Name ____ Date ______________
Partner's name ____ Period ____________

Lab Activity #4 – A Qualitative Study of Mole Ratios in a Chemical Reaction

Purpose:

1. To confirm that the mole ratio, between the two compounds, $Pb(NO_3)_{2(aq)}$ and $K_2Cr_2O_{7(aq)}$ is one to one (1:1) as indicated by the reaction.
2. Determine the oxidation states of each element in both compounds.
3. To define and become familiar with ALL of the words that appear in italic font.

$$Pb(NO_3)_{2(aq)} + K_2Cr_2O_{7(aq)} \rightarrow PbCr_2O_{7(s)} + 2\ KNO_{3(aq)}$$

Introduction:

This lab will introduce the concept of mole ratios between different substances in a reaction. The mole ratios are indicated by ***coefficients*** in the balanced reaction, some important facts about coefficient are

a) A coefficient *precedes* the formula it defines.
b) Coefficients can be changed to balance the reaction.
c) Coefficients are in the unit of the ***mole*** *(*the universal unit of ratio between different substances in any chemical situation.)
d) If a substance has no coefficient in front of it, the coefficient is assumed to be one.

The reactant compounds will be ***aqueous solutions*** of the same ***concentration***. This means equal volumes of these solutions will have an equal number of moles and therefore equal number of molecules. As you will measure the reactants in drops, the drop ratio is the mole ratio and therefore the coefficient ratio for the reaction. You will mix the reactants in various ratios, the exact ratio will give you the most solid product.

Materials:

a) Aqueous (1 M) solutions of $Pb(NO_3)_{2(aq)}$ and $K_2Cr_2O_{7(aq)}$
b) 2 micropipettes
c) Microchemistry plates with small and large wells.
d) Tooth picks for mixing.

Procedure:

1) Obtain a pipette and fill it with $K_2Cr_2O_{7(aq)}$,. Obtain another pipette and fill it with $Pb(NO_3)_{2(aq)}$.
2) Mix the two reagents by mixing drops according to the table. Be certain to use the line of wells near the edge of the plate such that you can see the results easily. **note – the wells are numbered on the plate and should correspond to the data table.
3) For each well, mix with a toothpick after adding the reagents.
After all wells have been mixed, allow the plate to settle for about two minutes and observe ***relative*** heights of the solid product, $\mathbf{PbCr_2O_{7(s)}}$**.** Indicate which well had the most precipitate. If your results are inconclusive, repeat the procedure.
4) Observe and record the color of the solution that is above the solid precipitate in each well.

Data Table 1: Well Layout

WELL #	1	2	3	4	5	6	7	8	9
Drops of $Pb(NO_3)_{2(aq)}$	1	2	3	4	5	6	7	8	9
Drops of $K_2Cr_2O_{7(aq)}$	9	8	7	6	5	4	3	2	1

Questions For Full/Formal Lab Report:

You must type a full/formal lab report. Include the following questions and their answers , in your report. However, DO NOT list these questions and answers, rather include them in your conclusion section as a paragraph.

a) Did you prove the mole ratios in this reaction ?
b) If 0.50 moles of $\mathbf{PbCr_2O_{7(s)}}$ was used, how many moles of the $\mathbf{K_2Cr_2O_{7(aq)}}$ should have been used.
c) If 2.0 moles of $\mathbf{K_2Cr_2O_{7(aq)}}$ was used, how many moles of each substance are reacting.
d) IMPORTANT – Make a model to simulate the reaction.
   a. Show $\mathbf{K_2Cr_2O_{7(aq)}}$ as an orange circle, and $\mathbf{Pb(NO_3)_{2(aq)}}$ as a clear circle, $\mathbf{PbCr_2O_{7(s)}}$ as a red circle and $\mathbf{KNO_{3(aq)}}$ as a black circle.
   b. Show wells 2, 5 and 8 – be careful!