Unit 2: Test Practice

Name: _____

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

1) When the following equation is balanced, the coefficients are _____.

$$NH_3\ (g) + O_2\ (g) \rightarrow NO_2\ (g) + H_2O\ (g)$$

A) 4, 7, 4, 6 B) 4, 3, 4, 3 C) 2, 3, 2, 3 D) 1, 1, 1, 1 E) 1, 3, 1, 2

2) There are _____ molecules of methane in 0.123 mol of methane (CH_4).

A) 7.40×10^{22}
B) 0.615
C) 5
D) 2.46×10^{-2}
E) 2.04×10^{-25}

3) A 2.25-g sample of magnesium nitrate, $Mg(NO_3)_2$, contains _____ mol of this compound.

A) 38.4 B) 0.0261 C) 148.3 D) 0.0152 E) 65.8

4) A compound contains 38.7% K, 13.9% N, and 47.4% O by mass. What is the empirical formula of the compound?

A) $K_2N_2O_3$ B) KNO_2 C) K_4NO_5 D) K_2NO_3 E) KNO_3

5) 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) 1.2 B) 1.5 C) 0.76 D) 0.51 E) 17.2

6) 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?

$$N_2\ (g) + H_2\ (g) \rightarrow NH_3\ (g) \text{ (not balanced)}$$

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

7) 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) 10.1 B) 7.99 C) 0.110 D) 24.0 E) 30.3

8) How many moles of magnesium oxide are produced by the reaction of 3.82 g of magnesium nitride with 7.73 g of water?

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

A) 0.114 B) 0.0756 C) 0.429 D) 0.0378 E) 4.57

9) The total concentration of ions in a 0.250 M solution of HCl is _____.

A) 0.125 M
B) 0.750 M
C) 0.500 M
D) 0.250 M
E) essentially zero.

10) Which of the following are weak electrolytes?

HCl
$HC_2H_3O_2$
NH_3
KCl

A) HCl , KCl
B) $HC_2H_3O_2$, KCl
C) HCl , $HC_2H_3O_2$, KCl
D) HCl , $HC_2H_3O_2$, NH_3 , KCl
E) $HC_2H_3O_2$, NH_3

11) Which ion(s) is/are spectator ions in the formation of a precipitate of AgCl via combining aqueous solutions of $CoCl_2$ and $AgNO_3$?

A) Cl^-
B) Co^{2+} and NO_3^-
C) NO_3^-
D) NO_3^- and Cl^-
E) Co^{2+} and Ag^+

12) The balanced net ionic equation for precipitation of $CaCO_3$ when aqueous solutions of Na_2CO_3 and $CaCl_2$ are mixed is _____.

A) $Ca^{2+}(aq) + CO_3^{2-}(aq) \rightarrow CaCO_3(s)$
B) $Na_2CO_3(aq) + CaCl_2(aq) \rightarrow 2NaCl(aq) + CaCO_3(s)$
C) $2Na^+(aq) + 2Cl^-(aq) \rightarrow 2NaCl(aq)$
D) $2Na^+(aq) + CO_3^{2-}(aq) \rightarrow Na_2CO_3(aq)$
E) $Na^+(aq) + Cl^-(aq) \rightarrow NaCl(aq)$

13) The spectator ions in the reaction between aqueous hydrochloric acid and aqueous ammonia are _____.

A) H^+ and NH_3
B) Cl^- only
C) H^+, Cl^-, and NH_4^+
D) H^+, Cl^-, NH_3, and NH_4^+
E) Cl^- and NH_4^+

14) Which of these metals is the least easily oxidized?

Na
Au
Fe
Ca
Ag

A) Au B) Ag C) Ca D) Fe E) Na

15) Based on the equations below, which metal is the most active?

$Pb(NO_3)_2$ (aq) + Ni (s) → $Ni(NO_3)_2$ (aq) + Pb (s)
$Pb(NO_3)_2$ (aq) + Ag (s) → No reaction
$Cu(NO_3)_2$ (aq) + Ni (s) → $Ni(NO_3)_2$ (aq) + Cu (s)

A) Pb B) Ni C) N D) Ag E) Cu

16) How many grams of H_3PO_4 are in 175 mL of a 3.5 M solution of H_3PO_4?

A) 60 B) 4.9 C) 0.61 D) 612 E) 20

17) The molarity (M) of an aqueous solution containing 22.5 g of glucose ($C_6H_{12}O_6$) in 35.5 mL of solution is _____.

A) 3.52 B) 1.85 C) 0.197 D) 0.125 E) 0.634

18) The molarity of an aqueous solution containing 75.3 g of glucose ($C_6H_{12}O_6$) in 35.5 mL of solution is _____.

A) 2.12 B) 0.197 C) 3.52 D) 1.85 E) 11.8

19) The molarity of a solution prepared by diluting 43.72 mL of 1.005 M aqueous $K_2Cr_2O_7$ to 500. mL is _____.

A) 0.870 B) 0.0218 C) 87.9 D) 0.0115 E) 0.0879

20) Oxalic acid is a diprotic acid. Calculate the percent of oxalic acid ($H_2C_2O_4$) in a solid given that a 0.7984 g sample of that solid required 37.98 mL of 0.2283 M NaOH for neutralization.

A) 97.78 B) 48.89 C) 28.59 D) 22.83 E) 1.086

21) The gain of electrons by an element is called _____.

A) disproportionation
B) sublimation
C) oxidation
D) reduction
E) fractionation

22) _____ is the oxidizing agent in the reaction below.

$$Cr_2O_7^{2-} + 6S_2O_3^{2-} + 14H^+ \rightarrow 2Cr^{3+} + 3S_4O_6^{2-} + 7H_2O$$

A) Cr^{3+} B) $S_4O_6^{2-}$ C) $Cr_2O_7^{2-}$ D) H^+ E) $S_2O_3^{2-}$

23) Which substance is serving as the reducing agent in the following reaction?

$$14H^+ + Cr_2O_7^{2-} + 3Ni \rightarrow 3Ni^{2+} + 2Cr^{3+} + 7H_2O$$

A) $Cr_2O_7^{2-}$ B) H_2O C) Ni^{2+} D) H^+ E) Ni

24) What is the oxidation number of potassium in $KMnO_4$?

A) 0 B) +3 C) –1 D) +1 E) +2

25) What is the oxidation number of manganese in MnO_2?

A) +2 B) +1 C) +4 D) +7 E) +3

1. If sugar and potassium chlorate are mixed they react explosively, releasing a spectacular purple flame. The reaction below describes this process:

$$\mathbf{C_{12}H_{22}O_{11}(s) + 8KClO_3(s) \rightarrow 12CO_2(g) + 11H_2O(g) + 8\ KCl(s)}$$

(a) Mr. Gauthier completes this reaction for his class using 15.00g of sugar, $C_{12}H_{22}O_{11}$, and 5.00g of the Potassium chlorate, $KClO_3$. Showing your work below, show which is the limiting reactant. [4 pts]

(b) Given the limiting reactant above in part (a), determine how much of the excess reactant is left at the end of the reaction [2 pts]

(c) How much Carbon Dioxide and Water is formed in this reaction (in grams) [6 pts]

2. **You are being asked by a university chemistry lab to *standardize* a batch of sodium hydroxide, NaOH using a primary standard. The primary standard of choice for this reaction is oxalic acid dihydrate ($H_2C_2O_4 \cdot 2H_2O$). (Titration Question)**

You weigh 0.50g of the oxalic acid dihydrate on a lab scale (Determine the moles of primary standard) [2 pts]

You fill your buret with the NaOH to be standardized. Write the complete balanced equation of the reaction. [1 pt]

You dissolve the primary standard in 50.00ml of distilled water and place that solution into an Erlenmeyer flask. If it takes 25.2ml of NaOH to reach the endpoint of the reaction (using phenolphthalein as an indicator), what is [NaOH] [3 pts]

Using the standardized NaOH from above you are asked to titrate and unknown concentration of $HCl_{(aq)}$
(a) Write the balanced reaction that occurs between NaOH and HCl [2 pts]
(b) If 15.23ml of NaOH are used, what is the concentration of the unknown $HCl_{(aq)}$ [2 pts]

3.Balance the following REDOX equation in basic conditions. [4 pts]

Hydrogen peroxide

$O_2 + Sb \rightarrow H_2O_2 + SbO_2^-$

4. Write the ionic equation and net ionic equation (balanced, with states) for each reaction:

   (a) Silver nitrate is reacted with Sodium chloride [4 pts]

   (ionic) _____

   (net ionic) _____

   (b) Ammonium carbonate is reacted with aluminum nitrate [4 pts]

   (ionic) _____

   (net ionic) _____

5. What is a primary standard and how is it used during a titration? [2 pts]

   _____

   _____

   _____

6. A 3.00 mol/L solution of NaOH is prepared. How many **milliliters** of this solution would be required to completely react with 3.50 mol of hydroiodic acid? [3 pts]

7. How many ml of 10.0M Hydrobromic acid would be required to prepare a 0.50L solution of $HBr_{(aq)}$ 0.120mol/L concentration? [3 pts]

8. The average concentration of sodium ion in seawater is 35mg of sodium ion per kg of seawater. What is the molarity of the sodium ion if the density of the seawater is 1.075 g/ml? [3 pts]

9. **A sample of NaOH is requested to be standardized. If 0.724g oxalic acid dehydrate, $H_2C_2O_4 \cdot 2H_2O$, is a primary standard and is prepared to be aqueous**:

   (a) Write the complete reaction between NaOH and $H_2C_2O_4$ [2 pts]

   _____

   (b) If 21.25ml of NaOH is used to neutralize the $H_2C_2O_4$, what is the molarity of the NaOH? [3 pts]

   (c) If 10.25ml of NaOH (from above) is used to neutralize 25.00ml of HCl of unknown concentration:

   (i) write the complete reaction between NaOH and HCl [2 pt]

   _____

   (ii) Determine the concentration of HCl [3 pt]