Aqueous Stoichiometry Questions

1) How would you prepare 500. mL of a 0.025 M solution of potassium permanganate?

$M = \frac{mol}{L}$

$0.025M = \frac{x}{0.500L}$

$0.0125 mole \frac{158.04g}{1 mole} =$

1.98g KMnO4 in a total of 500.mL

2) How would you prepare 1.0 L of 5.0 M HCl from a 12 M stock solution?

$M_1 V_1 = M_2 V_2$

$(12M)(x) = (5.0M)(1.0L)$

$x = 42 ml$

dilute 42ml of 12M HCl to total of 1.0L

3) How many grams of silver chloride can be prepared by the reaction of 100.0 mL of 0.10 M silver nitrate with 100.0 mL of .20 M NaCl? Calculate the concentration of each ion remaining in solution after precipitation is complete.

$AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

100.0ml
0.10M
$mole = (0.10M)(0.1000L)$
0.010mole
limit

100.0ml
0.20M
$mole = (0.20M)(0.1000L)$
0.020mole

$0.010 mol\ AgNO_3 \quad \frac{1 mole\ AgCl}{1 mole\ AgNO_3} \left| \frac{143.32g\ AgCl}{1 mole\ AgCl} \right. =$

1.4g AgCl precipitates

$[Ag^+] = 0M$

$[NO_3^-] = \frac{0.020mole}{0.2000L} = 0.10M$

$[Na^+] = \frac{0.010mole}{0.2000L} = 0.050M$

$[Cl^-] = \frac{0.010mole}{0.2000L} = 0.050M$

$Ag^+ + Cl^- \rightarrow AgCl$

0.010 0.020
-0.010 -0.010
0 0.010

4) Write the balanced, molecular equation for the reaction. A precipitate may not form in all cases. If a precipitate, does form, please write the complete ionic and net ionic equation.

$NaI_{(aq)} + AgNO_{3(aq)} \rightarrow$

$BaCl_{2(aq)} + Na_2SO_{4(aq)} \rightarrow$

$Pb(NO_3)_{2(aq)} + KCl_{(aq)} \rightarrow$

$NaOH_{(aq)} + Fe(NO_3)_{3(aq)} \rightarrow$

$NaOH_{(aq)} + MnSO_{4(aq)} \rightarrow$

5) Balance the following redox reactions in an acidic solution. Identify the substance being oxidized and reduced, as well as the oxidizing and reducing agent.

a) $HCOOH + MnO_4^- \rightarrow CO_2 + Mn^{2+}$

b) $ClO_2^- \rightarrow ClO_2 + Cl^-$

6) A 100.0 mL aliquot on 0.250 M aqueous lead (II) nitrate is mixed with 100.0 mL of 0.200 M aqueous sodium iodide.

A. Write the balanced chemical equation for any reaction that occurs.
B. What precipitate forms?
C. What mass of that precipitate is produced?
D. What is the concentration of the ions that are remaining?

$Pb(NO_3)_{2(aq)} + 2NaI_{(aq)} \rightarrow 2NaNO_{3(aq)} + PbI_{2(s)}$

100.0 mL, 0.250 M — 100.0 mL, 0.200 M

$mole = (0.250\,M)(0.1000\,L) = 0.0250\,mole$ $\quad \frac{0.0250\,mole}{1}$

$mole = (0.200\,M)(0.1000\,L) = 0.0200\,mole$ $\quad \frac{0.0200\,mole}{2}$

limit

$0.0200\,mole\,NaI \quad \frac{1\,mole\,PbI_2}{2\,mole\,NaI} \left| \frac{461.0\,g\,PbI_2}{1\,mole\,PbI_2} \right. = 4.61\,g$

$[Pb^{+2}] = \frac{0.0150\,mole}{0.2000\,L} = 0.0750\,M$

$[NO_3^-] = \frac{0.0250\,mole}{0.2000\,L} = 0.125\,M$

$[Na^+] = \frac{0.0200\,mole}{0.2000\,L} = 0.100\,M$

$[I^-] = 0\,M$

	Pb^{+2}	+	$2I^-$	$\rightarrow$	PbI_2
I	0.0250		0.0200		
C	-0.0100		-0.0200		
E	0.0150		0		