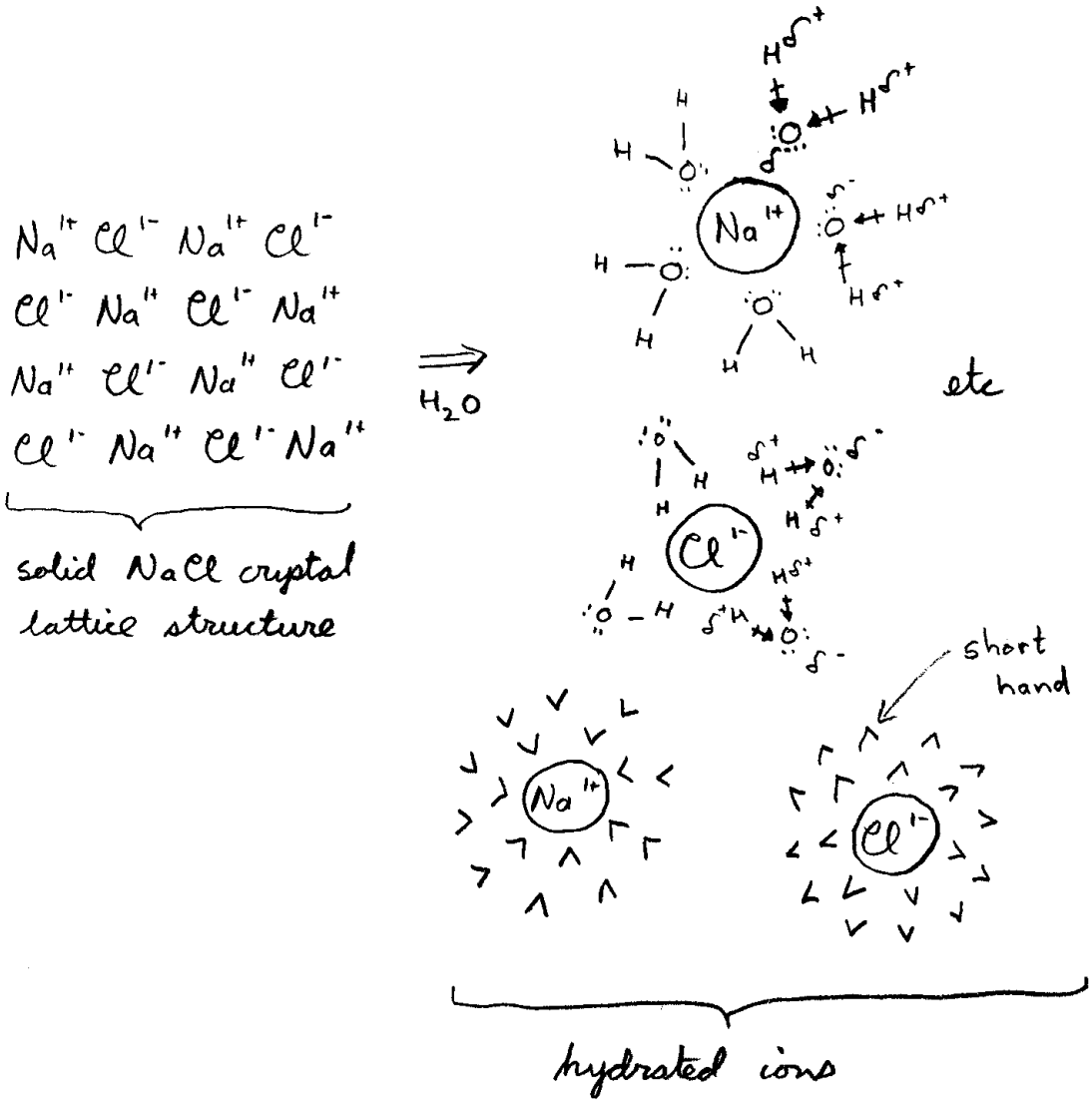
Solubility of Ionic Compounds – Solubility Rules

- when an ionic compound dissolves in water, its ions become "hydrated" through interactions between ionic charges and the δ^+ and δ^- charges on water molecules



- ionic compounds have variable solubility, some are very soluble, other are virtually insoluble (low soluble)

- solubility is based on replacement forces:

hydration energy > lattice energy ➜ soluble

hydration energy < lattice energy ➜ insoluble

- **SOLUBILITY RULES** list what is soluble and what is not

(DO SOLUBILITY RULES EXERCISE HERE)

- we can write **dissociation equation** for soluble substances (they show the aqueous ions that are produced through the dissolving process)

$NaNO_3(s) \xrightarrow[H_2O]{} Na^{1+}(aq) + NO_3^{1-}(aq)$

- dissociation equations produce ions and represent a physical change (change of state) not a chemical reaction

$K_2CO_3(s) \xrightarrow[H_2O]{} 2K^{1+}(aq) + CO_3^{2-}(aq)$

$PbCl_2(s) \xrightarrow[H_2O]{}$ (does not dissolve – insoluble)

$(NH_4)_3PO_4(s) \xrightarrow[H_2O]{} 3NH_4^{1+}(aq) + PO_4^{3-}(aq)$

Precipitate Reactions: double displacement reactions in which combination of ions result in insoluble substances and hence form precipitates. A precipitate is the formation of any solid from solution.

eg $Ba(NO_3)_2(s) \rightarrow Ba^{2+}(aq) + 2NO_3^{1-}(aq)$

$H_2SO_4(l) \rightarrow 2H^{1+}(aq) + SO_4^{2-}(aq)$

$Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

There are left over unreacted ions ($H^{1+}(aq)$ and $NO_3^{1-}(aq)$). These ion are called spectator ions (they watch the action, they do not participate in the precipitate)

The precipitate of $BaSO_4$ forms because $BaSO_4$ is low solubility and there Ba^{2+} and SO_4^{2-} ion cannot coexist in solution.