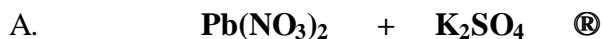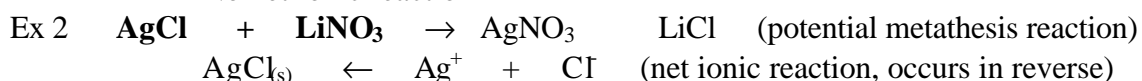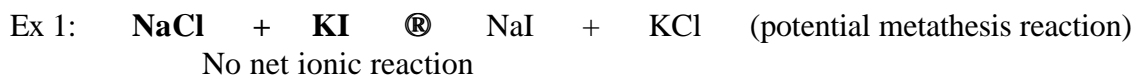| This exam consists of 4 pages. Make sure you have one of each. Print your name at the top of <u>each page</u> now. A fifth page contains a periodic chart. You may tear it off and use it for scratch paper. Show your work on calculations, including unit conversions, and give answers in the correct units and appropriate number of significant figures. **In problems involving molecular and formula weights, you may use values rounded to the nearest 0.1 amu.** If anything confuses you or is not clear, raise your hand and ask!	**Page**	**Points**
	1	_____
	2	_____
	3	_____
	4	_____
	Total	_____

Points

(18)   1.   For the potential reactants in water below:
               (a) Write the **balanced** potential metathesis equation in the **molecular form** showing the
                    correct formula for the potential metathesis products.
               (b) Write a balanced **net ionic equation,** (or indicate **no net ionic equation** if there is
                    none.)
               (c) If there is a net ionic equation, state whether the reaction should occur in the **forward**
                    or **reverse** direction.
               (d) Be sure to indicate precipitates with (s), gases with (g), and weak electrolytes by writing
                    the molecular formula rather than the ions

       Examples:

               Ex 1:   **NaCl   +   KI   ®   NaI   +   KCl**   (potential metathesis reaction)
                             No net ionic reaction
               Ex 2   **AgCl   +   LiNO$_3$ →   AgNO$_3$ LiCl**   (potential metathesis reaction)
                             AgCl$_{(s)}$ ←   Ag$^+$ +   Cl$^-$ (net ionic reaction, occurs in reverse)

       A.   **Pb(NO$_3$)$_2$ +   K$_2$SO$_4$ ®**

       B.   **CaCO$_3$ + NaBr   ®**

       C.   **K$_2$S   +   FeCl$_3$ ®**

(6)   2.   Classify as **strong acid, weak acid, strong base, weak base**, or **salt**:

HCl NH_3 $MgCl_2$

H_2S $HClO_4$ KOH

(6)   3.   **Circle** the following compounds which are **insoluble** in water:

$NaNO_3$ $Ca(C_2H_3O_2)_2$ $PbCl_2$ $BaCO_3$ Na_2SO_4 Al_2S_3

(12)   4.   Oxalic acid ($H_2C_2O_4$) was used as an acid standard to standardize a solution of sodium hydroxide. A sample of 1.55 g of oxalic acid dissolved in water required 45.2 mL of the sodium hydroxide solution to titrate it to the equivalence point.

(a) Write the balanced molecular equation for the reaction.

(b) Write the net ionic equation for the reaction.

(c) Calculate the molarity of the sodium hydroxide solution. (Show your work).
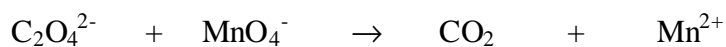
(9)   5.   Give the oxidation number of the indicated element in each of the following compounds or ions:

S in SO_3_____   **Br** in BrO_2^-_____   **Cu** in CuCl____

P in $H_2PO_4^-$_____   **C** in $C_6H_{12}O_6$_____   **Cr** in $K_2Cr_2O_7$____

S in HSO_3^-_____   **C** in CN^-_____   **Fe** in Fe_2O_3_____

(13)   6.   Given the following oxidation-reduction reaction:

$$C_2O_4{}^{2-} \quad + \quad MnO_4{}^- \quad \rightarrow \quad CO_2 \quad + \quad Mn^{2+}$$

(a) Identify: The reagent being oxidized   _____
                The reagent being reduced   _____
                The oxidizing agent   _____
                The reducing agent   _____

(b) Balance the equation **in basic solution**.

(6)   7.   State **Charles's Law** in its mathematical form.

(8)   8.   A gas in a piston occupies a volume of 0.55 L at a temperature of 25 ^{o}C and 755 torr
               pressure. What will be the pressure of the gas if the volume is reduced to 0.11 L and the
               temperature is raised to 125 ^{o}C?

(8)   9.   A tank contains 11.2 g of N_2 at 755 torr pressure. What will the pressure be if you then add 15.0 g of Argon to the tank?

(14)   10.   Oxygen can be prepared by the heating mercuric oxide (HgO) according to the following reaction:

$$2 \, HgO_{(s)} \; \rightarrow \; 2 \, Hg_{(l)} \; + \; O_{2\,(g)}$$
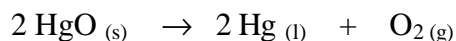
A sample of HgO was decomposed in this fashion, and the oxygen was collected over water by displacing the water from an upended container. The volume of the oxygen collected was 1.75 L at a temperature of 25 ^{o}C. The atmospheric pressure was 748 torr, and the vapor pressure of water at 25 ^{o}C is 23.8 torr. Calculate the **moles** of HgO and the **grams** of HgO in the sample. (Show your work) **R = 0.08206 L-atm-mol^{-1}-K^{-1}.**