



## 3055 BA SANGAM COLLEGE

PH: 6674003/9264117 E-mail: basangam@connect.com.fj



### Week 11

School: **Ba Sangam College**

Subject: **Chemistry**

Year: **12**

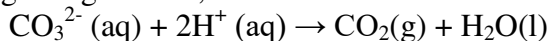
Name: \_\_\_\_\_

<b>Strand</b>	<b>4 Materials</b>
<b>Sub strand</b>	<b>12.4.1 Inorganic Chemistry</b>
<b>Content Learning Outcome</b>	<b>12.4.1.3 Conduct qualitative tests for ionic species.</b>

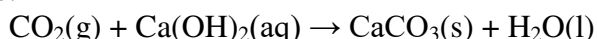
### Precipitation Reactions Continued

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

- Add any dilute strong acid to the substance suspected to be a solid carbonate. If a fizzing, colourless gas is given off, test with limewater.

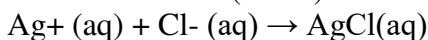


□ If the limewater turns milky and cloudy fine white precipitates are formed, this indicates that the substance is a carbonate.



#### 2. Chloride ions ( $\text{Cl}^-$ )

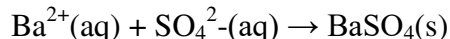
- To a solution of the salt suspected to have chloride ions, add silver nitrate solution.
- A white precipitate will form which will be insoluble in dilute mineral acids and when exposed to sunlight it will turn dark (violet) indicating that the salt is silver chloride.



- Add aqueous ammonia solution to the precipitate to confirm the test.
- The precipitate should dissolve indicating the presence of silver chloride.

#### 3. Sulphate ions ( $\text{SO}_4^{2-}$ )

Add barium chloride to the solution of the suspected salt. A white precipitate will form.

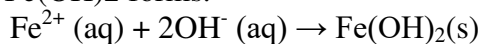


- The precipitate will be insoluble in all acids, no color change will occur when exposed to sunlight and it will not dissolve in aqueous ammonia solution.

### Confirmatory tests for the presence of cations

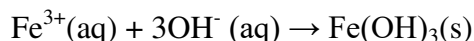
#### 1. Iron(II) ion ( $\text{Fe}^{2+}$ )

- Upon addition of sodium hydroxide solution to the sample suspected to have  $\text{Fe}^{2+}$ , a green precipitate of  $\text{Fe}(\text{OH})_2$  forms.



#### 2. Iron(III) ion ( $\text{Fe}^{3+}$ )

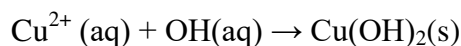
i. Upon addition of sodium hydroxide solution to the sample suspected to have  $\text{Fe}^{3+}$ , an orange precipitate of  $\text{Fe}(\text{OH})_3$  forms.



ii. Another test for  $\text{Fe}^{3+}$  is to add few drops of potassium thiocyanate (KSCN) or ammonium thiocyanate ( $\text{NH}_4\text{SCN}$ ) solution to the sample suspected to have  $\text{Fe}^{3+}$ . Formation of a dark red solution indicates presence of  $\text{Fe}^{3+}$ .

#### 3. Copper ions ( $\text{Cu}^{2+}$ )

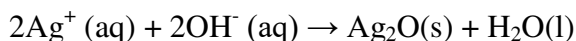
- Upon addition of sodium hydroxide to the sample suspected to have  $\text{Cu}^{2+}$ , a blue precipitate of  $\text{Cu}(\text{OH})_2$  will form.



- When concentrated ammonia solution is added to a new sample, a powdery light blue precipitate of copper(II) hydroxide forms which dissolves to form deep blue solution upon addition of excess ammonia solution.

#### 4. Silver ions ( $\text{Ag}^{+}$ )

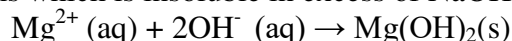
- Upon addition of sodium hydroxide to the sample suspected to have  $\text{Ag}^{+}$ , a brown precipitate of  $\text{Ag}_2\text{O}$  forms.



- When ammonia solution is added to a new sample, a brown precipitate forms which dissolves in excess ammonia solution.

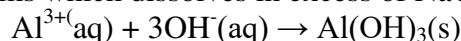
#### 5. Magnesium ions ( $\text{Mg}^{2+}$ )

- Upon addition of sodium hydroxide to the sample suspected to have  $\text{Mg}^{2+}$ , a white precipitate of  $\text{Mg}(\text{OH})_2$  forms which is insoluble in excess of  $\text{NaOH}$ .

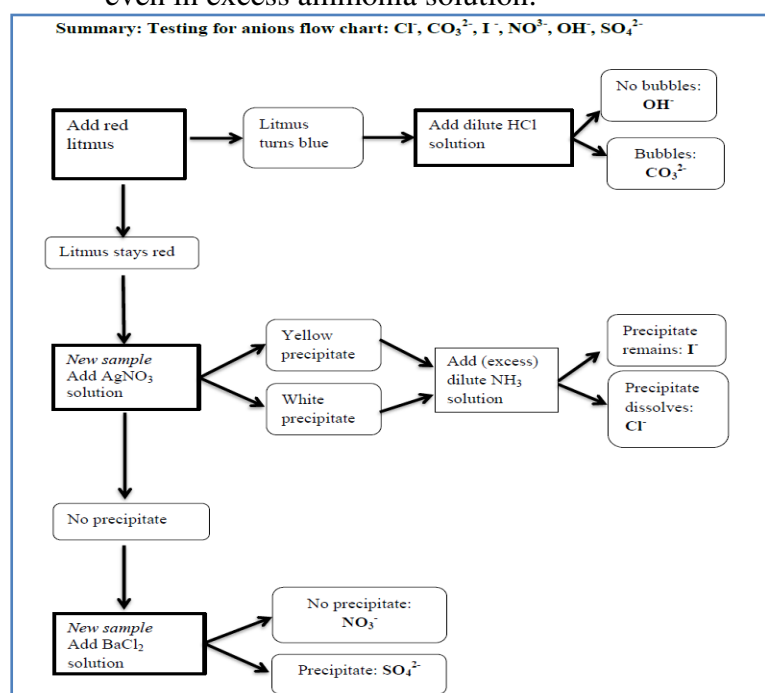


#### 6. Aluminium ions ( $\text{Al}^{3+}$ )

- Upon addition of sodium hydroxide to the sample suspected to have  $\text{Al}^{3+}$ , a white precipitate of  $\text{Al}(\text{OH})_3$  forms which dissolves in excess of  $\text{NaOH}$ .



- When ammonia solution is added to a new sample, a white precipitate forms which does not dissolve even in excess ammonia solution.



### Activity

1. Copy and complete the table below which summarizes the observations of the reactions that would occur upon mixing two pairs of solutions.

Reaction solutions	Sodium carbonate	Sodium chloride	Sodium sulphate
Silver nitrate	(a)	(b)	A white precipitate of silver sulphate
Barium chloride	A white precipitate of barium carbonate	No reaction	(c)
Copper chloride	(d)	(e)	

(5 marks)

4. Describe a simple laboratory test to distinguish between the  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  ions.