

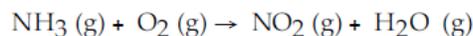
# UNIT 2: TEST

# 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 \_\_\_\_\_.



- 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 ( $\text{CH}_4$ ).

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

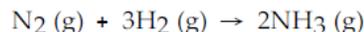
3) A 2.25-g sample of magnesium nitrate,  $\text{Mg}(\text{NO}_3)_2$ , contains \_\_\_\_\_ mol of this compound.

- 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)  $\text{K}_2\text{N}_2\text{O}_3$       B)  $\text{KNO}_2$       C)  $\text{K}_4\text{NO}_5$       D)  $\text{K}_2\text{NO}_3$       E)  $\text{KNO}_3$

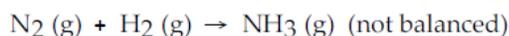
5) Under appropriate conditions, nitrogen and hydrogen undergo a combination reaction to yield ammonia:



A 7.1-g sample of  $\text{N}_2$  requires \_\_\_\_\_ g of  $\text{H}_2$  for complete reaction.

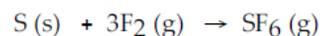
- A) 1.2      B) 1.5      C) 0.76      D) 0.51      E) 17.2

6) What is the maximum mass in grams of  $\text{NH}_3$  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?



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

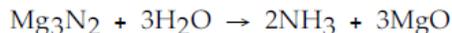
7) Sulfur and fluorine react in a combination reaction to produce sulfur hexafluoride:



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  $\text{SF}_6$ .

- 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?



- 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<sub>2</sub>H<sub>3</sub>O<sub>2</sub>  
NH<sub>3</sub>  
KCl
- A) HCl, KCl  
B) HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>, KCl  
C) HCl, HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>, KCl  
D) HCl, HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>, NH<sub>3</sub>, KCl  
E) HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>, NH<sub>3</sub>

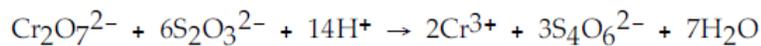
- 11) Which ion(s) is/are spectator ions in the formation of a precipitate of AgCl via combining aqueous solutions of CoCl<sub>2</sub> and AgNO<sub>3</sub>?
- A) Cl<sup>-</sup>  
B) Co<sup>2+</sup> and NO<sub>3</sub><sup>-</sup>  
C) NO<sub>3</sub><sup>-</sup>  
D) NO<sub>3</sub><sup>-</sup> and Cl<sup>-</sup>  
E) Co<sup>2+</sup> and Ag<sup>+</sup>

- 12) The balanced net ionic equation for precipitation of CaCO<sub>3</sub> when aqueous solutions of Na<sub>2</sub>CO<sub>3</sub> and CaCl<sub>2</sub> are mixed is \_\_\_\_\_.
- A) Ca<sup>2+</sup> (aq) + CO<sub>3</sub><sup>2-</sup> (aq) → CaCO<sub>3</sub> (s)  
B) Na<sub>2</sub>CO<sub>3</sub> (aq) + CaCl<sub>2</sub> (aq) → 2NaCl (aq) + CaCO<sub>3</sub> (s)  
C) 2Na<sup>+</sup> (aq) + 2Cl<sup>-</sup> (aq) → 2NaCl (aq)  
D) 2Na<sup>+</sup> (aq) + CO<sub>3</sub><sup>2-</sup> (aq) → Na<sub>2</sub>CO<sub>3</sub> (aq)  
E) Na<sup>+</sup> (aq) + Cl<sup>-</sup> (aq) → NaCl (aq)



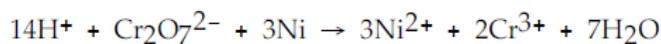
- 21) The gain of electrons by an element is called \_\_\_\_\_.
- A) disproportionation
  - B) sublimation
  - C) oxidation
  - D) reduction
  - E) fractionation

- 22) \_\_\_\_\_ is the oxidizing agent in the reaction below.



- A)  $\text{Cr}^{3+}$       B)  $\text{S}_4\text{O}_6^{2-}$       C)  $\text{Cr}_2\text{O}_7^{2-}$       D)  $\text{H}^+$       E)  $\text{S}_2\text{O}_3^{2-}$

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



- A)  $\text{Cr}_2\text{O}_7^{2-}$       B)  $\text{H}_2\text{O}$       C)  $\text{Ni}^{2+}$       D)  $\text{H}^+$       E)  $\text{Ni}$

- 24) What is the oxidation number of potassium in  $\text{KMnO}_4$ ?

- A) 0      B) +3      C) -1      D) +1      E) +2

- 25) What is the oxidation number of manganese in  $\text{MnO}_2$ ?

- 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:



(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 ( $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ ). (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]

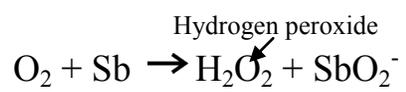
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You dissolve the primary standard in 50.00ml of distilled water and place that solution into an Erlenmeyer flask. If it takes 25.2ml of NaOH to reach the endpoint of the reaction (using phenolphthalein as an indicator), what is [NaOH] [3 pts]

Using the standardized NaOH from above you are asked to titrate and unknown concentration of  $\text{HCl}_{(\text{aq})}$

- (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  $\text{HCl}_{(\text{aq})}$  [2 pts]

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



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  $\text{HBr}_{(\text{aq})}$  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,  $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ , is a primary standard and is prepared to be aqueous:**

(a) Write the complete reaction between NaOH and  $\text{H}_2\text{C}_2\text{O}_4$  [2 pts]

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(b) If 21.25ml of NaOH is used to neutralize the  $\text{H}_2\text{C}_2\text{O}_4$ , 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]

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