Give the **Net-Ionic Equation** which represents a saturated solution of each of the following ionic substances in water:(*Hint: These are just like dissociation equations but they have a double arrow, indicating equilibrium.*)

- a) Ag2SO4(s)
- b) FeS(s)
- c) Mg(OH)2(s)
- d) Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>(s)
- e) BaSO3(s)
  - a)  $Ag2SO4(s) 2 \neq Ag^{+}(aq) + SO4^{2-}(aq)$
  - b)  $FeS(s) \rightleftharpoons Fe^{2+}(aq) + S^{2-}(aq)$
  - c)  $Mg(OH)2(s) \rightleftharpoons Mg^{2+}(aq) + 2OH^{-}(aq)$
  - d)  $Ca_3(PO_4)_2(s) \neq 3Ca^{2+}(aq) + 2PO_4^{3-}(aq)$
  - e) BaSO3(s)  $\neq$  Ba<sup>2+</sup>(aq) + SO3<sup>2-</sup>(aq)

## **Separating Mixtures of Ions by Precipitation**

• it is apparent from the Solubility Table that a cation may form a compound that is of low solubility (a precipitate) with one anion but be soluble with another

NEGATIVE IONS (Anions)	POSITIVE IONS (Cations)	SOLUBILITY OF COMPOUNDS	
Hydroxide, OH	Alkali ions, H <sup>+</sup> , NH <sub>4</sub> <sup>+</sup> , Sr <sup>2+</sup> Soluble		
	All others	LOW SOLUBILITY	

NEGATIVE IONS (Anions)	POSITIVE IONS (Cations)	SOLUBILITY OF COMPOUNDS	
Sulphate, SO <sub>4</sub> <sup>2-</sup>	All others	Soluble	
	Ag <sup>+</sup> , Ca <sup>2+</sup> , Sr <sup>2+</sup> , Ba <sup>2+</sup> , Pb <sup>2+</sup>	LOW SOLUBILITY	

- for example,  $Sr^{2+}$  will form a soluble compound with  $OH^{-}$  but a precipitate with  $SO_4^{2-}$
- Mg<sup>2+</sup> and Fe<sup>3+</sup> precipitate OH<sup>-</sup> but not SO<sub>4</sub><sup>2-</sup>
- the ability of cations to only precipitate with certain anions allows for SELECTIVE PRECIPITATION of those ions from a solution containing several different anions
- this is the basis of QUALITATIVE ANALYSIS which allows us to design a set of experiments to detect the presence of certain ions

Q. A solution contains either Ag<sup>+</sup> or Sr<sup>2+</sup> ions. Devise a method of determining which ion is present in the solution.

Q. A solution contains one or more of Ag<sup>+</sup>, Ni<sup>2+</sup> or Ba<sup>2+</sup> ions. Devise a method of separating each ion from the solution.

	a-	5042-	S2-	OH-	PO43-
AQ+	ppt	PPT	pp+	PP+	PP+
N12+	_	_	ppt	PP+	ppt
B02+	_	ppt		pp+	PP+

3. A solution is known to contain either Ba<sup>2+</sup> or Mg<sup>2+</sup> ions. Suggest a method by which these solutions could be analyzed to find out which ion is present. Be specific about any compounds that are added.

any compounds that are added.

802+ - PP+ PP+ PP+

MQ2+ - PP+ PP+ PP+

Add Na<sub>2</sub>SO<sub>4</sub>

- if ppt, contains Ba<sup>2+</sup>
- no ppt, contains Mg<sup>2+</sup>