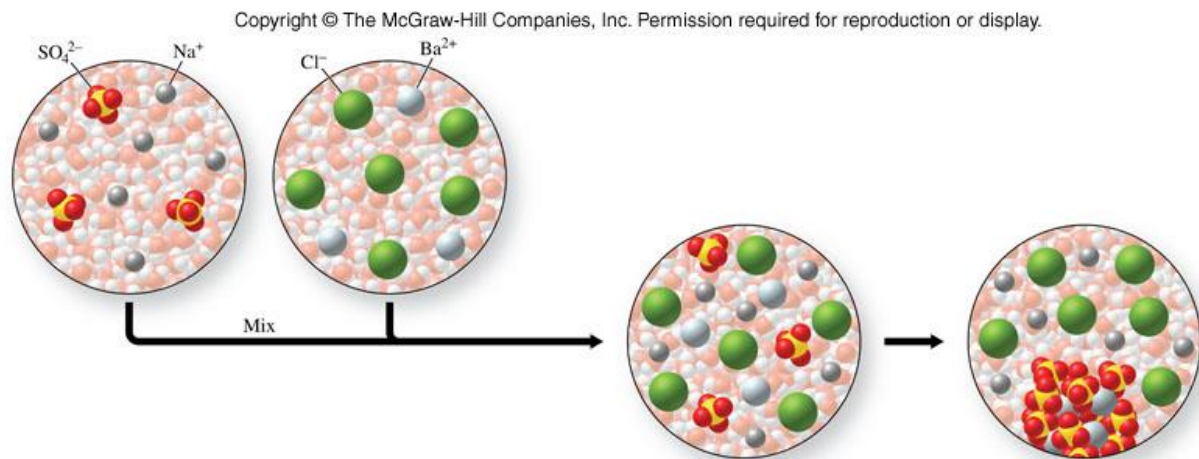
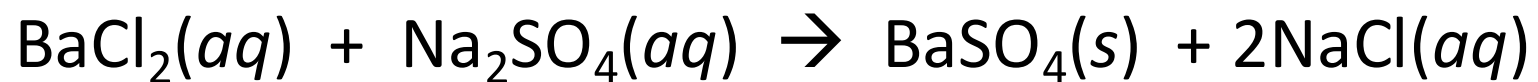


# Experiment #5

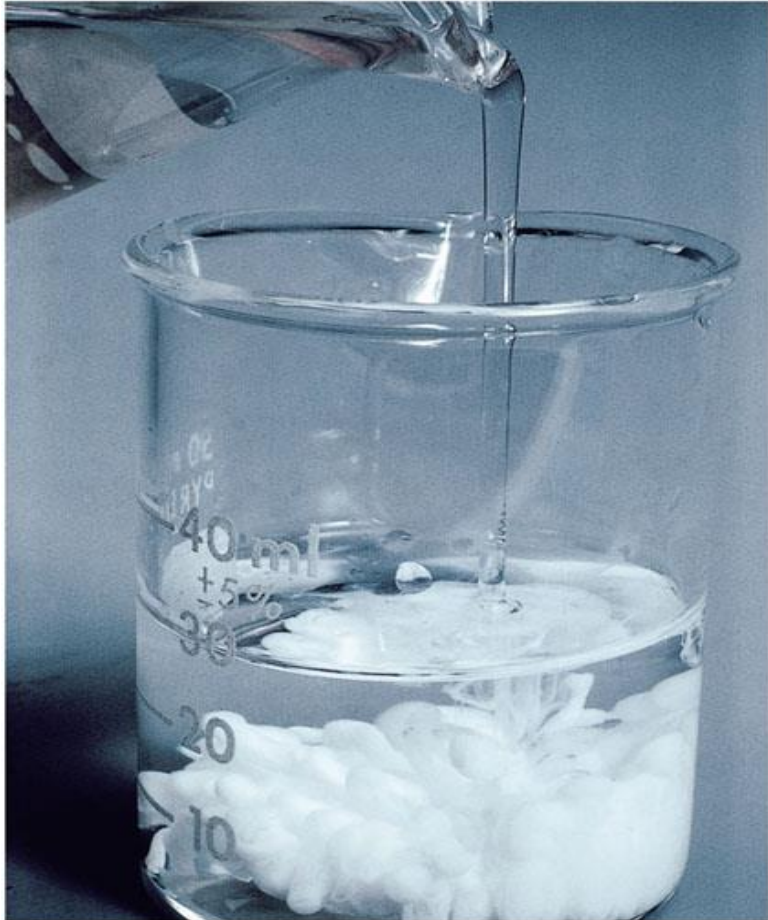
Qualitative Analysis of Cations in Solution

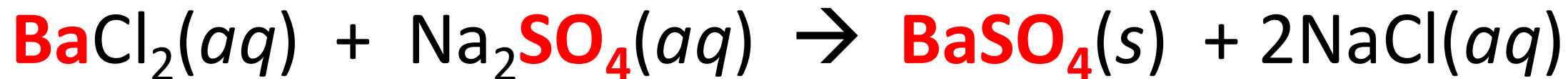
# Precipitation Reaction

In a precipitation reaction, an insoluble solid called a precipitate is formed.



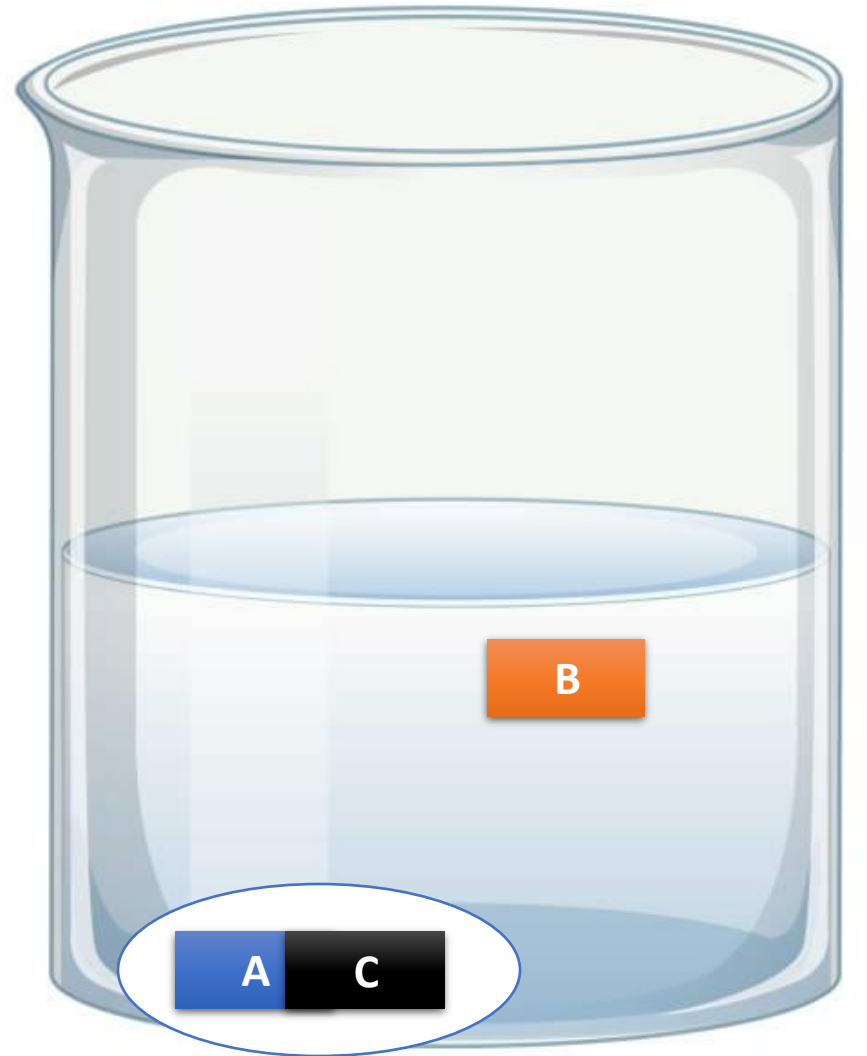
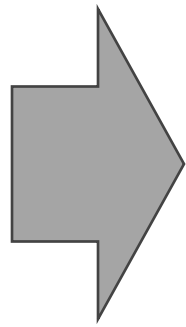
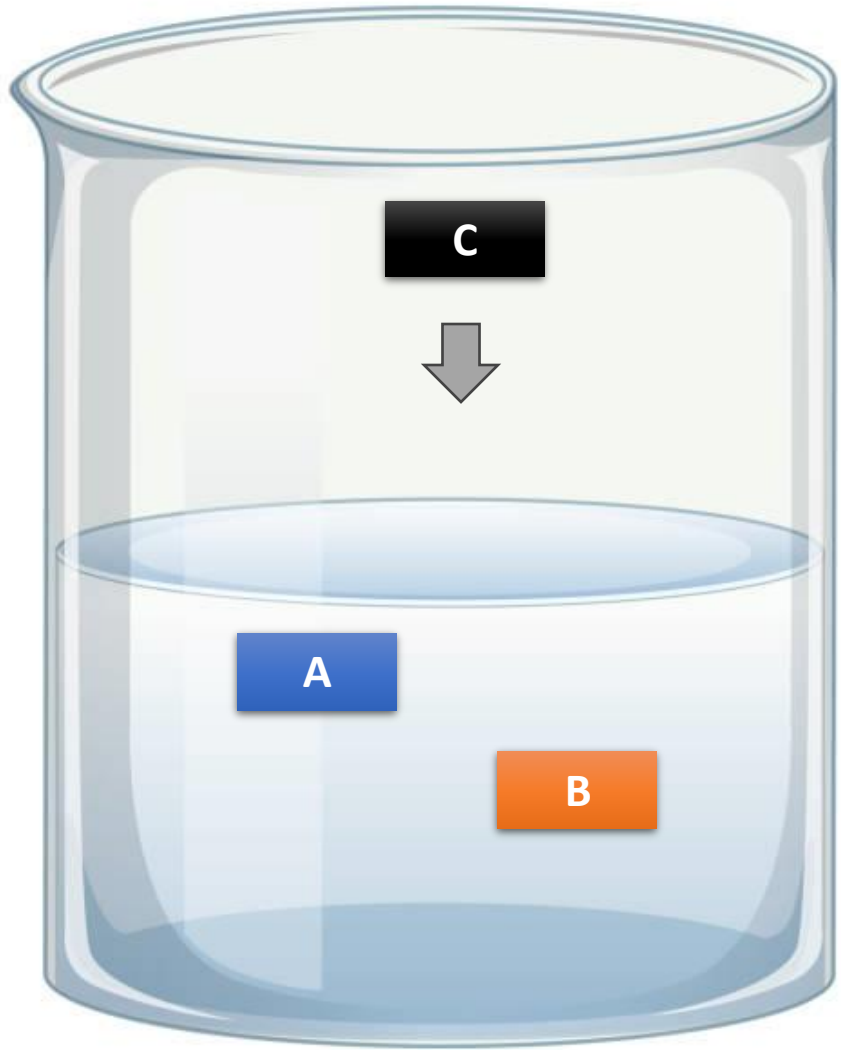
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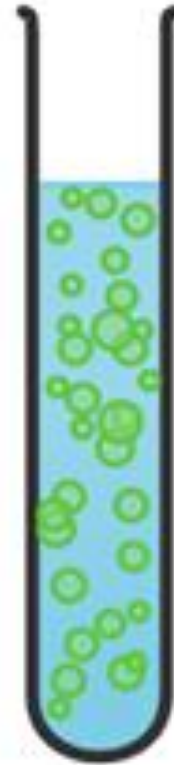
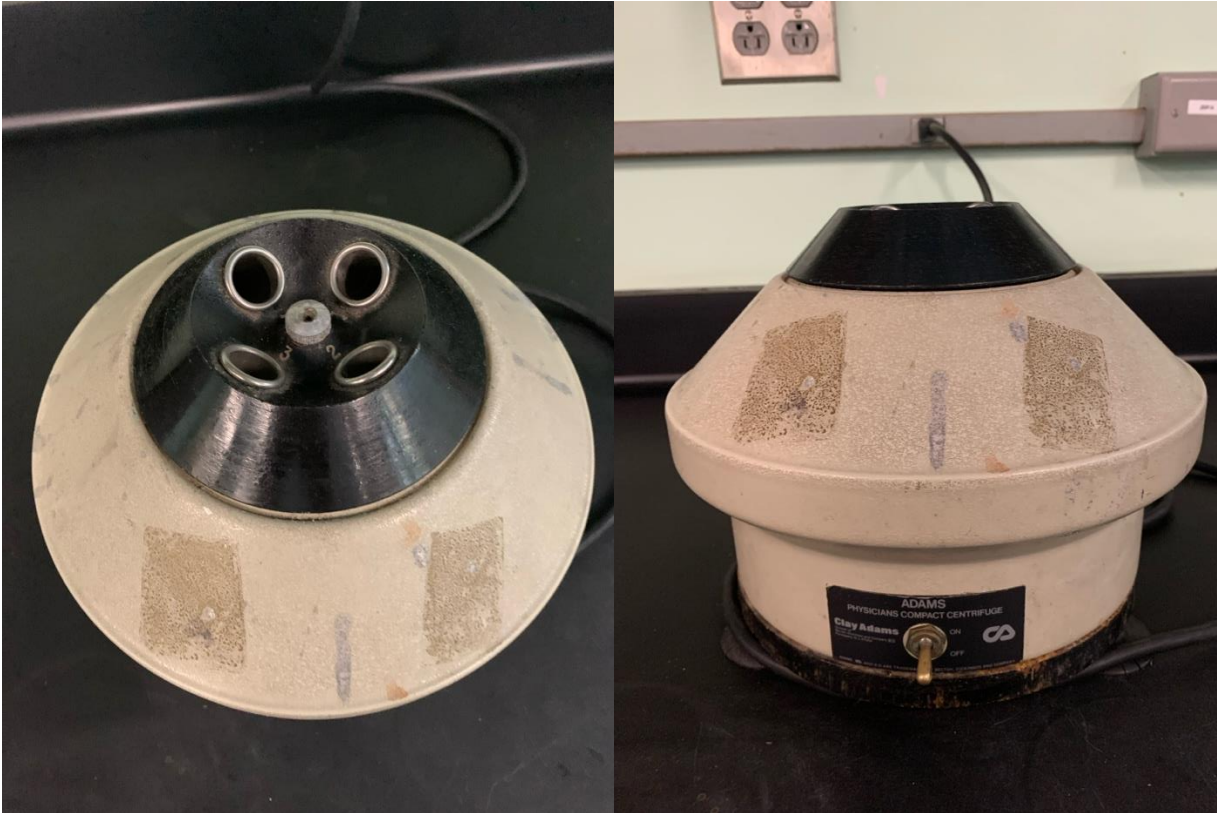
**TABLE 5.4** | Rules Used to Predict the Solubility of Ionic Compounds

Ions	Rule
Na <sup>+</sup> , K <sup>+</sup> , NH <sub>4</sub> <sup>+</sup> (and other alkali metal ions)	Most compounds of alkali metal and ammonium ions are soluble.
NO <sub>3</sub> <sup>-</sup> , CH <sub>3</sub> CO <sub>2</sub> <sup>-</sup>	All nitrates and acetates are soluble.
SO <sub>4</sub> <sup>2-</sup>	Most sulfates are soluble. Exceptions are BaSO <sub>4</sub> , SrSO <sub>4</sub> , PbSO <sub>4</sub> , CaSO <sub>4</sub> , Hg <sub>2</sub> SO <sub>4</sub> , and Ag <sub>2</sub> SO <sub>4</sub> .
Cl <sup>-</sup> , Br <sup>-</sup> , I <sup>-</sup>	Most chlorides, bromides, and iodides are soluble. Exceptions are AgX, Hg <sub>2</sub> X <sub>2</sub> , PbX <sub>2</sub> , and HgI <sub>2</sub> . (X = Cl, Br, or I.)
Ag <sup>+</sup>	Silver compounds, except AgNO <sub>3</sub> and AgClO <sub>4</sub> , are insoluble. AgCH <sub>3</sub> CO <sub>2</sub> is slightly soluble.
O <sup>2-</sup> , OH <sup>-</sup>	Oxides and hydroxides are insoluble. Exceptions are alkali metal hydroxides, Ba(OH) <sub>2</sub> , Sr(OH) <sub>2</sub> , and Ca(OH) <sub>2</sub> (somewhat soluble).
S <sup>2-</sup>	Sulfides are insoluble. Exceptions are compounds of Na <sup>+</sup> , K <sup>+</sup> , NH <sub>4</sub> <sup>+</sup> and the alkaline earth metal ions.
CrO <sub>4</sub> <sup>2-</sup>	Most chromates are insoluble. Exceptions are compounds of Na <sup>+</sup> , K <sup>+</sup> , NH <sub>4</sub> <sup>+</sup> , Mg <sup>2+</sup> , Ca <sup>2+</sup> , Al <sup>3+</sup> , and Ni <sup>2+</sup> .
CO <sub>3</sub> <sup>2-</sup> , PO <sub>4</sub> <sup>3-</sup> , SO <sub>3</sub> <sup>2-</sup> , SiO <sub>3</sub> <sup>2-</sup>	Most carbonates, phosphates, sulfites, and silicates are insoluble. Exceptions are compounds of Na <sup>+</sup> , K <sup>+</sup> , and NH <sub>4</sub> <sup>+</sup> .



Solid

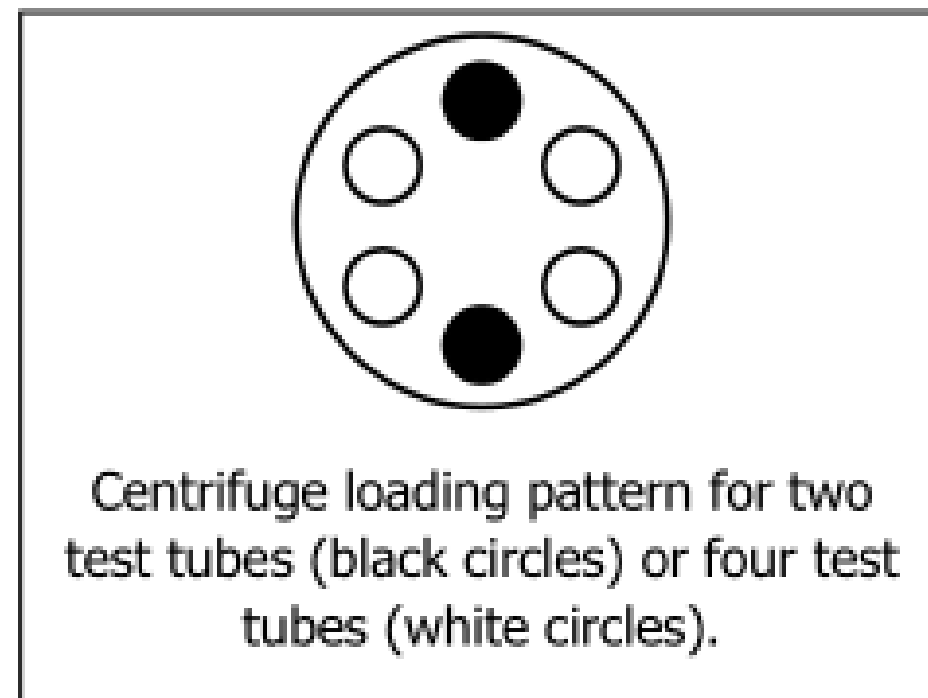
# Centrifuge



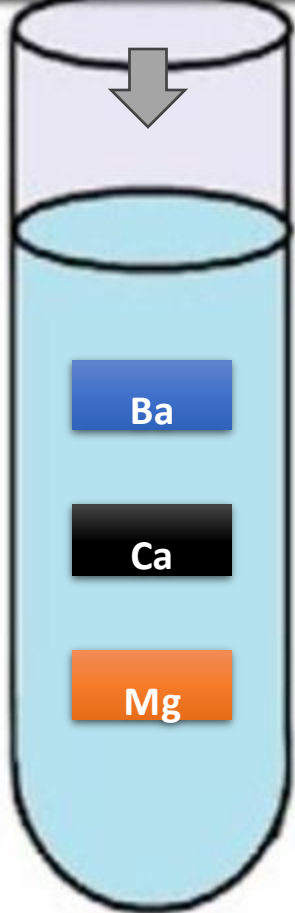
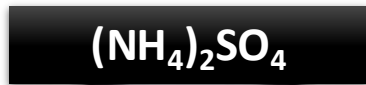
Before



After

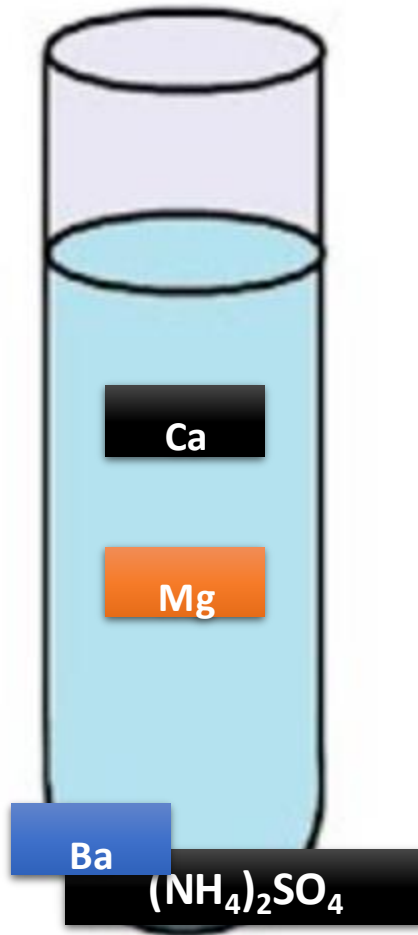
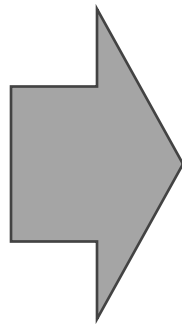


Centrifuge loading pattern for two test tubes (black circles) or four test tubes (white circles).



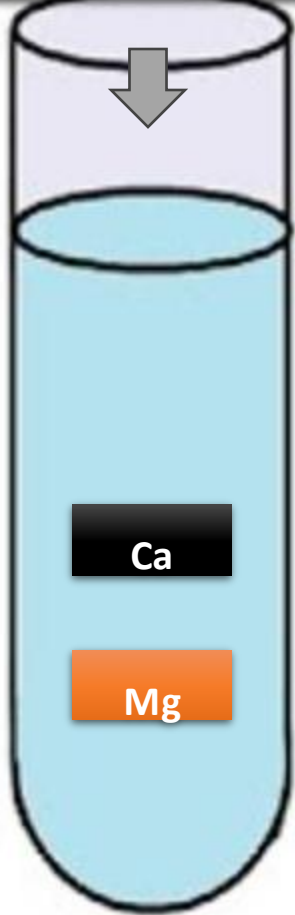
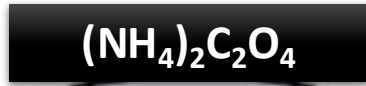
Test Tube #1

- 1) Mix
- 2) Centrifuge



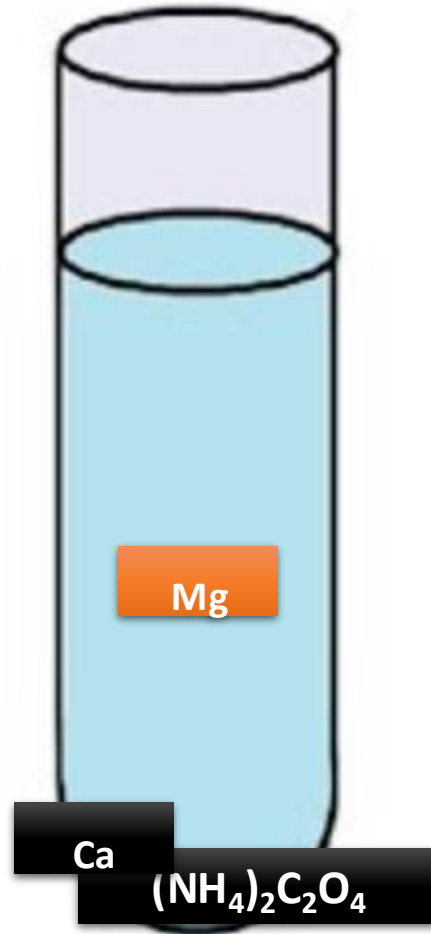
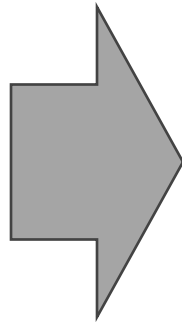
Pour the liquid to test tube #2

- 1) Add **10-15** drops of HCl to solid
- 2) Flame test (yellow green)

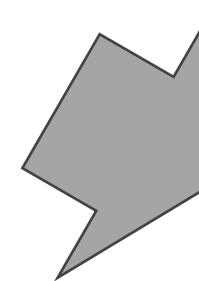
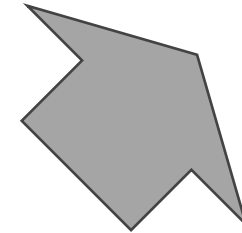


Test Tube #2

- 1) Mix
- 2) Centrifuge



**Pour the  
liquid to  
test tube #3**



- 1) Add 5 drops of HCl to solid
- 2) Flame test (orange red)

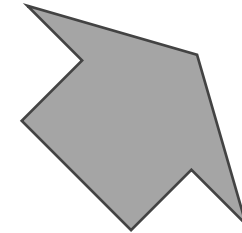
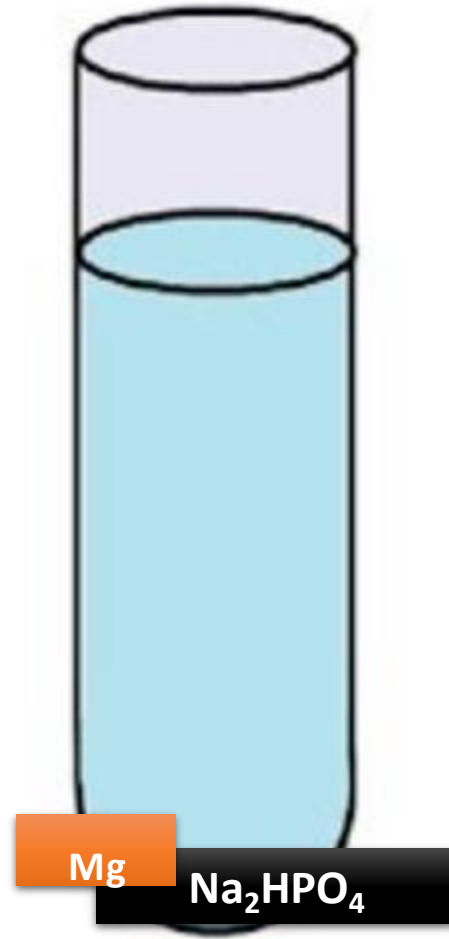
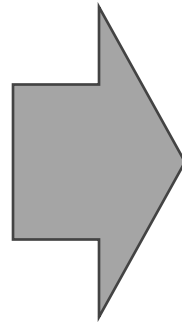


**Na<sub>2</sub>HPO<sub>4</sub>**



**Test Tube #2**

- 1) Mix
- 2) Centrifuge



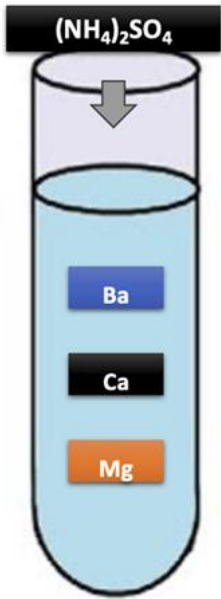
**Waste  
Container  
Beaker**



**Blue lake  
test**

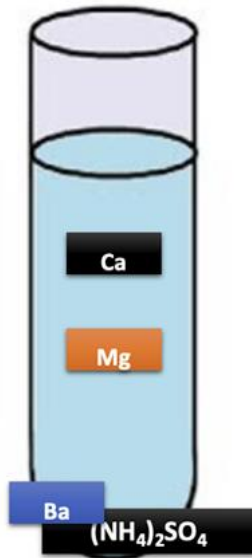
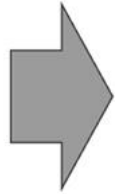
# Blue lake test

- 1) add Mg indicator (**8** drops)
- 2) Add NaOH dropwise until red litmus paper turns blue
- 3) Centrifuge
- 4) Blue gel = Presence of Mg

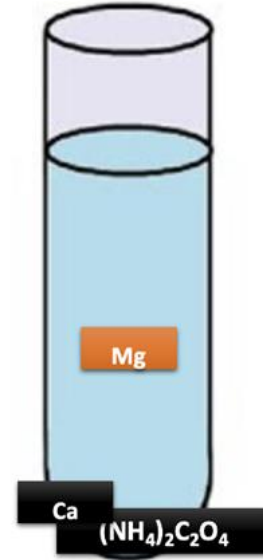


Test Tube #1

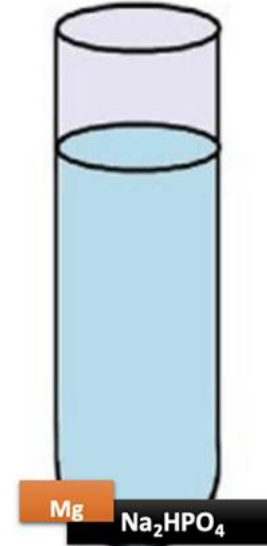
- 1) Mix
- 2) Centrifuge



- 1) Mix
- 2) Centrifuge



- 1) Mix
- 2) Centrifuge



- 1) Add **10-15** drops of HCl to solid
- 2) Flame test (yellow green)

- 1) Add 5 drops of HCl to solid
- 2) Flame test (orange red)

Blue lake test

- 1) add Mg indicator (**8** drops)
- 2) Add NaOH dropwise until red litmus paper turns blue
- 3) Centrifuge
- 4) Blue gel = Presence of Mg