Name ____________________________

AP Chemistry: Stoichiometry
Multiple Choice

(You may use a calculator.)

44. What number of moles of O_2 is needed to produce 14.2 grams of P_4O_{10} from P? (Molar Mass P_4O_{10} = 284)

(A) 0.0500 mole (B) 0.0625 mole (C) 0.125 mole (D) 0.250 mole (E) 0.500 mole

73. A 27.0-gram sample of an unknown hydrocarbon was burned in excess oxygen to form 88.0 grams of carbon dioxide and 27.0 grams of water. What is a possible molecular formula of the hydrocarbon?

(A) CH_4 (B) C_2H_2 (C) C_4H_3 (D) C_4H_6 (E) C_4H_{10}

23. How many grams of calcium nitrate, $Ca(NO_3)_2$, contains 24 grams of oxygen atoms?

(A) 164 grams (B) 96 grams (C) 62 grams (D) 50. grams (E) 41 grams

25. The simplest formula for an oxide of nitrogen that is 36.8 percent nitrogen by weight is…

(A) N_2O (B) NO (C) NO_2 (D) N_2O_3 (E) N_2O_5

39. When a hydrate of Na_2CO_3 is heated until all the water is removed, it loses 54.3 percent of its mass. The formula of the hydrate is…

(A) $Na_2CO_3 \cdot 10\ H_2O$ (B) $Na_2CO_3 \cdot 7\ H_2O$ (C) $Na_2CO_3 \cdot 5\ H_2O$ (D) $Na_2CO_3 \cdot 3\ H_2O$ (E) $Na_2CO_3 \cdot H_2O$

19. In which of the following compounds is the mass ratio of chromium to oxygen closest to 1.6 to 1.0?

(A) CrO_3 (B) CrO_2 (C) CrO (D) Cr_2O (E) Cr_2O_3

72. After completing an experiment to determine gravimetrically the percentage of water in a hydrate, a student reported a value of 38 percent. The correct value for the percentage of water in the hydrate is 51 percent. Which of the following is the most likely explanation for this difference?

A) Strong initial heating caused some of the hydrate sample to spatter out of the crucible.

B) The dehydrated sample absorbed moisture after heating.

C) The amount of the hydrate sample used was too small.

D) The crucible was not heated to constant mass before use.

E) Excess heating caused the dehydrated sample to decompose.

45. The alkenes are compounds of carbon and hydrogen with the general formula C_nH_{2n}. If 0.561 gram of any alkene is burned in excess oxygen, what number of moles of H_2O is formed?

(A) 0.0400 mole (B) 0.0600 mole (C) 0.0800 mole (D) 0.400 mole (E) 0.800 mole

37. __ $CH_3CH_2COOH_{(l)}$ + __ $O_{2(g)} \rightarrow$ __ $CO_{2(g)}$ + __ $H_2O_{(l)}$

How many moles of O_2 are required to oxidize 1 mole of CH_3CH_2COOH according to the reaction represented above?

(A) 2 moles (B) 5/2 moles (C) 3 moles (D) 7/2 moles (E) 9/2 moles

67. $BrO_3^- + 5\ Br^- + 6\ H^+ \rightleftarrows 3\ Br_2 + 3\ H_2O$

If 25.0 milliliters of 0.200-molar BrO_3^- is mixed with 30.0 milliliters of 0.450-molar Br^- solution that contains a large excess of H^+, the amount of Br_2 formed, according to the equation above, is…

(A) 5.00×10^{-3} mole (B) 8.10×10^{-3} mole (C) 1.35×10^{-2} mole
(D) 1.50×10^{-2} mole (E) 1.62×10^{-2} mole

56. It is suggested that SO_2 (molar mass 64 grams), which contributes to acid rain, could be removed from a stream of waste gas by bubbling the gas through 0.25-molar KOH, thereby producing K_2SO_3. What is the maximum mass of SO_2 that could be removed by 1,000 liters of the KOH solution?
(A) 4.0 kg (B) 8.0 kg (C) 16 kg (D) 20. kg (E) 40. kg

59. When a 1.25-gram sample of limestone was dissolved in acid, 0.44 gram of CO_2 was generated. If the rock contained no carbonate other than $CaCO_3$, what was the percent of $CaCO_3$ by mass in the limestone?

(A) 35% (B) 44% (C) 67% (D) 80% (E) 100%

26. $\ldots C_{10}H_{12}O_4S_{(s)} + \ldots O_{2(g)} \rightarrow \ldots CO_{2(g)} + \ldots SO_{2(g)} + \ldots H_2O_{(g)}$
When the equation above is balanced and all coefficients are reduced to their lowest whole-number terms, the coefficient for $O_{2(g)}$ is…
(A) 6 (B) 7 (C) 12 (D) 14 (E) 28

55. $10\ HI + 2\ KMnO_4 + 3\ H_2SO_4 \rightarrow 5\ I_2 + 2\ MnSO_4 + K_2SO_4 + 8\ H_2O$
According to the balanced equation above, how many moles of HI would be necessary to produce 2.5 mol of I_2, starting with 4.0 mol of $KMnO_4$ and 3.0 mol of H_2SO_4?
A) 20 B) 10 C) 8.0 D) 5.0 E) 2.5

24. A compound contains 1.10 mol of K, 0.55 mol of Te, and 1.65 mol of O. What is the simplest formula of this compound?
(A) KTeO
(B) KTe_2O
(C) K_2TeO_3
(D) K_2TeO_6
(E) K_4TeO_6

31. $CS_{2(l)} + 3\ O_{2(g)} \rightarrow CO_{2(g)} + 2\ SO_{2(g)}$
What volume of $O_{2(g)}$ is required to react with excess $CS_{2(l)}$ to produce 4.0 L of $CO_{2(g)}$? (Assume all gases are measured at 0°C and 1 atm.)
(A) 12 L
(B) 22.3 L
(C) 1/3 x 22.4 L
(D) 2 x 22.4 L
(E) 3 x 22.4 L

52. Propane gas, C_3H_8, burns in excess oxygen gas. When the equation for this reaction is correctly balanced and all coefficients are reduced to their lowest whole-number terms, the coefficient for O_2 is…

(A) 4 (B) 5 (C) 7 (D) 10 (E) 22

58. $2\ N_2H_{4(g)} + N_2O_{4(g)} \rightarrow 3N_{2(g)} + 4\ H_2O_{(g)}$

When 8.0 g of N_2H_4 (32 g mol^{-1}) and 92 g of N_2O_4 (92 g mol^{-1}) are mixed together and react according to the equation above, what is the maximum mass of H_2O that can be produced?

(A) 9.0 g (B) 18 g (C) 36 g (D) 72 g (E) 144 g

60. $2\ H_2O_{(l)} + 4\ MnO_4^-{}_{(aq)} + 3\ ClO_2^-{}_{(aq)} \rightarrow 4\ MnO_{2(s)} + 3\ ClO_4^-{}_{(aq)} + 4\ OH^-{}_{(aq)}$

According to the balanced equation above, how many moles of $ClO_2^-{}_{(aq)}$ are needed to react completely with 20. mL of 0.20 M $KMnO_4$ solution?

(A) 0.0030 mol (B) 0.0053 mol (C) 0.0075 mol (D) 0.013 mol (E) 0.030 mol