

Aqueous Solubility Rules for Ionic Compounds



1. Soluble compounds:
 - a. All compounds of the Group 1A ions.
 - b. All ammonium ion compounds.
 - c. All compounds that contain nitrate, perchlorate, chlorate, or acetate ion.
 - d. All compounds that contain chloride, bromide, or iodide ion except
 - i. lead(II) ion, Pb^{2+}
 - ii. mercury(I) ion, Hg_2^{2+}
 - iii. silver ion, Ag^+
 - e. All compounds that contain sulfate ion except
 - i. barium ion, Ba^{2+}
 - ii. ¹calcium ion, Ca^{2+}
 - iii. lead(II) ion, Pb^{2+}
 - iv. mercury(I) ion, Hg_2^{2+}
 - v. silver ion, Ag^+
 - vi. strontium ion, Sr^{2+}

2. Insoluble compounds:
 - a. All compounds of most other negative ions including
 - i. carbonate ion, CO_3^{2-}
 - ii. hydroxide ion, OH^-
 - iii. oxalate ion, $\text{C}_2\text{O}_4^{2-}$
 - iv. oxide ion, O^{2-}
 - v. phosphate ion, PO_4^{3-}
 - vi. sulfide ion, S^{2-}
 - vii. sulfite ion, SO_3^{2-}

¹Calcium sulfate is actually slightly soluble but we will consider it to be insoluble

Note that we are making some very broad generalities for solubility and we've broken the concept into two categories- soluble and insoluble. Some texts also make another category for compounds that are slightly soluble. A common rule-of-thumb is if an aqueous 0.1 mol/L solution can be made of the substance, it's considered to be soluble