AP Chemistry BLM (11th)
CHap 3 Test Review

$C_2H_{5.5}O_1 \times 2 = \boxed{C_4H_{11}O_2}$

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_2 and 1.070 g of H_2O. What is the empirical formula of the compound?

A) C_2H_5O
B) $C_4H_{10}O_2$
C) $C_4H_{11}O_2$
D) $C_4H_{10}O$
E) $C_2H_5O_2$

$C = \frac{.043}{.022} = 2$ $\quad H = \frac{.119}{.022} = 5.5$ $\quad O = \frac{.022}{.022} = 1$

$1.900\text{g } CO_2 \left| \frac{1\text{ mole } CO_2}{44\text{g } CO_2} \right| \frac{1\text{ mol C}}{1\text{ mol } CO_2} \left| \frac{12.01\text{g}}{1\text{ mol C}} \right. = .518\text{g C} = .043\text{ mol}$

$1.070\text{g } H_2O \left| \frac{1\text{ mol } H_2O}{18\text{g } H_2O} \right| \frac{2\text{ mol H}}{1\text{ mol } H_2O} \left| \frac{1.01\text{g H}}{1\text{ mol H}} \right. = .119\text{g H} = .119\text{ mol}$

$.9835 - (.518\text{g} + .119\text{g}) = .3475\text{g O} = .022\text{ mol}$

2. The combustion of propane (C_3H_8) in the presence of excess oxygen yields CO_2 and H_2O:

$$C_3H_8\,(g) + 5O_2\,(g) \rightarrow 3CO_2\,(g) + 4H_2O\,(g)$$

When 2.5 mol of O_2 are consumed in their reaction, _____ mol of CO_2 are produced.

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

$2.5\text{ mol } O_2 \left| \frac{3\text{ mol } CO_2}{5\text{ mol } O_2} \right. = \boxed{1.5\text{ mol } CO_2}$

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

$$PbCO_3\,(s) \rightarrow PbO\,(s) + CO_2\,(g)$$

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

$2.50\text{g } PbCO_3 \left| \frac{1\text{ mole } PbCO_3}{267.1\text{g } PbCO_3} \right| \frac{1\text{ mole PbO}}{1\text{ mole } PbCO_3} \left| \frac{223.2\text{g}}{1\text{ mol PbO}} \right. = \boxed{2.09\text{g}}$

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

$$N_2\,(g) + 3H_2\,(g) \rightarrow 2NH_3\,(g)$$

A 7.1-g sample of N_2 requires _____ g of H_2 for complete reaction.

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

$7.1\text{g } N_2 \left| \frac{1\text{ mol } N_2}{28\text{g } N_2} \right| \frac{3\text{ mol } H_2}{1\text{ mol } N_2} \left| \frac{2.0\text{g } H_2}{1\text{ mol } H_2} \right. = 1.52\text{g } H_2$

5. What is the maximum mass in grams of NH_3 that can be produced by the reaction of 1.0 g of N_2 with 3.0 g of H_2 via the equation below?

$N_2 + 3H_2 \rightarrow 2NH_3$ (Balanced)

N_2 (g) + H_2 (g) → NH_3 (g) (not balanced) Note: you can see N_2 is L.R.

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

$$1.0\text{ g } N_2 \left| \frac{1\text{ mole } N_2}{28\text{ g } N_2} \right| \frac{2\text{ moles } NH_3}{1\text{ mole } N_2} \left| \frac{17.01\text{ g } NH_3}{1\text{ mole } NH_3} \right. = 1.2\text{ g } NH_3$$

6. There are _____ mol of carbon atoms in 4 mol of dimethylsulfoxide (C_2H_6SO).

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

$$\frac{4\text{ mol } C_2H_6SO}{1\text{ mol } C_2H_6SO} \left| \frac{2\text{ mol C}}{} \right. = 8\text{ mol}$$

7. Write the balanced equation for the reaction that occurs when methanol, CH_3OH (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

$$2\,CH_3OH + 3O_2 \rightarrow 4H_2O + 2CO_2$$

8. There are _____ sulfur atoms in 25 molecules of $C_4H_4S_2$.

A) 1.5×10^{25}
B) 4.8×10^{25}
C) 3.0×10^{25}
D) 50
E) 6.02×10^{23}

$$25\text{ molecules } C_4H_4S_2 \left| \frac{2\text{ atoms Sulfur}}{1\text{ molecule } C_4H_4S_2} \right. = 50\text{ atoms sulfur}$$

9. How many grams of hydrogen are in 46 g of CH_4O?

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

$$46\text{ g } CH_4O \left| \frac{1\text{ mole } CH_4O}{32\text{ g } CH_4O} \right| \frac{4\text{ mole H}}{1\text{ mole } CH_4O} \left| \frac{1.01\text{ g H}}{1\text{ mole H}} \right. =$$

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

A) 0.8452
B) 1.183
C) 6.022×10^{23}
D) 8.648×10^{23}
E) 3.134×10^{25}

$$52.06\text{ g } CO_2 \left| \frac{1\text{ mole Carbon}}{44\text{ g } CO_2} \right. =$$

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_2
B) KSO_3
C) K_2SO_4
D) K_2SO_3
E) KSO_4

K $49.9\text{g} \left| \frac{\text{mole}}{39.1\text{g}} \right. = \frac{1.28}{1.28} = 1 \times 2 = 2$

S $20.3\text{g} \left| \frac{\text{1 mole}}{32.0\text{g}} \right. = \frac{.634}{1.28} = .5 \times 2 = 1$

O $30.3\text{g} \left| \frac{\text{1 mole}}{16\text{g}} \right. = \frac{1.9}{1.28} = 1.5 \times 2 = 3$

KNO_3

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) $C_2H_4O_2$
B) CH_2O
C) $C_2H_3O_4$
D) $C_2H_2O_4$
E) CHO_2

C $\frac{40.0\text{g}}{12.01\text{g/mol}} = \frac{3.33\text{mol}}{3.33} = 1$

H $6.71\text{g}/1.01\text{g/mol} = \frac{6.64\text{mol}}{3.33} = 2$

O $53.29/16.0\text{g/mol} = \frac{3.33\text{mol}}{3.33} = 1$

CH_2O = F.W. of 30

$\frac{\text{M.W.}}{\text{F.W.}} = \frac{60}{30} = 2$

$CH_2O \times 2 = C_2H_4O_2$

13. Combustion of a 1.031-g sample of a compound containing only carbon, hydrogen, and oxygen produced 2.265 g of CO_2 and 1.236 g of H_2O. What is the empirical formula of the compound?

A) C_3H_8O
B) C_3H_5O
C) $C_6H_{16}O_2$
D) $C_3H_9O_3$
E) $C_3H_6O_3$

$2.265\text{g } CO_2 \left| \frac{\text{1 mole } CO_2}{44\text{g } CO_2} \right| \frac{\text{2 mole C}}{\text{1 mole } CO_2} \left| \frac{12\text{g C}}{\text{1 mole C}} \right. = .617\text{g}$

$1.236\text{g } H_2O \left| \frac{\text{1 mol } H_2O}{18.01\text{g } H_2O} \right| \frac{\text{2 mole H}}{\text{1 mole } H_2O} \left| \frac{1.01\text{g H}}{\text{1 mole H}} \right. = .139\text{g}$

$1.031\text{g} - (.617 + .139) = .275\text{g O}$

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

$$S(s) + 3F_2(g) \rightarrow SF_6(g)$$

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_6.

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

$7.9\text{g } F_2 \left| \frac{\text{1 mole F}}{38.0\text{g } F_2} \right| \frac{\text{1 mole } SF_6}{\text{3 F moles}} \left| \frac{146.1\text{g } SF_6}{\text{1 mole } SF_6} \right. = 10.12\text{g } SF_6$

Theoritical Yield

$10.12\text{g } SF_6 \times .79 = 7.998\text{g}$ Actual Yield

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

13 continued

$\frac{.617\text{g C}}{12.0\text{g/mol}} = \frac{.0514}{.0173} = 3$

$\frac{.139\text{g H}}{1.01\text{g/mol}} = \frac{.139}{.0173} = 8$

$\frac{.275\text{g O}}{16.0\text{g/mol}} = \frac{.0173}{.0173} = 1$

C_3H_8O