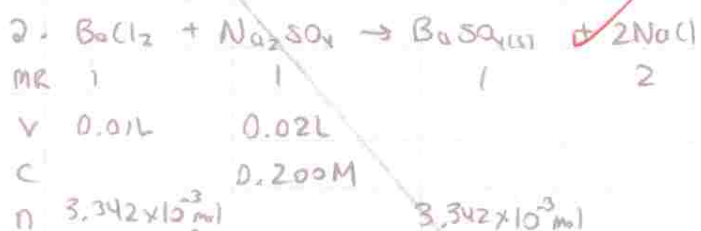
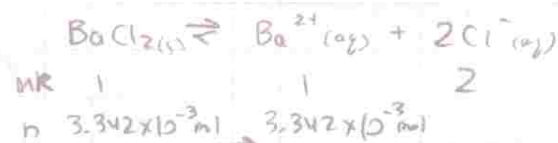


### Pre-lab Questions:

- $24.67 + 9.42 - 0.2 = 3.4 \times 10^{-3}$
- $6340 / 5348 \times 2345 = 2.78 \times 10^3$
- $3.53 \times 10^{-3} \text{ M} \times 96 \text{ mL} = 3.4 \times 10^{-3} \text{ moles}$



$$n_{\text{BaSO}_4} = \frac{m}{\text{MM}} = \frac{0.7800 \text{ g}}{233.4 \text{ g/mol}} = 3.342 \times 10^{-3} \text{ mol}$$



$$C_{\text{Ba}^{2+}} = \frac{n_{\text{Ba}^{2+}}}{V} = \frac{3.342 \times 10^{-3} \text{ mol}}{0.0100 \text{ L}} = 0.3342 \text{ M}$$

\* Sample of  $\text{BaCl}_2$  is 100 fold less

$\therefore C_{\text{Ba}^{2+}} = 0.3342 \text{ M} / 100$

$= 3.34 \times 10^{-3} \text{ M}$

Purpose: To demonstrate the technique of using quantitative gravimetric analysis; To use a solution of  $\text{Na}_2\text{SO}_4$  to find the concentration of  $\text{Pb}^{2+}$  in an unknown sample

Procedure: Please refer to the 2009 Chem 1A03/1E03 lab manual for a detailed procedure.

Changes??

7.8  
10

### Observations: (unknown sample M)

	$\text{Pb}(\text{NO}_3)_2$	$\text{Na}_2\text{SO}_4$	$\text{PbSO}_4$ (s)	$\text{NaNO}_3$
Molecular mass (g/mol)	331.21	142.05	303.27	85.00
mass (g)		0.37	0.4065	
moles (mol)	$1.34 \times 10^{-3}$	$2.6 \times 10^{-3}$	$1.349 \times 10^{-3}$	
concentration (M)	0.1340	0.35		
Hazards	-cumulative poison in body -cause anemia, kidney damage, eyesight damage -corrosive -greater than 0.1 mg/L is harmful	-mildly toxic if ingested -drinking water with > 50 mg/L result in gastro-intestinal irritation	-cumulative poison in body -cause anemia, kidney damage, eyesight damage -corrosive -greater than 0.1 mg/L is harmful	-irritation through ingestion, skin and eye contact -ingestion cause diarrhea, abdominal pain, dizziness, convulsions

### Sample Calculations:

Given volume  $\text{Na}_2\text{SO}_4 = 7.5 \text{ mL}$

concentration  $\text{Na}_2\text{SO}_4 = 0.35 \text{ M}$

$$n_{\text{Na}_2\text{SO}_4} = C \cdot V$$

$$= 0.35 \text{ M} \cdot 0.0075 \text{ L}$$

$$= 2.625 \times 10^{-3} \text{ mol}$$

$$m_{\text{Na}_2\text{SO}_4} = n \times \text{MM}$$

$$= 2.625 \times 10^{-3} \text{ mol} \times 142.05 \text{ g/mol}$$

$$= 0.37 \text{ g}$$

LP 8/10 Late

# Report

mass of filter paper = ~~0.1550g~~ 0.1870g

mass of weighing paper = 1.2405g

mass of filter + weighing paper = 1.8340g  
+ lead sulfate (sample M)

$m_{PbSO_4} = (\text{mass of filter + weighing + solid}) -$   
 $(\text{mass of filter}) - (\text{mass of weighing paper})$   
 $= 1.8340g - 1.2405g - 0.1870g$   
 $= 0.4065g$

$$n_{PbSO_4} = \frac{m}{MM} = \frac{0.4065g}{331.21g/mol} = 1.227 \times 10^{-3} mol$$

$$V_{PbSO_4} = 0.01L$$

$$\rightarrow C_{PbSO_4} = \frac{n}{V} = \frac{1.227 \times 10^{-3} mol}{0.01L} = 0.1227M$$

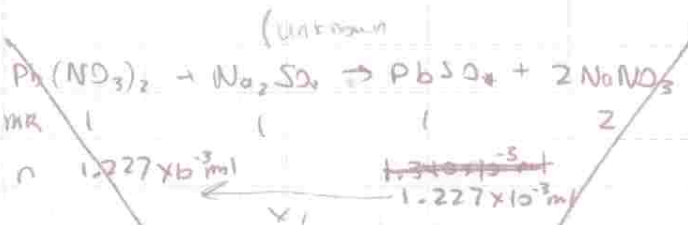
Original Sample (4000 fold less concentrated)

$$C_{PbSO_4} = \frac{0.1227M}{4000} = 3.0675 \times 10^{-5} M$$

10% of  $Pb^{2+}$  is absorbed in blood

$$10\% \text{ of } 3.0675 \times 10^{-5} = 3.0675 \times 10^{-6} M$$

$$3.0675 \times 10^{-6} \frac{mol}{L} \cdot \frac{331.21g/mol}{mol} \cdot \frac{1000mg}{g} = 1.016 mg/L$$



$$C_{Pb(NO_3)_2} = \frac{n}{V} = \frac{1.227 \times 10^{-3} mol}{0.01L} = 0.1227M$$

concentration of original sample:  
(4000 fold less)

$$C_{Pb(NO_3)_2} = \frac{0.1227M}{4000} = 3.0675 \times 10^{-5} M$$

10% of  $Pb^{2+}$  is absorbed by bloodstream

$$\therefore (0.1)(C_{Pb(NO_3)_2})$$
  
$$= 0.1 \times 3.0675 \times 10^{-5} M$$
  
$$= 3.0675 \times 10^{-6} M$$

$$3.0675 \times 10^{-6} M \times \frac{331.21g/mol}{mol} \times \frac{1000mg}{g}$$
  
$$= 1.016 mg/L$$

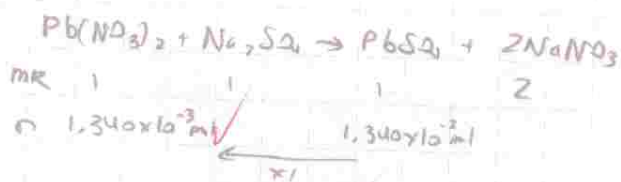
A person drinking this water would absorb:

## References:

Mallinckrodt Baker, Inc. (2009). MSDS:  
Sodium Nitrate. Retrieved September 23,  
2009, from <www.jtbaker.com/msds/  
english.html/54442.htm>

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$$n_{PbSO_4} = \frac{m}{MM} = \frac{0.4065g}{303.266g/mol} = 1.340 \times 10^{-3} mol$$



$$V_{Pb(NO_3)_2} = 0.012 \text{ L}$$

$$C_{Pb(NO_3)_2} = \frac{n}{V} = \frac{1.340 \times 10^{-3} mol}{0.012 L} = 0.1340 M$$

0.135 M

concentration of original sample:

$$C_{Pb(NO_3)_2} = \frac{0.1340 M}{4000} = 3.350 \times 10^{-5} M$$

10% of Pb<sup>2+</sup> is absorbed by blood

$$0.1 \times 3.350 \times 10^{-5} M = 3.350 \times 10^{-6} M$$

$$3.350 \times 10^{-6} M \cdot \frac{303.266 g/mol}{1000 mg/g} = 1.016 mg/L$$

Should be mass of lead not PbSO<sub>4</sub>

A person drinking this water will have the following symptoms:

- developmental toxicity
- decrease in vitamin D metabolism
- decrease in nerve conduction velocity
- decrease in hemoglobin synthesis
- abdominal pain
- increased red blood cell degeneration
- kidney failure
- brain structure breakdown

## Sources of Error:

- The vacuum filtration system was an inaccurate method to collect the precipitate because there were precipitate that stuck to the side of the Buchner funnel and it was hard to scrape them off. Also there were precipitate looking down into the Erlenmeyer flask when filtering with the vacuum, resulting in loss of precipitate mass.

- The balance used to measure the mass of the filter, weighing paper and solid was not very accurate because there was air molecules that weighed down the balance. Also when the filter paper and solid were weighed on the balance, the machine's measured mass kept bouncing up and down.

To improve experiment:

- use more accurate method to ~~precipitate~~ collect the precipitate and use a more air-tight sealed electronic balance to get accurate measurement.

0.4 Sample was wet

Discuss & conclusions  
work your errors into a discussion

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