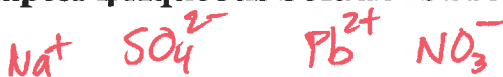


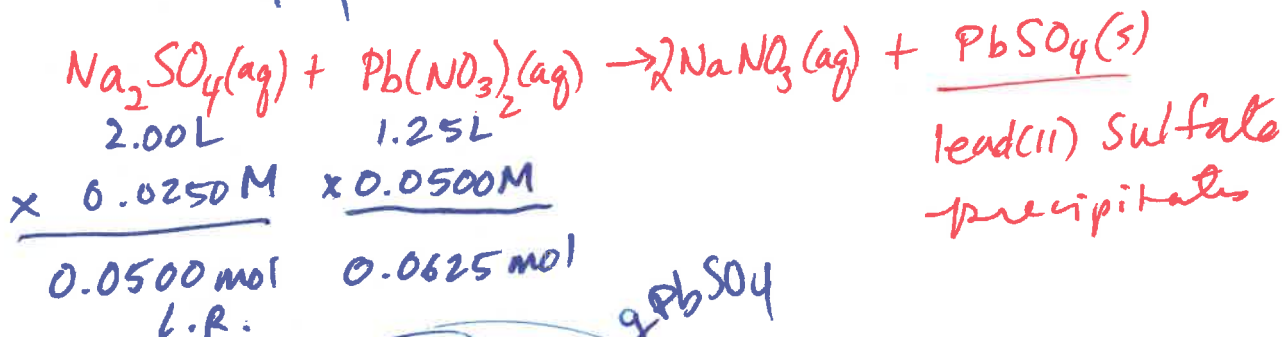
**CHEM 101A – Chapter 4 Aqueous Solutions Problems**



1. Aqueous solutions containing sodium sulfate and lead(II) nitrate are mixed.

a. What species precipitates?

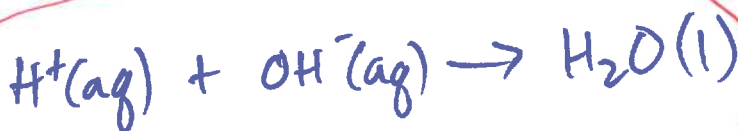
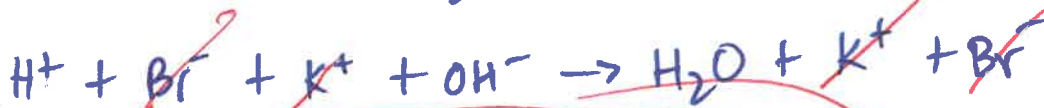
1:1



b. Calculate the mass of precipitate formed when 1.25 L of 0.0500 M  $\text{Pb}(\text{NO}_3)_2$  and 2.00 L of 0.0250 M  $\text{Na}_2\text{SO}_4$  are mixed.

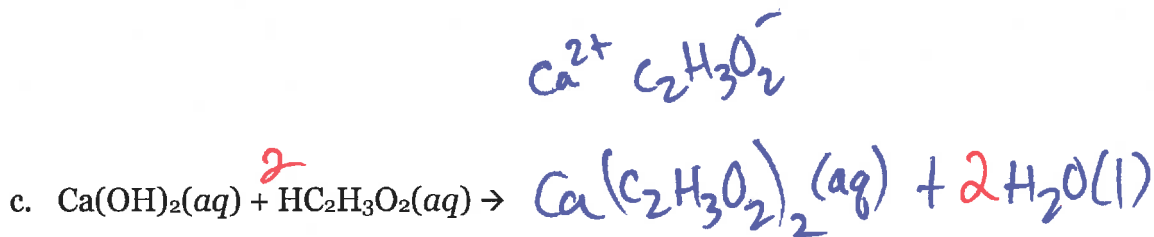
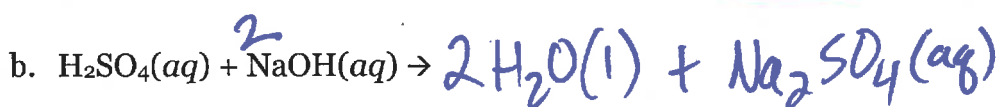
$$\begin{aligned} \text{L.R.} \quad & 0.0500\text{mol} \text{ PbSO}_4 \times \frac{1 \text{ mol PbSO}_4}{1 \text{ mol Na}_2\text{SO}_4} \times \frac{303.27 \text{ g PbSO}_4}{1 \text{ mol PbSO}_4} \\ & = 15.1635 \text{ g PbSO}_4 \\ & \boxed{15.2 \text{ g PbSO}_4} \quad (3) \end{aligned}$$

2. Complete and balance each acid-base reaction below. Write the net ionic equation of equations a and c.



SA/SB

$$\text{Na}^+ \text{SO}_4^{2-}$$

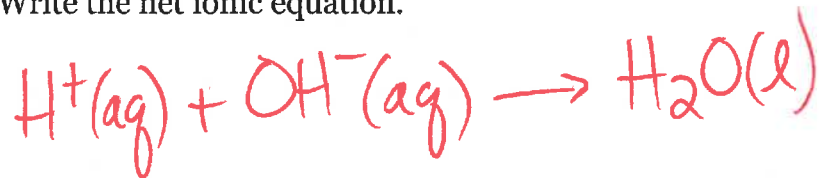
$$\text{Na}^+$$


Spectator

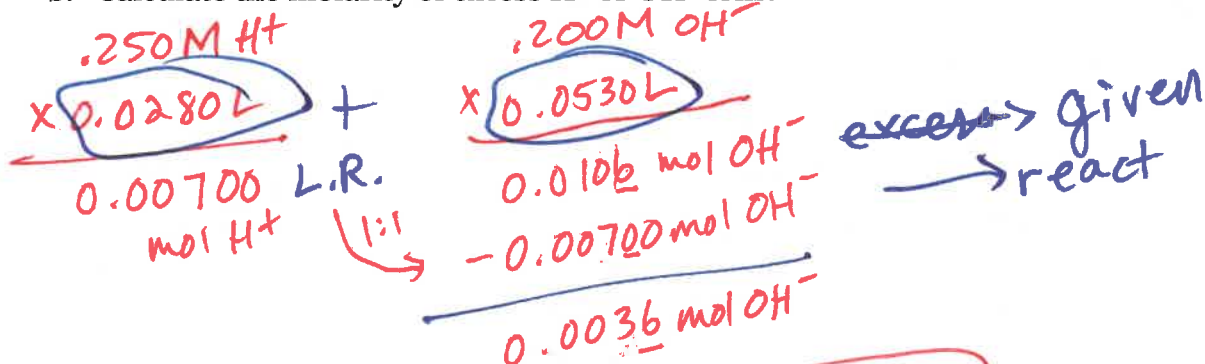


3. You combine 28.0 mL of 0.250M HNO<sub>3</sub> with 53.0 mL of 0.200M KOH.

a. Write the net ionic equation.



b. Calculate the molarity of excess H<sup>+</sup> or OH<sup>-</sup> ions.



$$\frac{0.0036\text{ mol OH}^-}{0.081\text{ L}} = 0.44\text{ M OH}^-$$

$$0.00700\text{ mol H}^+ \times \frac{1\text{ mol OH}^-}{1\text{ mol H}^+} = 0.00700\text{ mol OH}^- \text{ react}$$

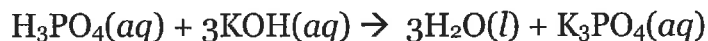
c. Calculate the volume of H<sub>2</sub>O formed (assume H<sub>2</sub>O density = 1.00 g/mL).  
Would the volume change substantially or negligibly?

$$0.00700\text{ mol H}^+ \rightarrow ?\text{ g H}_2\text{O}$$

$$0.00700\text{ mol H}^+ \times \frac{1\text{ mol H}_2\text{O}}{1\text{ mol H}^+} = 0.00700\text{ mol H}_2\text{O} \times \frac{18.016\text{ g}}{1\text{ mol}} = 0.126\text{ g H}_2\text{O}$$

$$81.0\text{ mL} \\ + 0.126\text{ mL}$$

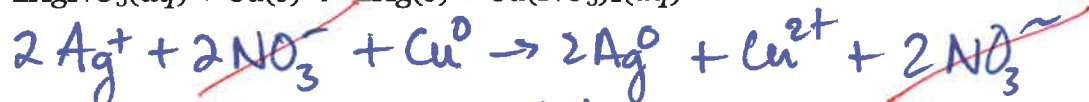
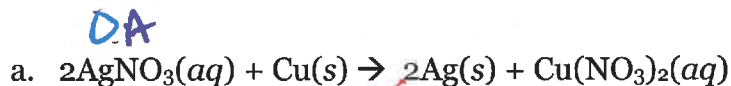
5. Assign oxidation state to all atoms in the equation below. Is the reaction redox?



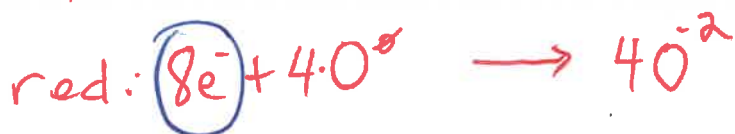
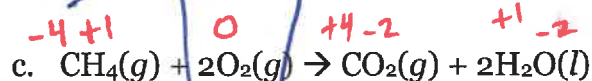
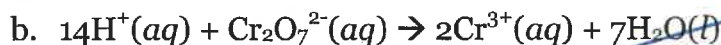
NO

Atom	Ox State Reactant	Ox State Product
H	+1	+1
P	+5	+5
O (in phosphate)	-2	-2
O (in hydroxide/water)	-2	-2
K	+1	+1

6. Determine the oxidizing agent and the number of electrons transferred in each redox reaction below.



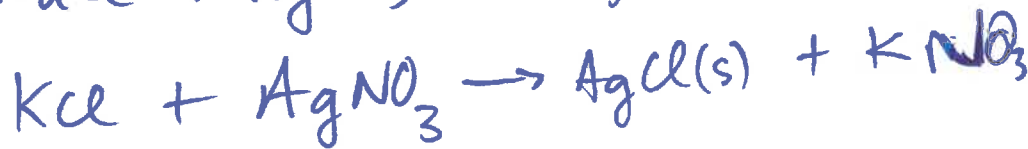
$n = 2e^-$



$n = 8e^-$

4. A mixture contains only sodium chloride and potassium chloride. A 0.1586-g sample of the mixture was dissolved in water. It took 22.90 mL of 0.1000 M AgNO<sub>3</sub> to completely precipitate all the chloride present. What is the composition (by mass percent) of the mixture?

$= .002290$   
mol AgNO<sub>3</sub>



let x = moles NaCl → ? g

let y = moles KCl → ? g

1)  $x + y = .002290$   
 $-58.44x$   
 $-0.1331y$

moles NaCl & KCl

2)  $58.44x + 74.55y = 0.1586$

grams " "

$16.11y = 0.0255$

$y = 1.58 \times 10^{-3}$  mol KCl

↳ 0.1181 g KCl

0.0405 g NaCl

} 0.1586g

74.46% KCl  
25.54% NaCl