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 **saturated** when no additional solute can be dissolved at a particular temperature
- A **Supersaturated** 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_2, N_2, Ar, and other gases)
Gas in liquid	Carbonated water (CO_2 in water)
Gas in solid	H_2 in palladium metal
Liquid in liquid	Gasoline (mixture of hydrocarbons)
Liquid in solid	Dental amalgam (mercury in silver)
Solid 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

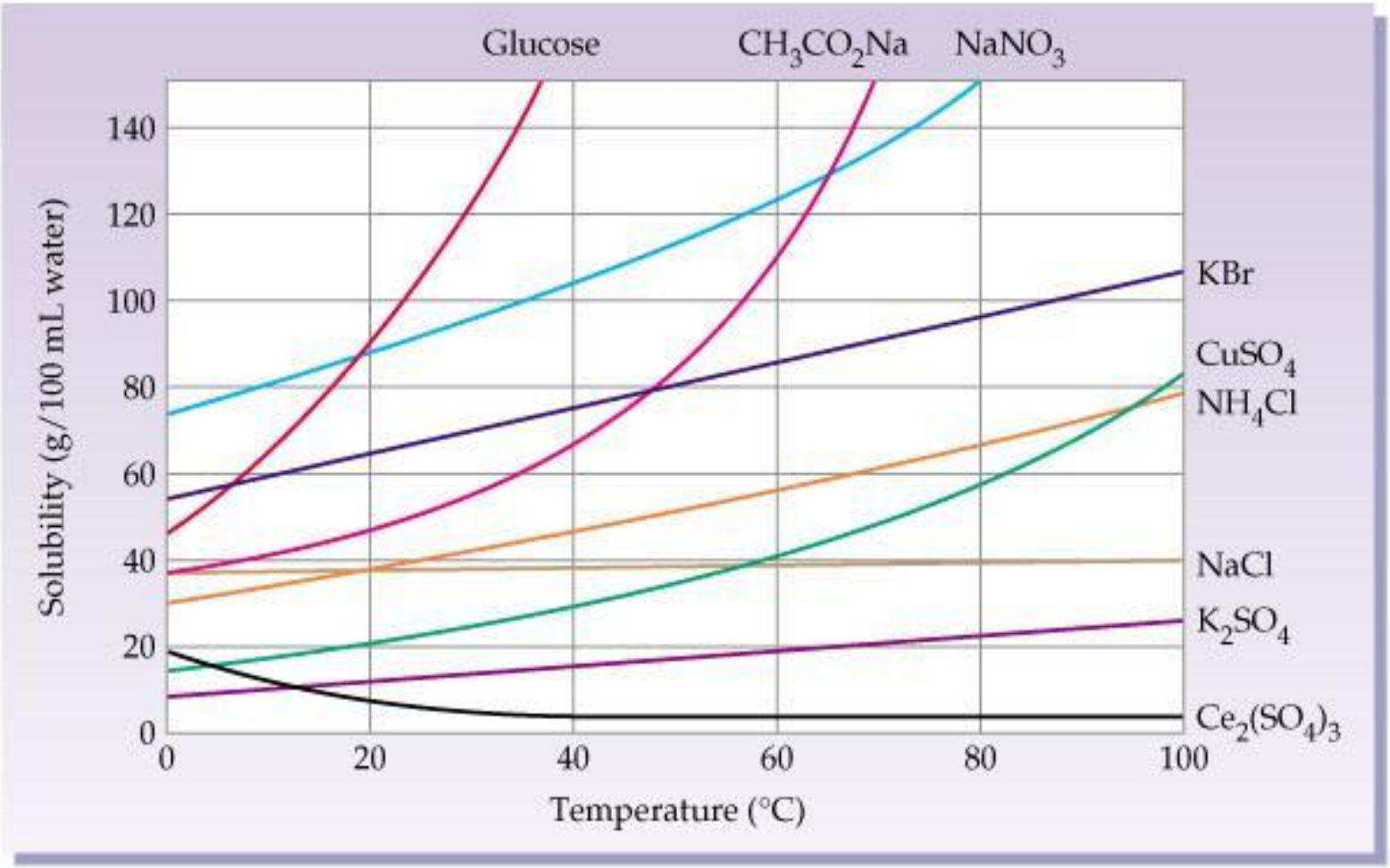
Properties of Solutions, Colloids, and Suspensions

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

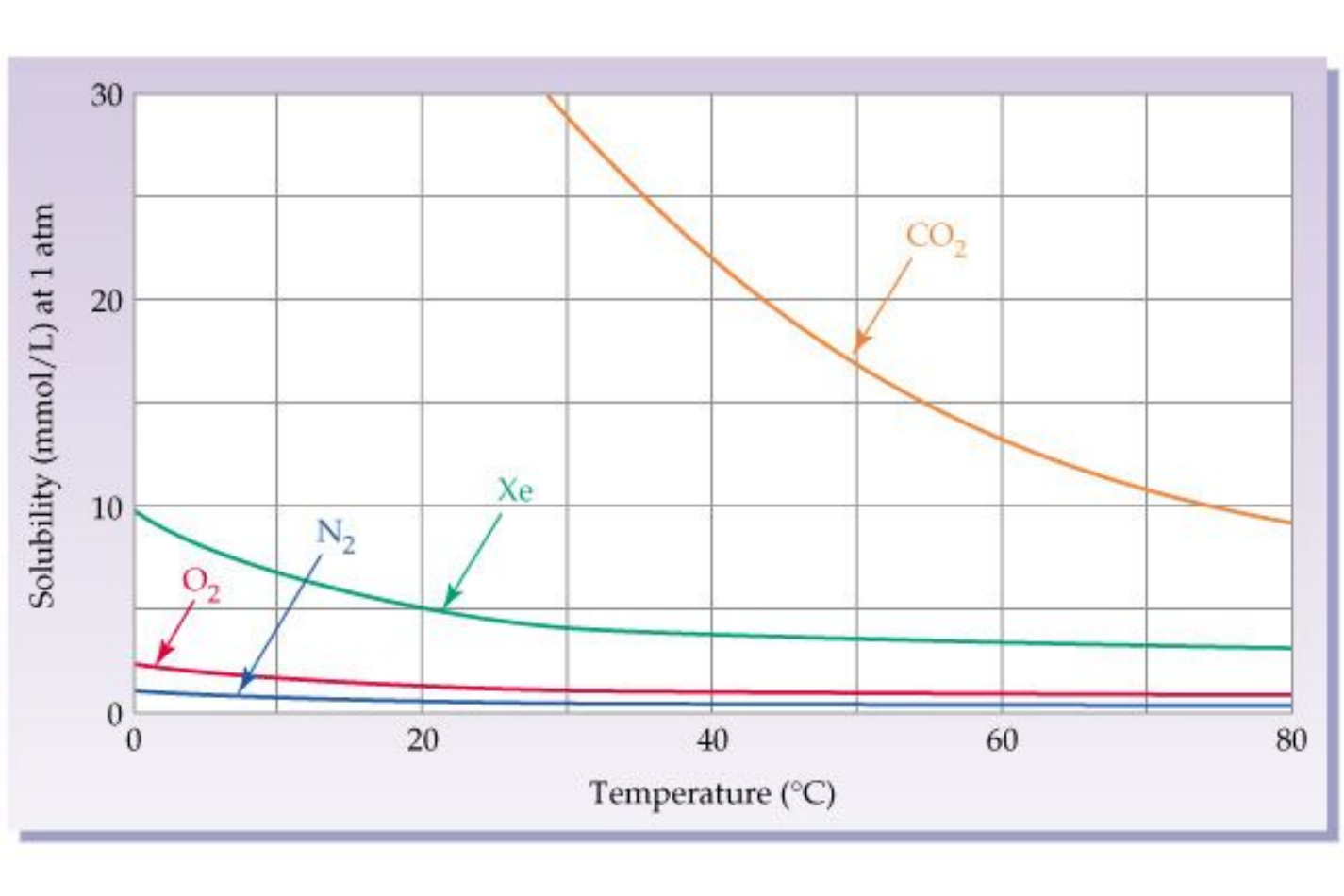
SOLUBILITY

- 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 **Miscible**.
- 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

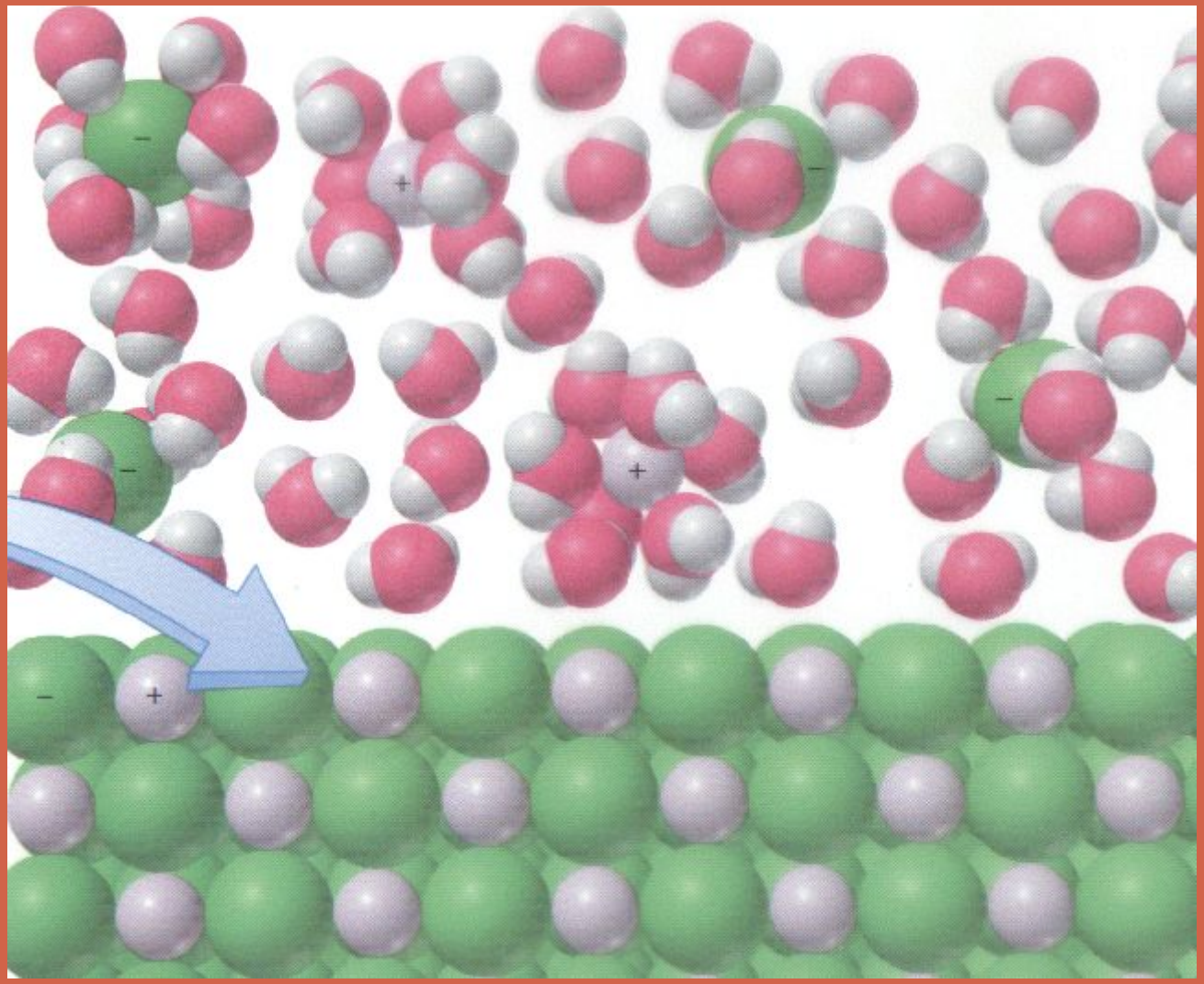


Pressure has little effect on the solubility of liquids and solids. The solubility of gases is strongly influenced by pressure. Gases dissolve more at high pressure.

SOLUBILITY OF COMMON IONS IN WATER

Soluble Compounds		Important Exceptions
Compounds containing	NO_3^-	None
	$C_2H_3O_2^-$	None
	Cl^-	Compounds of Ag^+, Hg_2^{2+}, and Pb^{2+}
	Br^-	Compounds of Ag^+, Hg_2^{2+}, and Pb^{2+}
	I^-	Compounds of Ag^+, Hg_2^{2+}, and Pb^{2+}
	SO_4^{2-}	Compounds of Sr^{2+}, Ba^{2+}, Hg_2^{2+}, and Pb^{2+}
Insoluble Compounds		**Important Exceptions**
Compounds containing	S^{2-}	Compounds of NH_4^+, the alkali metal cations, and Ca^{2+}, Sr^{2+}, and Ba^{2+}
	CO_3^{2-}	Compounds of NH_4^+ and the alkali metal cations
	PO_4^{3-}	Compounds of NH_4^+ and the alkali metal cations
	OH^-	Compounds of the alkali metal cations, and Ca^{2+}, Sr^{2+}, and Ba^{2+}

DISSOLUTION OF SODIUM CHLORIDE IN WATER



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