

## Separation and Identification Of Some

### Inorganic Anions



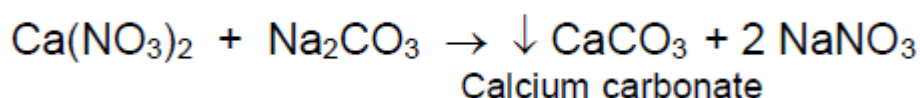
## Theory

### Carbonate ion ( $\text{CO}_3^{2-}$ )

Carbonic acid  $\text{H}_2\text{CO}_3$  is a very weak electrolyte, with two steps dissociation reaction. One proton dissociation of carbonic acid takes place in neutral pH solutions and leads to formation of bicarbonate anion  $\text{HCO}_3^-$ . The presence of this ion in blood is very important and, together with blood-solubilized carbon dioxide, forms a principal blood pH buffering system. Dissociation of second proton needs slightly basic media and leads to formation of carbonate ions  $\text{CO}_3^{2-}$ .

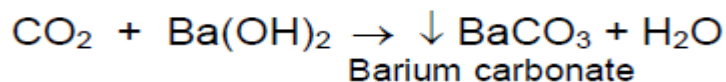
### Detection of $\text{CO}_3^{2-}$

1. Calcium nitrate or barium hydroxide precipitates from carbonic ions solutions a sediment of calcium or barium carbonate:



**Procedure:** Add a few drops of calcium nitrate ( $\text{Ca}(\text{NO}_3)_2$ ) solution to 0.5 – 1.0 ml of carbonate ions solution to obtain a white sediment of calcium carbonate.

2. Strong acids decompose carbonate salts, releasing carbon dioxide gas, which can be detected as gas bubbles on the test tube walls, or in a form of white sediment of barium carbonate, after adding a few drops of baryta water -  $\text{Ba}(\text{OH})_2$ .

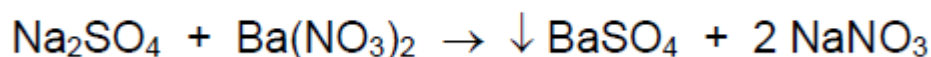


**Procedure:** Add a few drops of 1M H<sub>2</sub>SO<sub>4</sub> (or HCl) solution to the carbonate salt solution (0.5 - 1.0 ml) and seal the test tube using cork stopper with U-shaped glass tubing. Carefully mix the tube content and observe gas bubbles, settling on the tube walls. Quickly immerse free end of the tubing in baryta water and observe formation of barium carbonate white sediment.

### **Sulfate ion (SO<sub>4</sub><sup>2-</sup>)**

#### **Detection of SO<sub>4</sub><sup>2-</sup>**

Barium chloride or barium nitrate precipitates a barium sulfate sediment from sulfate ions solution. Barium sulfate is sparingly soluble in acids and bases.



**Procedure:** Add a few drops of barium nitrate (chloride) to 1 ml of sulfate ions solution and observe formation of abundant white barium sulfate sediment.

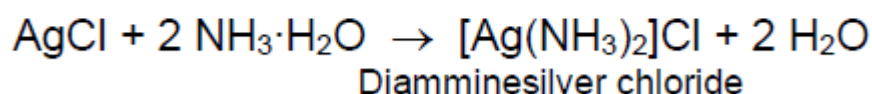
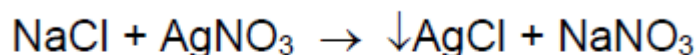
### **Chloride ion (Cl<sup>-</sup>)**

Chloride is very important anion, present in blood serum and in other extracellular media. Chloride ions are very common in nature and are present in tap water.

## **Lab.5 Medical Chemistry Dr.Nada Hasan**

Silver nitrate ( $\text{AgNO}_3$ ) reacts with chloride solution to precipitate white silver chloride. Silver chloride is soluble in excess of  $\text{NH}_3 \cdot \text{H}_2\text{O}$ , in solutions of  $\text{Na}_2\text{S}_2\text{O}_3$ , KCN and concentrated HCl.

### **Detection of Cl**



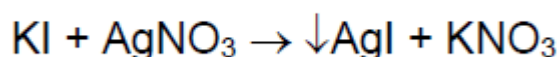
**Procedure:** Add a few drops of silver nitrate solution to a test tube containing 0.5 - 1.0 ml of chloride anions solution. As a result AgCl precipitate is formed. Transfer a portion of the precipitate to another test tube and add drop by drop 2M  $\text{NH}_3 \cdot \text{H}_2\text{O}$  solution, until the precipitate is dissolved. AgCl can be reprecipitated again upon addition of nitric acid.

### **Iodide ion ( I )**

Iodine is another significant microelement of halogenes family. Iodide ions are absorbed by thyroid gland, oxidated to iodine and incorporated into thyroid hormones.

### **Detection of I**

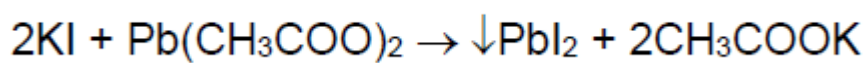
1. Silver nitrate ( $\text{AgNO}_3$ ) reacts with iodide ions to precipitate yellow silver iodide.



**Procedure:** Add a few drops of silver nitrate solution to 1 ml of iodide ions solution and observe formation of a light-yellow precipitate of silver iodide.

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2. Lead acetate reacts with iodide ions and yellow precipitate of lead iodide is formed



**Procedure:** Add a few drops of  $\text{Pb}(\text{CH}_3\text{COO})_2$  solution to 1 ml of potassium iodide solution. A yellow precipitate of lead (II) iodide  $\text{PbI}_2$  is formed.