Exam chapter 3 Exam E KEY

Name_____

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

1) When the following equation is balanced, the coefficient of water is _____. 1) _____

$2\ K\ (s) + H_2O\ (l) \rightarrow KOH\ (aq) + H_2\ (g)$

A) 1 B) 5 C) 4 D) 2 E) 3

2) Of the reactions below, which one is a decomposition reaction? 2) _____

A) $2N_2 + 3H_2 \rightarrow 2NH_3$

B) $NH_4Cl \rightarrow NH_3 + HCl$

C) $2Mg + O_2 \rightarrow 2MgO$

D) $2CH_4 + 4O_2 \rightarrow 2CO_2 + 4H_2O$

E) $Cd(NO_3)_2 + Na_2S \rightarrow CdS + 2NaNO_3$

3) 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? 3) _____

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

4) There are _____ mol of carbon atoms in 4 mol $C_4H_8O_2$). 4) _____

A) 32 B) 8 C) 20 D) 4 E) 16

5) The formula weight of lead (II) carbonate ($PbCO_3$) is _____ amu. 5) _____

A) 219.2 B) 267.2 C) 273.2 D) 207.2 E) 235.2

6) How many moles of carbon dioxide are there in 52.06 g of carbon dioxide? 6) _____

A) 8.648×1023

B) 0.8452

C) 3.134×1025

D) 1.183

E) 6.022×1023

7) Calculate the percentage by mass of lead in $Pb(NO_3)_2$. 7) _____

A) 38.6 B) 44.5 C) 65.3 D) 71.2 E) 62.6

8) What is the empirical formula of a compound that contains 29% Na, 41% S, and 30% O by mass? 8) _____

A) NaSO B) $Na_2S_2O_3$ C) $Na_2S_2O_6$ D) $NaSO_2$ E) $NaSO_3$

9) 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? 9) _____

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

$2.265\text{g } CO_2 \times \frac{12\text{g C}}{44\text{g}} = 0.6177 \quad \frac{0.6177}{1.031} = 60\%\text{C}$

$1.236\text{g } H_2O \times \frac{2\text{g H}}{18\text{g}} = 0.1373 \quad \frac{0.1373}{1.031} = 13.3\%\text{H}$

10) Calcium carbide (CaC_2) reacts with water to produce acetylene (C_2H_2): 10) ~~26.7%~~

$$CaC_2\,(s) + 2H_2O\,(g) \rightarrow Ca(OH)_2\,(s) + C_2H_2\,(g)$$

Production of 13 g of C_2H_2 requires consumption of _____ g of H_2O.

A) 4.8×10^2 B) 9.0 C) 4.8×10^{-2} D) 4.5 E) 18

$13\text{g } C_2H_2 \times \frac{1\text{mol}}{26\text{g}} \times \frac{2\text{mol } H_2O}{1\text{mol } C_2H_2} \times \frac{18\text{g}}{1\text{mol } H_2O} = 18\text{g } H_2O$

11) A 3.82-g sample of magnesium nitride is reacted with 7.73 g of water. 11) _____

$$Mg_3N_2 + 3H_2O \rightarrow 2NH_3 + 3MgO$$

The yield of MgO is 3.60 g. What is the percent yield in the reaction?

A) 46.6 B) 99.9 C) 78.4 D) 94.5 E) 49.4

12) _____ Several brands of antiacids use $Al(OH)_3$ to react with stomach acid, which contains primarily HCl:

$$Al(OH)_3\,(s) + 3\,HCl\,(aq) \longrightarrow AlCl_3\,(aq) + 3\,H_2O\,(l)$$

Calculate the number of grams of HCl that can react with 0.500g of $Al(OH)_3$.

$.5\text{g } Al(OH)_3 \times \frac{1\text{mol}}{78\text{g}} \times \frac{3\text{mol HCl}}{1\text{mol } Al(OH)_3} \times \frac{36.45\text{g}}{1\text{mol}} = 0.70\text{ g HCl used}$

13) _____ What is the coefficient for carbon dioxide when dimethylether, CH_3OCH_3 gas combusts to form water carbon dioxide gas.

$CH_3OCH_3 + 3O_2 \rightarrow 2CO_2 + 3H_2O$

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

6 $52.06\,g\,CO_2 \times \frac{1\,mol}{44\,g} = 1.183\,mol\,CO_2$

7 $PbCO_3$ $\frac{207.2\,g}{331.2\,g} \times 100 =$ 62.6%

8 $29\,g\,Na \times \frac{1\,mol}{23\,g} = 1.26 = 1 \times 2 = 2$

$41\,g\,S \times \frac{1\,mol}{32\,g} = 1.28 = 1 \times 2 = 2$

$30\,g\,O \times \frac{1\,mol}{16\,g} = \frac{1.875}{1.26} = 1.5 \times 2 = 3$

$Na_2S_2O_3$

9] $2.265\,g\,CO_2 \times \frac{12\,g\,C}{44\,g} = \frac{0.6177}{1.031} \times 100 = 60\%\,C$

$1.236\,g\,H_2O \times \frac{2\,g\,H}{18} = \frac{0.1373}{1.031} \times 100 = 13.3\%\,H$

$26.7\%\,O$

$60\,g\,C \times \frac{1\,mol}{12\,g} = \frac{5}{1.66} = 3$

$13.3\,g\,H \times \frac{1\,mol}{1\,g} = \frac{13.3}{1.66} = 8$ C_3H_8O

$26.7\,g\,O \times \frac{1\,mol}{16\,g} = 1.66 = 1$

10] $CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2$

$13\,g\,C_2H_2 \times \frac{1\,mol\,C_2H_2}{26\,g} \times \frac{2\,mol\,H_2O}{1\,mol\,C_2H_2} \times \frac{18\,g}{1\,mol\,H_2O}$

$= 18\,g\,H_2O$

11 $Mg_3N_2 + 3H_2O \rightarrow 2NH_3 + 3MgO$

$3.82\,g\ Mg_3N_2 \times \frac{1\,mol}{100.9\,g} = 3.78 \times 10^{-2}\,mol$ L.R.

$7.73\,g\ H_2O \times \frac{1\,mol}{18\,g} = 4.29 \times 10^{-1}\,mol\ H_2O$ Excess

$3.78 \times 10^{-2}\,mol\ Mg_3N_2 \times \frac{3\,mol\ H_2O}{1\,mol\ Mg_3N_2}$

$= 1.13 \times 10^{-1}\,mol\ H_2O$ needed

$3.78 \times 10^{-2}\,mol\ Mg_3N_2 \times \frac{3\,mol\ MgO}{1\,mol\ Mg_3N_2} \times \frac{40.3\,g}{1\,mol\ MgO} = 4.5\,g\ Mg$ theoretical

$\frac{3.6\,g}{4.5\,g} \times 100 = 78.7\%$ yield

12 $Al(OH)_3 + 3HCl \rightarrow AlCl_3 + 3H_2O$

$0.5g\ Al(OH)_3 \times \frac{1mol\ Al(OH)_3}{78g} \times \frac{3\ mol\ HCl}{1mol\ Al(OH)_3} \times \frac{36.45g}{1mol\ HCl} = 0.70g\ HCl$

13 $CH_3OCH_3 + 3O_2 \rightarrow 2CO_2 + 3H_2O$