

Name: Key
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Chemistry 12
 Solubility Lesson #5
Separating Mixtures of Ions by Precipitation Methods
QUALITATIVE ANALYSIS

Example 1 : A solution contains one or both of the cations Ag^+ and Sr^{2+} , devise a method which will precipitate out BOTH of the cations.

Answer:

Step 1. Create a table which has the **CATIONS** you think are in the solution as the **ROW HEADERS** and the **ANIONS** you will use to try and precipitate out the cations as the **COLUMN HEADERS**:

	$\text{Cl}^- (*)$	SO_4^{2-}	S^{2-}	OH^-	$\text{PO}_4^{3-} (*)$
Ag^+	PPT	PPT	PPT	PPT	PPT
Sr^{2+}	—	PPT	—	—	PPT

Step 2. Fill the table in using "—" to show a **soluble** compound or "ppt" to show a **precipitate**

Step 3. Based on the above table we can devise a way to separate the cations

a. FIRST precipitate out Ag^+ , by adding:

Either a. Cl^- , Br^- or I^- (Paired with Net)
 b. S^{2-}
 or
 c. OH^-

*****FILITER THE PPT OUT*****

b. SECOND precipitate out Sr^{2+} , by adding:

Either a. SO_4^{2-}
 or
 PO_4^{3-} , CO_3^{2-} , SO_3^{2-}

Example 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?

	$\text{Cl}^- (*)$	SO_4^{2-}	S^{2-}	OH^-	$\text{PO}_4^{3-} (*)$
Ag^+	PPT	PPT	PPT	PPT	PPT
Ba^{2+}	—	PPT	—	PPT	PPT
Ni^{2+}	—	—	PPT	PPT	PPT

a. First precipitate out Ag^+ by adding:

Either: Cl^- , Br^- or I^- (paired with Na^+)
in the form ex NaCl , NaBr or NaI
of

Then \rightarrow **FILTER OFF THE PPT**
b. Second precipitate out Ba^{2+} by adding:

ONLY SO_4^{2-} (paired with Na^+)
in the form ex Na_2SO_4
of

Then \rightarrow **FILTER OFF THE PPT**
c. Third precipitate out Ni^{2+} by adding:

Either: S^{2-} , OH^- or PO_4^{3-} , CO_3^{2-} or SO_3^{2-}
in the form ex Na_2S , NaOH , Na_3PO_4 , Na_2CO_3 or Na_2SO_3
of

You could **re-write** the above answer in the form of an experimental procedure:

Step 1. To 1 mL of a solution that might contain Ag^+ , Ba^{2+} and/or Ni^{2+} , add a few drops of 1 M NaCl .

if a PPT forms then Ag^+ is Present, if not it is absent. Filter PPT before proceeding.

Step 2. To the solution from step 1, add a few drops of 1 M Na_2SO_4

if a PPT forms then Ba^{2+} is Present, if not it is absent. Filter any PPT before proceeding.

Step 3. To the solution from Step 2, add a few drops of 1 M NaOH .

if a PPT forms then Ni^{2+} is present, if not it is absent. filter and discard any PPT.

Seat work/Homework: Exercises: 26 - 39 (odd numbers only) pgs 90-91

PLO's: H4 and H6

(into solution)

* recall the rule of N; to add a desired anion use Na^+
cation use NO_3^- .