

CHAPTER 4

Solution - homogeneous mixture
Solute dissolves in the SOLVENT
aqueous sol'n \rightarrow solvent = H_2O

HYDRATION

\rightarrow a type of SOLUTION
 \rightarrow solvent molecules surround solute particle

$H_2O \rightarrow$ universal solvent
- polar, H-bond

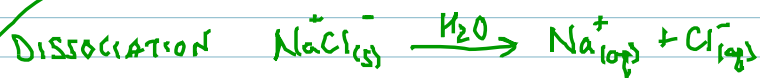
SOLUTES IN H_2O

1) NON ELECTROLYTES

2) ELECTROLYTES \rightarrow produce conducting solutions



A) STRONG \Rightarrow 100% DISSOCIATION OR IONIZATION



\rightarrow STRONG ACIDS, BASES, SOLUBLE IONICS

B) WEAK \Rightarrow some dissociation or ionization

\rightarrow weak acids, weak bases ($K_a, K_b < 10^{-3}$)
slightly soluble ionics (K_{sp})

often \rightleftharpoons reach EQ

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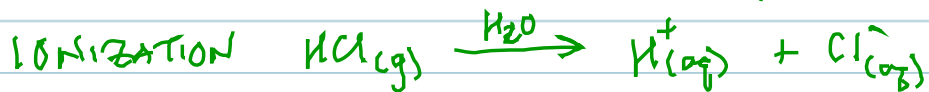
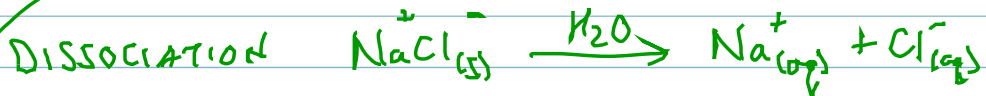
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NONPOLAR SOLUTE \rightarrow INSOLUBLE in H_2O
 \rightarrow hydrocarbons, benzene C_6H_6

SOLUTIONS \Rightarrow unsaturated / saturated / supersaturated
miscible \rightarrow liquids that dissolve into each other
coffee/cream H_2O/CH_3CH_2OH
immiscible \rightarrow oil/ H_2O
supersaturated \rightarrow crystallization
large crystals
core slowly

MOLECULAR VIEW OF SOLUTION

\rightarrow solute particles take up spaces formerly occupied by solvent molecules

3 STEPS

- 1) separate solvent particles (DISRUPT IMF) \leftarrow ENDOTHERMIC
- 2) separate solute particles (BREAK IMF) \leftarrow
- 3) solute-solvent interaction forms EXOTHERMIC

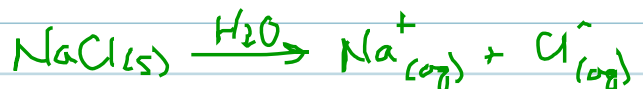
$$\Delta H_{\text{SOLN}} = \Delta H_1 + \Delta H_2 + \Delta H_3$$

how can a solid with $(+)\Delta H_{\text{SOLN}}$ dissolve spontaneously

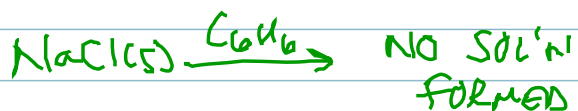
$$\Delta G = \Delta H - T\Delta S$$

dissolving is always $(+\Delta S)$

the nature of the solute-solvent interaction plays ~~an~~ a role



"like dissolves like"



SOLUBILITY \rightarrow depends on T ($\neq P$ for gases)

T dependence

- ① in general, solid solubility \uparrow solvent $T \uparrow$
- ② in general, gas solubility \downarrow solvent $T \uparrow$

Pressure effect

Henry's Law: the solubility of a gas in a liquid is proportional to ~~the~~ the pressure of the gas over the liquid

\rightarrow when the P of the gas above the liquid decreases, the concentration of dissolved gases will also decrease

\rightarrow if the dissolved gas reacts with the solvent \rightarrow dissolve more than expected