

**Water Solubility Rules** (ref. Table 4.1, p. 144, *Chemistry, seventh edition, Zumdahl & Zumdahl*)

*Note that there may be a number of exceptions to these rules, and/or there are more subtle classifications ("partially soluble", "somewhat soluble", "marginally soluble", etc.), but these are the rules that we will use in CHM 101 & 114.*

1. nitrate ( $\text{NO}_3^-$ ) salts are water soluble (*Required memorization*)
2. soluble cation salts:
  - a. alkali metal cation ( $\text{Li}^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ...) salts are water soluble (*Required memorization*)
  - b. ammonium ( $\text{NH}_4^+$ ) salts are water soluble (*Required memorization*)
3. Most chloride, bromide, and iodide salts are soluble. EXCEPTIONS (for CHM 114 & 101): chloride, bromide, and iodide salts containing  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ , and  $\text{Hg}_2^{2+}$  are INSOLUBLE.
4. Most sulfate salts are soluble. EXCEPTIONS (for CHM 114 & 101):  $\text{BaSO}_4$ ,  $\text{PbSO}_4$ ,  $\text{Hg}_2\text{SO}_4$ , and  $\text{CaSO}_4$ , are INSOLUBLE.
5. Most hydroxide salts are insoluble, unless rule #2 applies to the compound.
6. Most sulfide ( $\text{S}^{2-}$ ), carbonate ( $\text{CO}_3^{2-}$ ), chromate ( $\text{CrO}_4^{2-}$ ), and phosphate ( $\text{PO}_4^{3-}$ ) salts are insoluble, unless rule #2 applies to the compound.