Chemistry 1516L Week 8

Graduate Teaching Assistant

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Important – Safety

- Goggles must be worn at all times for your own safety
- Repeated failure to wear goggles will result in loss of points (10 each time)
- Lab coats must be worn
- Do not sit on the benchtops – you don’t know what chemicals may have been spilt on them. Compounds like concentrated acids go through jeans (and then you) very quickly
- Be sensible and ask questions if you are not sure about experiments
Analysis of Cations

- Over the next several weeks we will test for the presence of various **cations** using standard chemical reactions
- We will observe, and isolate, solid precipitates and use a centrifuge to aid the separation
- This week we will perform preliminary tests on known materials to see what happens when a particular cation is actually present
- The second part of this week’s experiment is then to use the knowledge from these preliminary tests to detect which cations are present in an unknown sample

Qualitative Analysis of Metal Cations

**Lab Manual Flow Charts – What the symbols mean**

- **horizontal line:** a solid and a liquid are to be separated from each other
- **single vertical line:** the liquid solution in the separation
- **double vertical line:** the solid substance in the separation
- **underlined formulas:** indicate solid substances
- **boxed in:** the confirmation for an ion

The flow charts in the lab manual for Experiments 6, 7, 8, and 9 are guides on how to (sequentially) analyze for each type of cation
Qualitative Analysis of Metal Cations

General Flow Chart (from lab manual):
Flow Chart for analysis of Group 1: Ag⁺, Hg₂²⁺, Pb²⁺
Flow Chart for analysis of Group 2: Pb²⁺, Bi³⁺, Cu²⁺, As³⁺, Sn⁴⁺
Flow Chart for analysis of Group 3: Ni²⁺, Fe²⁺, Mn²⁺, Al³⁺, Cr³⁺, Zn²⁺

Separation of Cations into 5 Groups (we are using the BLUE cations):

Group 1: Ag⁺, Hg₂²⁺, Pb²⁺
Group 2: Pb²⁺, Bi³⁺, Cu²⁺, As³⁺, Sn⁴⁺
Group 3: Ni²⁺, Fe²⁺, Mn²⁺, Al³⁺, Cr³⁺, Zn²⁺
Group 4: Ba²⁺, Sr²⁺, Ca²⁺
Group 5: Mg²⁺, Na⁺, K⁺

Tests for Group 1-3 Cations

Gp 1 Precipitates
AgCl, Hg₂Cl₂, PbCl₂
Groups 2, 3, 4, 5 stay in solution
Add thioacetamide (TAA)
In acidic solution

Gp 2 Precipitates
PbS, CuS, As₂S₃
Groups 3, 4, 5 stay in solution
Add thioacetamide (TAA)
In basic solution

Gp 3 Precipitates
NiS, FeS, MnS
Groups 4, 5 stay in solution

Continued…
This Week – Exp 6 - Preliminary Tests on Knowns

**From the Lab Manual:**

Semimicro Qualitative Analysis: General (Experiment 6)

- 8 Test tubes for 8 different cation tests; cations are from Groups 1-3, available on front bench to confirm results
- Follow directions from lab manual for analysis of cation solutions with HCl (Group 1), acidic thioacetamide (Group 2), and basic thioacetamide (Group 3)
- We do not analyze for Groups 4 and 5
- Complete questions 1-6 on Data Report Sheet for Experiment 6
- Move on to Experiment 7 (Group 1 Unknown)

Experiment 7 : Analysis of Group 1 Cations

Complete all parts of the analysis except Part 10 and record your answers on the Data Report Sheet

Obtain an unknown and record the unknown number (each student gets their own unknown)

Analyze the Unknown solution for Ag⁺, Pb²⁺, Hg₂²⁺ using the procedure in Table 44.1 in the Lab Manual
<table>
<thead>
<tr>
<th>For Next Lab Session:</th>
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<tbody>
<tr>
<td>• Read next experiment – Qualitative Analysis of Group 2 Cations</td>
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<tr>
<td>• Get the updates from the 1516L webpage and read them</td>
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<tr>
<td>• Email me with any concerns.</td>
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