g sample of N<sub>2</sub> requires \_\_\_\_\_ g of H<sub>2</sub> for complete reaction.

A) 0.51  
 B) 0.76  
 C) 1.2  
 D) 1.5  
 E) 17.2

$\frac{7.1 \text{ g N}_2}{28 \text{ g N}_2} \times \frac{1 \text{ mole N}_2}{1 \text{ mole N}_2} \times \frac{3 \text{ mol H}_2}{1 \text{ mole N}_2} \times 2.0 \text{ g H}_2 = 1.52 \text{ g H}_2$

5. What is the maximum mass in grams of  $\text{NH}_3$  that can be produced by the reaction of 1.0 g of  $\text{N}_2$  with 3.0 g of  $\text{H}_2$  via the equation below?



$\text{N}_2(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{NH}_3(\text{g})$  (not balanced) Note: you can see  $\text{N}_2$  is L.R.

- A) 2.0
- B) 1.2**
- C) 0.61
- D) 17
- E) 4.0

$$\frac{1.0 \text{ g N}_2 \mid 1 \text{ mole N}_2 \mid 2 \text{ moles NH}_3 \mid 17.0 \text{ g NH}_3}{28 \text{ g N}_2 \mid 1 \text{ mole N}_2 \mid 1 \text{ mole NH}_3} = 1.2 \text{ g NH}_3$$

6. There are \_\_\_\_\_ mol of carbon atoms in 4 mol of dimethylsulfoxide ( $\text{C}_2\text{H}_6\text{SO}$ ).

- A) 2
- B) 6
- C) 8**
- D) 4
- E) 3

$$\frac{4 \text{ mol C}_2\text{H}_6\text{SO} \mid 2 \text{ mol C}}{1 \text{ mol C}_2\text{H}_6\text{SO}} = 8 \text{ mol}$$

7. Write the balanced equation for the reaction that occurs when methanol,  $\text{CH}_3\text{OH}(\text{l})$ , is burned in air. What is the coefficient of methanol in the balanced equation?

- A) 1
- B) 2**
- C) 3
- D) 4
- E) 3/2



8. There are \_\_\_\_\_ sulfur atoms in 25 molecules of  $\text{C}_4\text{H}_4\text{S}_2$ .

- A)  $1.5 \times 10^{25}$
- B)  $4.8 \times 10^{25}$
- C)  $3.0 \times 10^{25}$
- D) 50**
- E)  $6.02 \times 10^{23}$

$$\frac{25 \text{ molecules C}_4\text{H}_4\text{S}_2 \mid 2 \text{ atoms Sulfur}}{1 \text{ molecule C}_4\text{H}_4\text{S}_2} = 50 \text{ atoms sulfur}$$

9. How many grams of hydrogen are in 46 g of  $\text{CH}_4\text{O}$ ?

- A) 5.8**
- B) 1.5
- C) 2.8
- D) 0.36
- E) 184

$$\frac{46 \text{ g CH}_4\text{O} \mid 1 \text{ mole CH}_4\text{O} \mid 4 \text{ mole H} \mid 1.0 \text{ g H}}{32 \text{ g CH}_4\text{O} \mid 1 \text{ mole CH}_4\text{O} \mid 1 \text{ mole H}} =$$

10. How many moles of carbon dioxide are there in 52.06 g of carbon dioxide?

- A) 0.8452
- B) 1.183**
- C)  $6.022 \times 10^{23}$
- D)  $8.648 \times 10^{23}$
- E)  $3.134 \times 10^{25}$

$$\frac{52.06 \text{ g CO}_2 \mid 1 \text{ mole Carbon}}{44 \text{ g CO}_2} =$$

11. What is the empirical formula of a compound that contains 49.4% K, 20.3% S, and 30.3% O by mass? *assume 100g*

- A) KSO<sub>2</sub>
- B) KSO<sub>3</sub>
- C) K<sub>2</sub>SO<sub>4</sub>
- D) K<sub>2</sub>SO<sub>3</sub>**
- E) KSO<sub>4</sub>

$$\begin{aligned}
 \text{K } & \frac{49.4 \text{ g}}{39.1 \text{ g/mol}} = 1.26 \approx 1 \times 2 = 2 \\
 \text{S } & \frac{20.3 \text{ g}}{32.0 \text{ g/mol}} = 0.634 \approx 0.5 \times 2 = 1 \\
 \text{O } & \frac{30.3 \text{ g}}{16.0 \text{ g/mol}} = 1.89 \approx 1.5 \times 2 = 3
 \end{aligned}$$



12. A compound contains 40.0% C, 6.71% H, and 53.29% O by mass. The molecular weight of the compound is 60.05 amu. The molecular formula of this compound is *assume 100g*

- A) C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>**
- B) CH<sub>2</sub>O
- C) C<sub>2</sub>H<sub>3</sub>O<sub>4</sub>
- D) C<sub>2</sub>H<sub>2</sub>O<sub>4</sub>
- E) CHO<sub>2</sub>

$$\begin{aligned}
 \text{C } & \frac{40.0 \text{ g}}{12.0 \text{ g/mol}} = 3.33 \text{ mol} = 1 \\
 \text{H } & \frac{6.71 \text{ g}}{1.01 \text{ g/mol}} = 6.64 \text{ mol} = 2 \\
 \text{O } & \frac{53.29 \text{ g}}{16.0 \text{ g/mol}} = 3.33 \text{ mol} = 1
 \end{aligned}$$

CH<sub>2</sub>O = F.W. of 30  
 M.W. = 60 = 2  
 F.W. = 30  
 CH<sub>2</sub>O × 2 = **C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>**

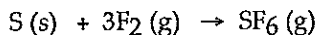
13. Combustion of a 1.031-g sample of a compound containing only carbon, hydrogen, and oxygen produced 2.265 g of CO<sub>2</sub> and 1.236 g of H<sub>2</sub>O. What is the empirical formula of the compound?

- A) C<sub>3</sub>H<sub>8</sub>O
- B) C<sub>3</sub>H<sub>5</sub>O
- C) C<sub>6</sub>H<sub>16</sub>O<sub>2</sub>
- D) C<sub>3</sub>H<sub>9</sub>O<sub>3</sub>
- E) C<sub>3</sub>H<sub>6</sub>O<sub>3</sub>

$$\begin{aligned}
 \text{CO}_2 & \frac{2.265 \text{ g}}{44 \text{ g/mol}} = 0.0515 \text{ mol CO}_2 \rightarrow 0.103 \text{ g C} \\
 \text{H}_2\text{O} & \frac{1.236 \text{ g}}{18.0 \text{ g/mol}} = 0.0687 \text{ mol H}_2\text{O} \rightarrow 0.139 \text{ g H}
 \end{aligned}$$

$$1.031 \text{ g} - (0.617 + 0.139) = 0.275 \text{ g O}$$

14. Sulfur and fluorine react in a combination reaction to produce sulfur hexafluoride:



In a particular experiment, the percent yield is 79.0%. This means that in this experiment, a 7.90-g sample of fluorine yields \_\_\_\_\_ g of SF<sub>6</sub>.

- A) 30.3
- B) 10.1
- C) 7.99**
- D) 24.0
- E) 0.110

$$\frac{7.9 \text{ g F}_2}{38.0 \text{ g F}_2} \times \frac{1 \text{ mole F}_2}{3 \text{ moles F}_2} \times \frac{1 \text{ mole SF}_6}{1 \text{ mole SF}_6} \times 146.1 \text{ g SF}_6 = 10.12 \text{ g SF}_6$$

Theoretical Yield

$$10.12 \text{ g SF}_6 \times 0.79 = 7.998 \text{ g}$$

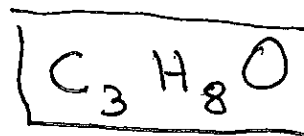
$$\% \text{ yield} = \frac{7.998 \text{ g}}{10.12 \text{ g}} \times 100\% = 79.0\%$$

$$= 79.0\%$$

$$\frac{0.617 \text{ g C}}{12.0 \text{ g/mol}} = 0.0514 \text{ mol} = 3$$

$$\frac{0.139 \text{ g H}}{1.01 \text{ g/mol}} = 0.139 \text{ mol} = 8$$

$$\frac{0.279 \text{ g O}}{16.0 \text{ g/mol}} = 0.0173 \text{ mol} = 1$$



13 continued