### **SOLUTIONS & SOLUBILITIES**

# **TERMS**

- Solution: a homogeneous mixture containing particles the size of a typical ion or covalent molecule. (0.1–2.0 nm in diameter)
- Colloid: a homogeneous mixture containing particles with diameters in the range 2–500 nm
- Suspensions are mixtures with even larger particles, but they are not considered true solutions because they separate upon standing.
- Solute: the dissolved substance in a solution
- Solvent: the major component in a solution

- A solution is <u>saturated</u> when no additional solute can be dissolved at a particular temperature
- A <u>Supersaturated</u> solution can form when more than the equilibrium amount of solute is dissolved at an elevated temperature, and then the supersaturated solution is slowly cooled.
- An Unsaturated solution is formed when more of the solute can dissolve in it at a particular temperature.

# KINDS OF SOLUTIONS

Kind of Solution	Example
Gas in gas	Air (O <sub>2</sub> , N <sub>2</sub> , Ar, and other gases)
Gas in fiquid	Carbonated water (CO <sub>2</sub> in water)
Gas in solid	H <sub>2</sub> in palladium metal
Liquid in liquid	Gasofine (mixture of hydrocarbons)
Liquid in solid	Dental amalgam (mercury in silver)
Sofid in liquid	Seawater (NaCl and other salts in water)
Solid in solid	Metal alloys, such as sterling silver (92.5% Ag, 7.5% Cu)

#### Table 22-3

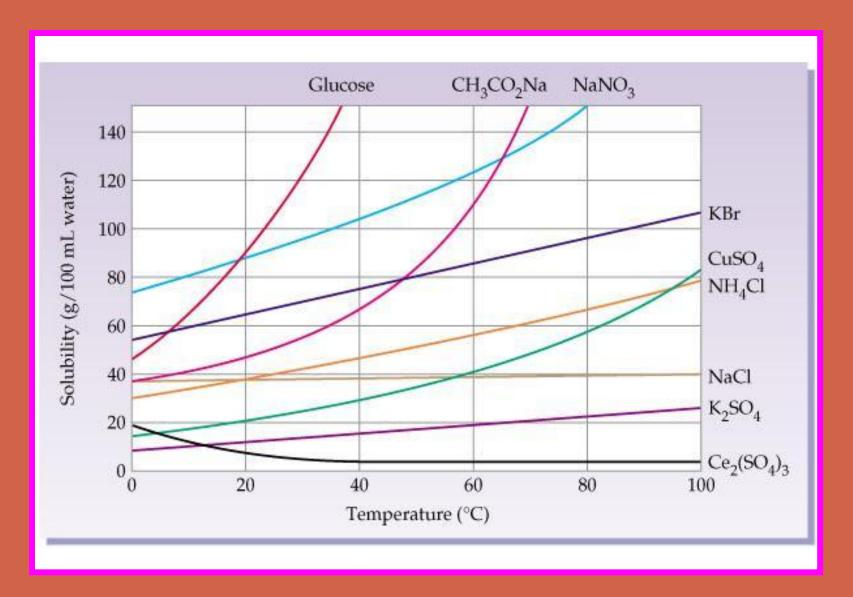
## Properties of Solutions, Colloids, and Suspensions

Solutions	Colloids	Suspensions	
Do not settle out	Do not settle out	Settle out on standing	
Pass unchanged through ordinary filter paper	Pass unchanged through ordinary filter paper	Separated by ordinary filter paper	
Pass unchanged through membrane	Separated by a membrane	Separated by a membrane	
Do not scatter light	Scatter light	Scatter light	
Affect colligative properties	Do not affect colligative properties	Do not affect colligative properties	

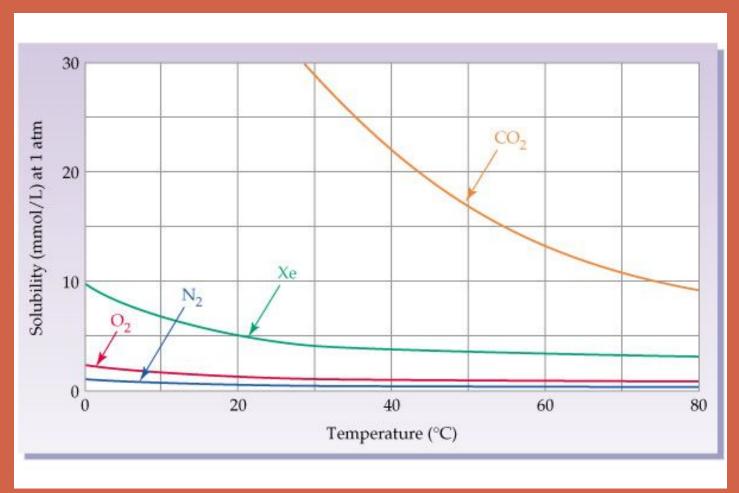
# SOLUBILITY

- The amount of solute per unit solvent required to form a saturated solution is called the solute's Solubility.
- When two liquids are completely soluble in each other they are said to be <u>Miscible</u>.
- Solubility is effected by Temperature. With increase in temperature solubility of most of the substances increases.
- Most gases become less soluble in water as the temperature increases.

#### SOLUBILITY GRAPH OF SALTS IN WATER



#### SOLUBILITY GRAPH OF GASES IN WATER

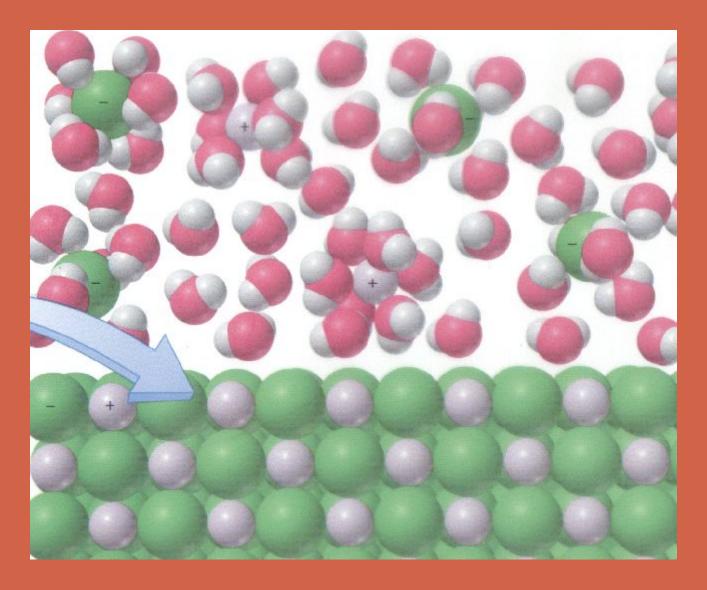


Pressure has little effect on the solubility of liquids and solids. The solubility of gases is strongly influenced by pressure. Gases dissolve more at high pressure.

### SOLUBILITY OF COMMON IONS IN WATER

Solub le Compounds		Important Exceptions
Compounds containing	NO3-	None
	C2H3O2	None
	CI	Compounds of $Ag^+$ , $Hg_2^{2+}$ , and $Pb^{2+}$
	Br <sup>-</sup>	Compounds of $Ag^+$ , $Hg_2^{2+}$ , and $Pb^{2+}$
	I-	Compounds of Ag+, Hg2 <sup>2+</sup> , and Pb <sup>2+</sup>
	$504^{2-}$	Compounds of $Sr^{2+}$ , $Ba^{2+}$ , $Hg_2^{2+}$ , and $Pb^{2+}$
Insolub le Compounds		Important Exceptions
Compounds containing	<i>5</i> 2-	Compounds of $NH_4^+$ , the alkali metal cations, and $Ca^{2+}$ , $Sr^{2+}$ , and $Ba^{2+}$
	co <sub>3</sub> 2-	Compounds of $\mathrm{NH_4}^+$ and the alkali metal cations
	$PO_4^{3-}$	Compounds of $\mathrm{NH_4}^+$ and the alkali metal cations
	OH-	Compounds of the alkali metal cations, and Ca <sup>2+</sup> , Sr <sup>2+</sup> , and Ba <sup>2+</sup>

### DISSOLUTION OF SODIUM CHLORIDE IN WATER



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