

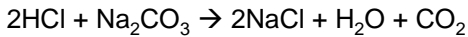
# Qualitative Analysis: Anions & Cations

## Testing for Negative ions (anions)

### Testing for presence of a carbonate

Add any dilute acid and observe effervescence.

Bubble gas through limewater to test for CO<sub>2</sub> – will turn limewater cloudy

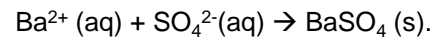


Fizzing due to CO<sub>2</sub> would be observed if a carbonate was present

### Testing for presence of a sulfate

**Acidified** BaCl<sub>2</sub> solution is used as a reagent to test for sulfate ions

If **barium chloride** is added to a solution that contains sulphate ions a **white precipitate** forms



Other anions should give a negative result which is no precipitate forming

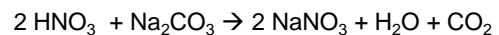
The acid is needed to react with carbonate impurities that are often found in salts which would form a white barium carbonate precipitate and so give a false result

Sulfuric acid cannot be used to acidify the mixture because it contains sulphate ions which would form a precipitate

### Testing for halide ions with silver nitrate.

This reaction is used as a test to identify which halide ion is present. The test solution is made acidic with **nitric acid**, and then **silver nitrate solution** is added dropwise.

The role of nitric acid is to react with any carbonates present to prevent formation of the precipitate Ag<sub>2</sub>CO<sub>3</sub>. This would mask the desired observations

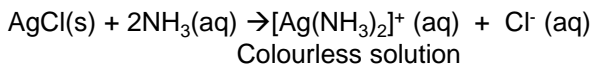


Fluorides produce no precipitate  
Chlorides produce a **white** precipitate  
 $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$   
Bromides produce a **cream** precipitate  
 $\text{Ag}^+(\text{aq}) + \text{Br}^-(\text{aq}) \rightarrow \text{AgBr}(\text{s})$   
Iodides produce a **pale yellow** precipitate  
 $\text{Ag}^+(\text{aq}) + \text{I}^-(\text{aq}) \rightarrow \text{AgI}(\text{s})$

Hydrochloric acid cannot be used to acidify the mixture because it contains chloride ions which would form a precipitate

The silver halide precipitates can be treated with ammonia solution to help differentiate between them if the colours look similar:

**Silver chloride** dissolves in **dilute ammonia** to form a complex ion



**Silver bromide** dissolves in **concentrated ammonia** to form a complex ion



**Silver iodide** does not react with ammonia – it is too insoluble.

The sequence of tests required is carbonate, sulfate then halide. (This will prevent false results of as both BaCO<sub>3</sub> and Ag<sub>2</sub>SO<sub>4</sub> are insoluble.)

