Lab 3 - Analysis of Cations

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1 Pre-Lab

1.1 Purpose

1. Understand solubility and precipitation
2. Understand how these apply to the equilibrium constant, K_sp
3. Use analysis to identify metal cations in an unknown sample based on experimentation.
4. Perform a flame test.

1.2 Definitions

Analysis - An investigation of the characteristics of a substance to discover its identity.

Cation - A positively charged ion.

Reactants - The substances that go into a chemical reaction.

Products - The substances produced at the end of a reaction.

Solvent - A solvent is a substance that dissolves a solute, resulting in a solution.

Solubility - The maximum amount of a substance that will dissolve in a given amount of a solvent at a specified temperature.

Precipitation - Formation of a separable solid substance from a solution, either by converting the substance into an insoluble form or by changing the composition of the solvent to diminish the solubility of the substance in it.

Reagent - A substance or compound added to a system to cause a chemical reaction, or test if one occurs.

1.3 Equations / Keys

1.3.1 Insoluble compounds and their K_{sp} values

K_{sp} (solubility product constant) = The equilibrium constant for a solid substance dissolving in an aqueous solution. It represents the level at which a solute dissolves in solution. The more soluble a substance is, the higher the Ksp value it has.

Formula	***Name***	$K_{sp}(25°C)$
$BaSO_4$	Barium sulfate	$1.08 * 10^{-10}$
$PbSO_4$	Lead sulfate	$2.53 * 10^{-8}$
$CaSO_4$	Calcium sulfate	$4.93 * 10^{-5}$
$Cu(OH)_2$	Copper hydroxide	$4.80 * 10^{-20}$
$Co(OH)_2$	Cobalt hydroxide	$1.00 * 10^{-15}$
$Ni(OH)_2$	Nickel hydroxide	$6.00 * 10^{-16}$
$Ca(OH)_2$	Calcium hydroxide	$6.50 * 10^{-6}$

1.3.2 Possible Sets

Set	***Cations***
1	Pb^{2+}, Ag^{+}
2	$Fe^{3+}, Cu^{2+}, Ni^{2+}, Co^{2+}$
3	Ba^{2+}, Ca^{2+}
4	K^{+}, Li^{+}

2 Flowcharts

Please see the following page for flowchart.

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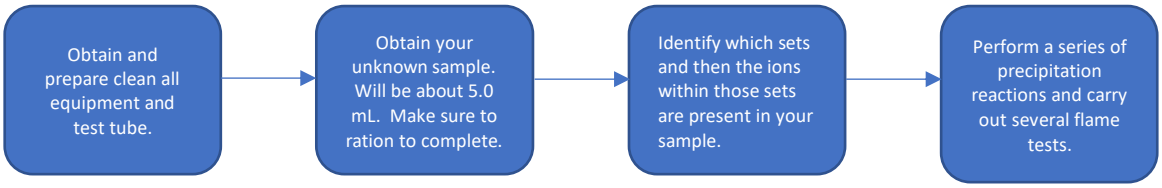
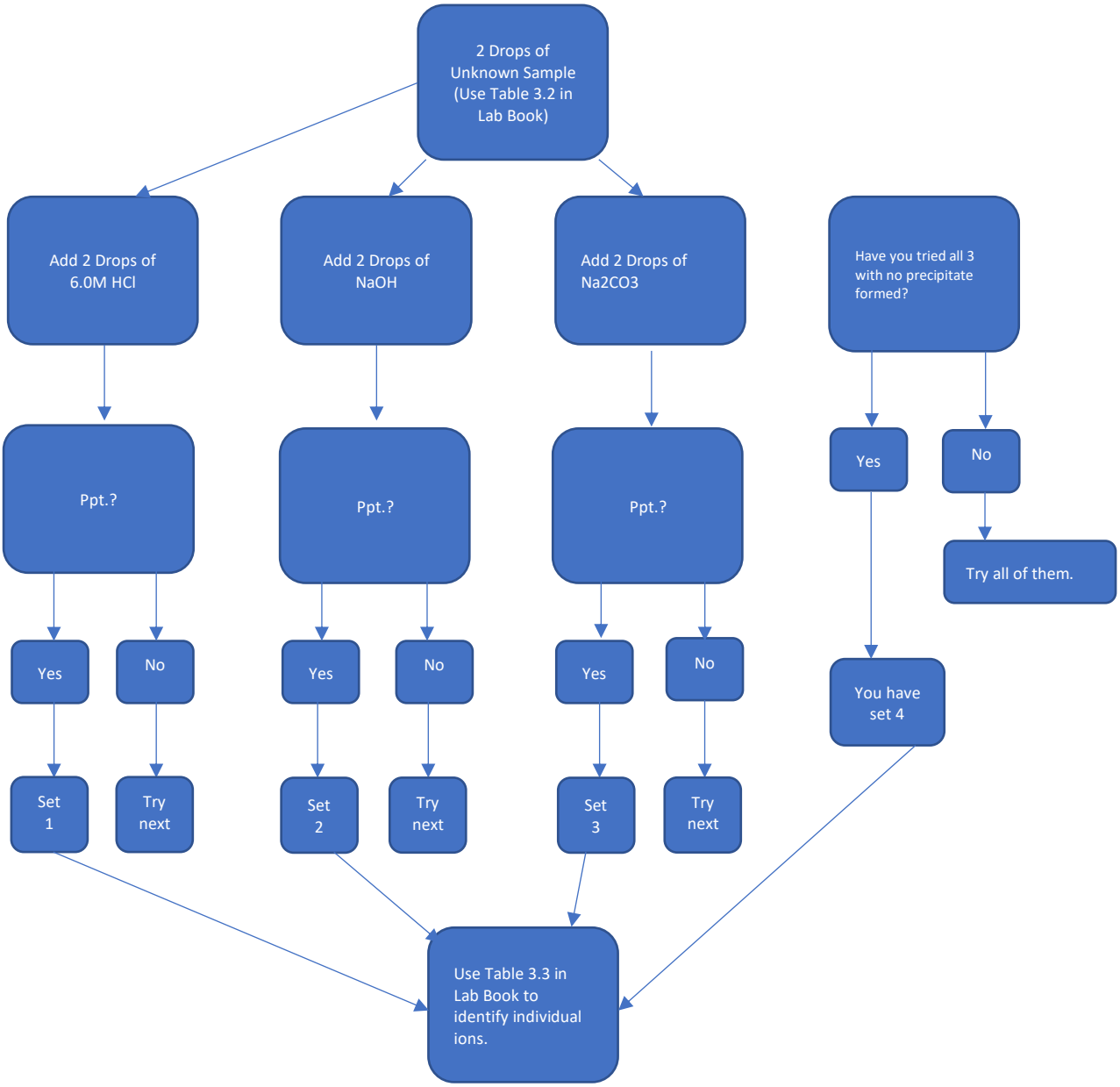
OVERVIEW



PART ONE – IDENTIFY SETS



3 Waste Collection

Waste collection into pre-labeled containers: Ions that have been mixed with a reagent chemical have to be collected separately, in individual containers.

4 Declaration of Academic Integrity

I certify that this is my own work and I understand that if I am found to be in violation of the honor code, I will be subject to the highest penalty.

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5 Calculations