Review Chapter 4: Reactions in Aqueous Solutions Name_____
(from text p. 156 # 71, 99, 101, 102, 109, 112, 114, 118, 121, 132)

4.71 How would you prepare 60.0 mL of 0.200 M HNO_3 from a stock solution of 4.00 M HNO_3?

4.99 Classify the following reactions as one of the following: precipitation, acid-base, combination redox, decomposition redox, disproportionation redox, or displacement redox

(a) $Cl_2 + 2\ OH^- \rightarrow Cl^- + ClO^- + H_2O$ _____

(b) $Ca^{2+} + CO_3^{2-} \rightarrow CaCO_3$ _____

(c) $NH_3 + H^+ \rightarrow NH_4^+$ _____

(d) $2\ CCl_4 + CrO_4^{2-} \rightarrow 2\ COCl_2 + CrO_2Cl_2 + 2\ Cl^-$ Is this a redox reaction? _____
(Don't try to more specifically categorize this reaction.)

(e) $Ca + F_2 \rightarrow CaF_2$ _____

(f) $2\ Li + H_2 \rightarrow 2\ LiH$: _____

(g) $Ba(NO_3)_2 + Na_2SO_4 \rightarrow 2\ NaNO_3 + BaSO_4$: _____

(h) $CuO + H_2 \rightarrow Cu + H_2O$: _____

(i) $Zn + 2\ HCl \rightarrow ZnCl_2 + H_2$: _____

(j) $2\ FeCl_2 + Cl_2 \rightarrow 2\ FeCl_3$: _____

4.101 Which of the following aqueous solutions would you expect to be the best conductor of electricity at 25°C? Explain your answer.

a) 0.20 M NaCl

b) 0.60 M CH_3COOH

c) 0.25 M HCl

d) 0.20 *M* $Mg(NO_3)_2$,

4.102 A 5.00×10^2-mL sample of 2.00 *M* HCl solution is treated with 4.47 g of magnesium. Calculate the concentration of the acid solution after all the metal has reacted. Assume that the volume remains unchanged.

Molecular Eq:

4.109 Calculate the mass of the precipitate formed when 2.27 L of 0.0820 *M* $Ba(OH)_2$ are mixed with 3.07 L of 0.0774 *M* Na_2SO_4.

Molecular Eq:

4.112 A 1.00-g sample of a metal X (that is known to form X^{2+} ions) was added to a 0.100 L of 0.500 *M* H_2SO_4. After all the metal had reacted, the remaining acid required 0.0334 L of 0.500 *M* NaOH solution for neutralization. Calculate the molar mass of the metal and identify the element.

Mol Eq for 1st rxn: $X(s) + H_2SO_4(aq) \longrightarrow$

Mol Eq for 2nd rxn: $H_2SO_4(aq) + NaOH(aq) \longrightarrow$

4.114 A 60.0-mL 0.513 *M* glucose ($C_6H_{12}O_6$) solution is mixed with 120.0 mL of 2.33 *M* glucose solution. What is the concentration of the final solution? Assume the volumes are additive.

4.118 Using the apparatus shown at the right, a student found that a sulfuric acid solution caused the lightbulb to glow brightly. However, after the addition of a certain amount of barium hydroxide [$Ba(OH)_2$] solution, the light began to dim even though $Ba(OH)_2$ is also a strong electrolyte. Determine the molecular and net ionic equations for the reaction that occurs and explain why the light bulb dims.

(c)

Molecular Eq:

Net Ionic

4.121 The concentration of lead ions (Pb^{2+}) in a sample of polluted water that also contains NO_3^- ions is determined by adding solid Na_2SO_4 to exactly 500. mL of the water.

(a) Write the molecular and net ionic equations for the reaction.

Mol Eq:

Net Ionic:

(b) Calculate the molar concentration of Pb^{2+} if 0.00450 g of Na_2SO_4 was needed for the complete precipitation of Pb^{2+} as $PbSO_4$.

4.132 A useful application of oxalic acid is the removal of rust (Fe_2O_3) from bathtub rings according to the reaction, $Fe_2O_3(s) + 6H_2C_2O_4(aq) \rightarrow 2Fe(C_2O_4)_3^{3-} + 3H_2O + 6H^+(aq)$

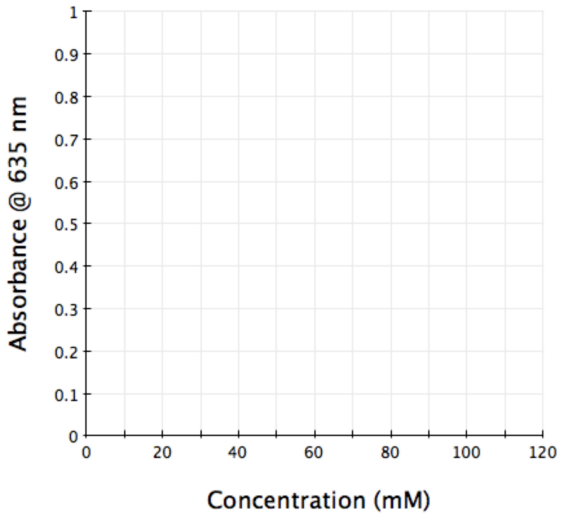
Calculate the number of grams of rust that can be removed by 5.00×10^2 mL of a 0.100 *M* solution of oxalic acid.

A. You perform a Beer's law experiment to determine the concentration of an unknown solution of copper (II) ion in solution. You use a spectrometer and collect absorbance of 4 stock solution at a wavelength of 635 nm. The data is displayed below at the right.

1. **Sketch the data in the graph below the data chart.**

2. **Write a linear equation that relates the concentration of $CuSO_4$ to its absorbance at 635 nm.** ***The value for the slope of the line must have units.***

Concentration of $CuSO_4$, mM	Absorbance
10.0	0.090
25.0	0.240
50.0	0.480
100.0	0.960



3. **You now put a 2.50 g penny into 50.0 mL of HNO_3. After reacting overnight, you dilute the blue Cu^{2+} solution to a volume of 100.0 mL. You test a sample of this solution and find that it has an absorbance of 0.120 at 635 nm.**

   a. **Calculate the concentration of Cu^{2+} in the solution.**

   b. **Calculate the mass (in grams) of copper present in the penny.**

   c. **Calculate the percent of copper present in the penny.**

Answers: 71) 3.00 mL; 102) 1.26 M; 109) 43.4 g $BaSO_4$; 112) MM = 24.0 g/mol; 114) 1.73 M; 121b) 6.345×10^{-5} M; 132) 1.33 g Fe_2O_3; A2) 0.00960 mM^{-1}; A3a) 12.5 mM; A3b) 0.0793 g Cu; A3c) 3.18%