

QUALITATIVE ANALYSIS

-an experimental procedure designed to identify the presence of a certain ion

-qualitative means the identity of an ion is found

-quantitative means the amount of an ion is measured

-three methods

1.Colour of aqueous solutions:

<u>Ion</u>	<u>colour</u>
Cu^{2+}	blue
Co^{2+}	pink
Ni^{+}	green
Fe^{2+}	orange
MnO_4^-	purple
CrO_4^{2-}	yellow
$\text{Cr}_2\text{O}_4^{2-}$	orange

2.Flame tests

Metallic ion

Flame colour

Li^+	crimson
Na^+	yellow
K^+	violet
Ca^{2+}	orange
Sr^{2+}	red
Cu^{2+}	green
Sn^{2+}	bluish white

3.Selective Precipitation

- laboratory test solutions containing known ions are used to generate precipitates
- this tests for the presence of certain ions in an unknown solution
- works for colourless solutions
- conclusive

Lab test solution

precipitate ion

HCl	Cl^-
NH_4OH	OH^-
H_2S	S^{2-}
$(\text{NH}_4)_2\text{CO}_3$	CO_3^{2-}

*always use negative (-) ion

Example 1:

A solution contains Ba^{2+} or Ag^+

When HCl is added to the solution, a precipitate forms. What ion is present in this solution?

	Ba^{2+}	Ag^+
Cl^-	S	I

Note: S = soluble I = insoluble

(precipitate)

Answer : Ag^+

Flow Charts

-separation scheme that works well for unknown solutions containing a combination of ions

-must determine the order in which to add the lab test solutions so that only one ion could precipitate in each step

-in the last step a flame test may be used



The beaker may contain aqueous lead (II) ions (Pb^{2+}) and /or aqueous sodium ions (Na^+)

	Pb^{2+}	Na^+
HCl	I	S
NH_4OH	I	S
H_2S	I	S
$(\text{NH}_4)_2\text{CO}_3$	I	S

Remember.... 'I' on your solubility tables means insoluble which means precipitate!!!!

'S' on your solubility tables means soluble which means no precipitate

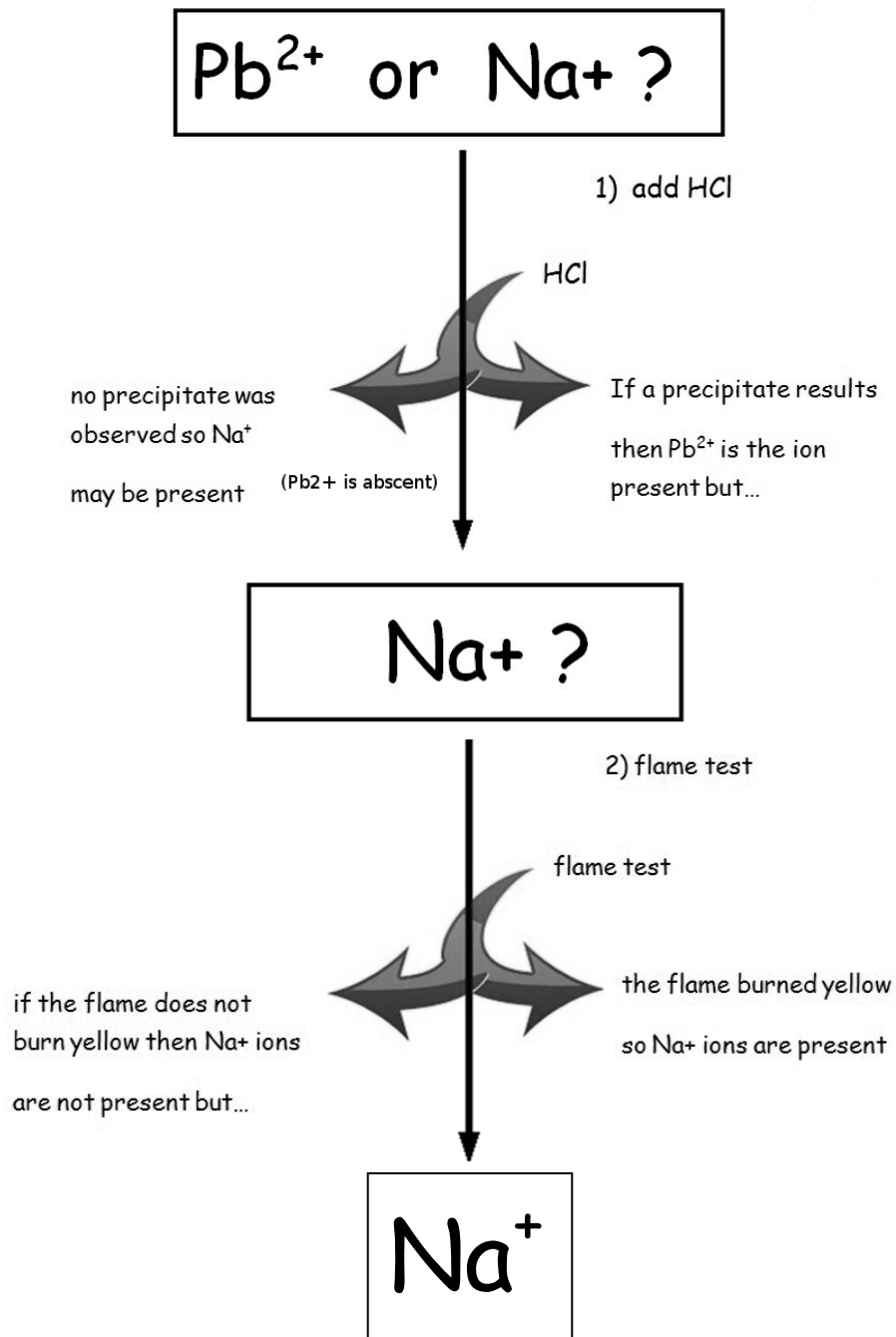
(S) As a subscript in a chemical equation means solid which means precipitate ex.



Example 2:

An unknown solution may contain Pb^{2+} and / or Na^+ .

Use the lab test solutions and design a separation scheme to determine which ions are present.



Example 3: Design a separation scheme to test an unknown solution which may contain any combination of Fe^{2+} , Ag^+ , and Ba^{2+} ions. Use the table below.

	Fe^{2+}	Ag^+	Ba^{2+}
HCl	S	I	S
NH_4OH	I	I	S
H_2S	I	I	I
$(\text{NH}_4)_2\text{CO}_3$	I	I	I

$Fe^{2+}, Ag^+, Ba^{2+}?$

1) add HCl

HCl

no precipitate was
observed so Ag^+
is absent

If a precipitate results
then Ag^+ is the ion
present but...

$Fe^{2+}, Ba^{2+}?$

2) add NH_4OH

NH_4OH

no precipitate was
observed so Fe^{2+}
is absent

If a precipitate results
then Fe^{2+} is the ion
present but...

$Ba^{2+}?$

2) add $(NH_4)_2CO_3$

$(NH_4)_2CO_3$

If no precipitate
is observed then
 Ba^{2+} is absent

If a precipitate results
then Ba^{2+} is the ion
present