AP Chemistry
Review for quiz
Unit #3

1. How would you prepare the following?

b. 500 mL of 0.025 M $AgNO_3$ from solid $AgNO_3$

$108 + 14 + 48$

$\frac{.025 \text{ moles}}{L} \left| \frac{.5 L}{} \right| \frac{170 g}{1 \text{ mole}} = 2.125 g$

108
14
48
170

Measure out 2.1 g $AgNO_3$
Put into 500 mL vol. flask
Dissolve in water
Dilute to line ; Mix.

c. 1.5 L of 0.25 M $KMnO_4$ from 2.20 M Stock solution.

$M_1V_1 = M_2V_2$

$(2.20M)(V_1) = (0.25M)(1.5L)$

$V_1 = \frac{(0.25M)(1.5L)}{(2.20M)} = 0.17L = 170mL$

Measure 170mL 2.2 M $KMnO_4$ Stock
Put into 1.5L flask.
Dilute to line ; Mix.

2. Write net ionic equations for the reaction, if any, that occurs when aqueous solutions of the following are mixed.

b. Sodium chloride and mercury(I)nitrate

$Hg_2^{+2} + 2Cl^- \rightarrow Hg_2Cl_2(s)$

c. Calcium hydroxide and sodium carbonate

$Ca^{+2} + CO_3^{-2} \rightarrow CaCO_3$

d. Sodium sulfide and iron(III)chloride

$Fe^{+3} + S^{-2} \rightarrow Fe_2S_3$

e. strontium nitrate and potassium phospate.

$3Sr^{+2} + 2PO_4^{-3} \rightarrow Sr_3(PO_4)_2$

3. A solution contains one, two or three of the following ions: Ag^+, Fe^{+3}, and/or Ca^{+2}. Explain how you could separate and identify the unknown containing Ag^+, Fe^{+3}, and/or Ca^{+2}.

Ag^+, Fe^{+3}, Ca^{+2}
| HCl
$AgCl$ ↓ | Fe^{+3}, Ca^{+2}
| $NaOH$
$Fe(OH)_3$ ↓ | $Ca^{+2} \xrightarrow{H_3PO_4} Ca_3(PO_4)_2(s)$

4. What mass of barium sulfate can be produced when 20.00 mL of a 0.100M solution of barium chloride is mixed with 15.00 mL of a 0.300 M solution of iron(III)sulfate? Calculate the concentrations of each ion remaining in solution after precipitation is complete.

$3BaCl_2 + Fe_2(SO_4)_3 \rightarrow 3BaSO_4 + 2FeCl_3$

$BaCl_2 \rightarrow Ba^{+2} + 2Cl^-$
.002 .002 .004

$Fe_2(SO_4)_3 \rightarrow 2Fe^{+3} + 3SO_4^{-2}$
.0045 .009 .0135

$BaCl_2$ Limiting Reagent

$\frac{.1 \text{ mole}}{L} \left| \frac{.02 L}{} \right| \frac{3 \text{ mole } BaSO_4}{3 \text{ mole } BaCl_2} \left| \frac{233 g}{1 \text{ mole}} \right. = 0.466 g$

$Fe_2(SO_4)_3$ $\frac{.3 \text{ mol}}{L} \left| \frac{.015 L}{} \right| \frac{3 \text{ mole } BaSO_4}{1 \text{ mole } Fe_2(SO_4)_3} \left| \frac{233 g}{1 \text{ mole}} \right. = 3.15 g$

	Ba^{+2}	Cl^-	Fe^{+3}	SO_4^{-2}
I	.002	.004	.009	0.0135
C	-.002	0	0	-.002
E	∅	.004	.009	0.0115
[ ]	∅	.114 M	0.257 M	0.329 M

[ ] = Final Conc.
= Total Vol

$[Ba^{+2}] = \frac{.604 \text{ mol}}{.0352} = 0.114 M$

$[Cl^-] = \frac{.009 \text{ mol}}{.0352} = 0.257 M$

Fe^{+3}

SO_4^{-2} $\frac{.0115 \text{ mol}}{.0352} = 0.329 M$

5. Write the net ionic equations for the reactions that occur when the following are mixed.

   b. Sulfuric acid and sodium hydroxide

   $H^+ + OH^- \rightarrow H_2O$

   c. Perchloric acid with magnesium hydroxide.

   $H^+ + Mg(OH)_2 \rightarrow H_2O + Mg^{+2}$

   d. Nitrous (not nitric) acid and barium hydroxide

   $HNO_2 + OH^- \rightarrow H_2O + NO_2^-$

6. A solution is prepared by dissolving 57.0g of NaOH in 250 mL of 1.00 M HCl. Will the final solution be acidic, basic, or neutral? Calculate the concentrations of all the ions present in the solution after the reaction has occurred. Assume no volume change on addition of NaOH.

$NaOH + HCl \rightarrow H_2O + NaCl$

NaOH: $\frac{57g}{40g} \left| \frac{1 mole}{} \right. = 1.425 moles$

HCl: $\frac{1 mole}{L} \left| \frac{.25L}{} \right. = 0.25 moles$

	Na^+	OH^-	H^+	Cl^-
I	1.425	1.425	.25	.25
C	∅	−.25	−.25	∅
E	1.425	1.175	∅	.25
[ ]	~~5.7M~~ 5.7M	4.7M	∅	1M

Total Vol. .25L

7. What volume of 0.500 M calcium hydroxide is required to neutralize 45.00 mL of 0.100 M nitric acid.

$2HNO_3 + Ca(OH)_2 \rightarrow 2H_2O + Ca(NO_3)_2$

$\frac{.1 \text{ Moles } HNO_3}{L} \left| \frac{.045L}{} \right. \left| \frac{1 mol\ Ca(OH)_2}{2 moles\ HNO_3} \right| \frac{1L}{.5 \text{ moles } Ca(OH)_2} = 0.0045L$ " $4.5mL$

$M_1V_1 = M_2V_2$

$(.5)V_1 = (.1)(45)$

$V_1\left(\frac{1}{2}\right) = 4.5$ or 8.

The concentration of a certain sodium hydroxide solution was determined by using the solution to titrate a sample of KHP. KHP is a weak acid with one acidic hydrogen and a molar mass of 204.22 g/mol. In the titration, 24.54 mL of the NaOH solution was required to react with 0.256 g KHP. Calculate the molarity of the sodium hydroxide.

$KHP + NaOH \rightarrow H_2O + NaKP$

$\frac{0.256g\ KHP}{} \left| \frac{1 mole\ KHP}{204.22g} \right. \left| \frac{1 mole\ NaOH}{1 mole\ KHP} \right| \frac{}{.02454L} = 0.05116M$