

Identifying unknown through
qualitative analysis

Qualitative Analysis

- Involves the use of experimental procedures to determine which elements or ions are present in a substance.
- Qualitative vs Quantitative
- *Qualitative* is looking at general results without numbers while *quantitative* is analyzing the numbers

- The basic idea:
 - You need to develop a series of procedures to identify the ions present.
- Key things to remember
 - that ions are present in an Aq solution
 - Both anions and cations are present in solution
 - Some anions can form precipitate with *only one of two cations*

Scenario 1

- You have a solution that may contain Ag^+ or Sr^{2+}
- What can you add to identify the cation?

Method:

- Try different combinations of anions to look for a ppt reaction in just one of the two cations
- **These are all the anions that will cause a ppt reaction**

	Cl^-	SO_4^{2-}	S^{2-}	OH^-	PO_4^{3-}
Ag^+	Ppt	Ppt	Ppt	Ppt	Ppt
Sr^{2+}	-	Ppt	-	-	ppt

	Cl ⁻	SO ₄ ²⁻	S ²⁻	OH ⁻	PO ₄ ³⁻
Ag ⁺	Ppt	Ppt	Ppt	Ppt	Ppt
Sr ²⁺	-	Ppt	-	-	ppt

- We can use Cl⁻ and SO₄²⁻
- Use Cl⁻ first and look for a precipitate. If a ppt occurs, then we know that it is with Ag⁺.
- We can further conclude by adding SO₄²⁻ *AFTER* to see if there is a precipitate.
- If there is a ppt reaction, then Sr²⁺ is present, if it is not, then Sr²⁺ is absent.

Scenario 2

- A solution contains one or more of Ag^+ , Ba^{2+} , and Ni^{2+} . What ions could be added and in what order to determine which of these cations are present?
- Setup solubility table

	Cl^-	SO_4^{2-}	S^{2-}	OH^-	PO_4^{3-}
Ag^+	Ppt	Ppt	Ppt	Ppt	Ppt
Ba^{2+}	-	Ppt	-	ppt	ppt
Ni^{2+}	-	-	Ppt	Ppt	ppt

Determining the order

	Cl ⁻	SO ₄ ²⁻	S ²⁻	OH ⁻	PO ₄ ³⁻
Ag ⁺	Ppt	Ppt	Ppt	Ppt	Ppt
Ba ²⁺	-	Ppt	-	ppt	ppt
Ni ²⁺	-	-	Ppt	Ppt	ppt

- We know that Cl⁻ is the only one that will react, so add Cl⁻ first.

Determining the order

	Cl ⁻	SO ₄ ²⁻	S ²⁻	OH ⁻	PO ₄ ³⁻
Ag ⁺	Ppt	Ppt	Ppt	Ppt	Ppt
Ba ²⁺	-	Ppt	-	ppt	ppt
Ni ²⁺	-	-	Ppt	Ppt	ppt

- Add SO₄²⁻ to react with Ba²⁺
- We can test to see if Ni²⁺ is present by reacting the remaining solution with S²⁻