CHEMISTRY 111  
HOMEWORK

STOICHIOMETRY & MOLARITY

DUE ____________

1. The equation for the reaction of sodium with water is: \(2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2\). If 7.2 g of Na undergoes reaction with water and the resulting hydrogen is burned in oxygen to produce water, how many grams of water would be produced?  
   (1) 2.8  (2) 1.8  (3) 3.7  (4) 5.6  (5) 7.2

2. Nitrogen reacts with hydrogen to produce ammonia. How many grams of ammonia can be produced by this reaction if 10.0 g of nitrogen undergoes reaction with 10.0 g of hydrogen?  
   (1) 20 g  (2) 10 g  (3) 12.1 g  (4) 56.7 g  (5) need a balanced equation

3. The compound \(X_2\text{O}_3\) is reduced by hydrogen according to the reaction:  
   \(X_2\text{O}_3 + 3\text{H}_2 \rightarrow 2X + 3\text{H}_2\text{O}\).  
   If 9.30 g of \(X_2\text{O}_3\) produce 3.64 g of \(\text{H}_2\text{O}\), what is the element \(X\)?  
   (1) \text{Fe}  (2) \text{Cr}  (3) \text{Co}  (4) \text{Sc}  (5) \text{V}

4. A 15.0 g sample of lithium is reacted with 15.0 g of fluorine to form \(\text{LiF}\): \(2\text{Li} + \text{F}_2 \rightarrow 2\text{LiF}\).  
   After the reaction is complete, what will be present?  
   (1) 2.16 mol \(\text{LiF}\)  (2) 2.16 mol \(\text{LiF}\) & 0.395 mol \(\text{F}_2\)  (3) 0.790 mol \(\text{LiF}\) & 1.37 mol \(\text{Li}\)  
   (4) 0.790 mol \(\text{LiF}\)  (5) none of these is correct

5. What is the minimum grams of air needed for the complete combustion of 5.00 g of ethane \((\text{C}_2\text{H}_6)\)?  
   Air is 21% \(\text{O}_2\) by mass.  
   \(2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 4\text{CO}_2 + 6\text{H}_2\text{O}\)  
   (1) 89  (2) 35  (3) 9.2  (4) 127  (5) 62

6. All of the chloride ion in 1.0 mol of \(\text{MgCl}_2\) is precipitated from aqueous solution as \(\text{AgCl}\). The weight of pure, dry \(\text{AgCl}\) obtained is:  
   (1) 12.6 g  (2) 287 g  (3) 139 g  (4) 54.2 g  (5) 0.77 g

7. How many grams of \(\text{NaCl}\) are required to prepare 485 mL of 0.200 M \(\text{NaCl}\) (MW 58.44 g/mol)?  
   (1) 0.097 g  (2) 97 g  (3) 11.7 g  (4) 0.200 g  (5) 5.67 g

8. What volume of 0.693 M \(\text{HCl}\) contains 0.0525 moles of \(\text{HCl}\)?  
   (1) 103 mL  (2) 75.8 mL  (3) 69.3 mL  (4) 52.5 mL  (5) 43.9 mL

9. If you dissolve 8.96 g of \(\text{H}_2\text{SO}_4\) in enough water to make 396 mL of solution, what is its molarity?  
   (1) 0.231  (2) 0.462  (3) 0.578  (4) 0.641  (5) 0.773

10. If 78.0 mL of a 1.00 M solution of \(\text{KMnO}_4\) is diluted to 400.0 mL, what is the resulting molarity?  
    (1) 0.10  (2) 0.195  (3) 0.390  (4) 0.45  (5) 0.78

11. How many mL of 0.100 M \(\text{NaOH}\) is required to react with 50.0 mL of 0.100 M \(\text{H}_2\text{SO}_4\) according to the reaction shown?  
    \(2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow 2\text{H}_2\text{O} + \text{Na}_2\text{SO}_4\)  
    (1) 50  (2) 100  (3) 150  (4) 200  (5) 300
12. What volume of 0.02496 M KMnO₄ is required to react with 0.1906 g of Fe²⁺ according to the equation:

\[ \text{MnO}_4^- + 5\text{Fe}^{2+} + 8\text{H}^+ \rightarrow \text{Mn}^{2+} + 5\text{Fe}^{3+} + 4\text{H}_2\text{O} \]

(1) 5.47 mL  (2) 12.58 mL  (3) 27.35 mL  (4) 54.92 mL  (5) 136.8 mL

13. A solution is prepared by dissolving 0.5808 g of acetone (MW = 58.08) in enough water to make 100.0 mL of solution. What is the concentration of acetone? (M)

(1) 0.1000 M  (2) 0.00100 M  (3) 0.5808 M  (4) 1.000 M  (5) 0.01000 M

14. Concentrated HCl is a 12.0 M solution of HCl in water. How many milliliters of concentrated HCl must be diluted to 250 mL so that the resulting solution is 0.0500 M in HCl?

(1) 5.00 mL  (2) 12.5 mL  (3) 0.0125 mL  (4) 12.0 mL  (5) 1.04 mL

15. Magnesium reacts with HCl according to the following equation:

\[ \text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2(\text{aq}) + \text{H}_2(\text{g}) \]

How many mL of a 0.200 M HCl solution are necessary to react exactly with 1.215 g of magnesium?

(1) 50.0 mL  (2) 25.0 mL  (3) 500 mL  (4) 250 mL  (5) none of these.

16. Calculate the concentration of a solution made by adding 30 mL of water to 35 mL of a 6.0 M solution (assume that the volumes are additive).

(1) 3.1 M  (2) 3.2 M  (3) 3.3 M  (4) 3.4 M  (5) 3.5 M

17. What is the [Cl⁻] in a 0.100 M solution of calcium chloride?

(1) 0.100 M  (2) 0.200 M  (3) 0.050 M  (4) 0.300 M  (5) this would depend on the volume of solution involved

18. How many moles of SO₄²⁻ ions are in 0.100 L of a 0.20 M solution of Al₂(SO₄)₃?

(1) 0.0020  (2) 0.0040  (3) 0.0060  (4) 0.240  (5) 0.0600

19. To what final volume would 100 mL of 6.0 M NaCl have to be diluted in order to make "physiological saline" (0.54 M NaCl)?

(1) 1.1 L  (2) 910 mL  (3) 90 mL  (4) 540 mL  (5) 1.9 L

20. 2.75 g of a substance was dissolved in water to yield 150 mL of solution. The concentration of that solution was determined to be 0.0800 M. What was the molecular weight of the substance in g/mol?

(1) 275  (2) 27.5  (3) 150  (4) 18.3  (5) 229