

## extension

### Chemistry in Action

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Keyword: HC6SLNX

## Solubility Values

The **solubility** of a substance is the amount of that substance required to form a saturated solution with a specific amount of solvent at a specified temperature. The solubility of sugar, for example, is 204 g per 100. g of water at 20.°C. The temperature must be specified because solubility varies with temperature. For gases, the pressure must also be specified. Solubilities must be determined experimentally, and they vary widely, as illustrated in **Table 4**. Solubility values can be found in chemical handbooks and are usually given as grams of solute per 100. g of solvent or per 100. mL of solvent at a given temperature.

The rate at which a solid dissolves is unrelated to its solubility at that temperature. The maximum amount of a given solute that dissolves and reaches equilibrium is always the same under the same conditions.

## Solute-Solvent Interactions

Lithium chloride is highly soluble in water, but gasoline is not. On the other hand, gasoline mixes readily with benzene,  $C_6H_6$ , but lithium chloride does not. Why are there such differences in solubility?

“Like dissolves like” is a rough but useful rule for predicting whether one substance will dissolve in another. What makes substances similar depends on the type of bonding, the polarity or nonpolarity of molecules, and the intermolecular forces between the solute and solvent.

**TABLE 4** Solubility of Solutes as a Function of Temperature (in g solute/100. g  $H_2O$ )

Substance	Temperature (°C)					
	0	20	40	60	80	100
AgNO <sub>3</sub>	122	216	311	440	585	733
Ba(OH) <sub>2</sub>	1.67	3.89	8.22	20.94	101.4	—
C <sub>12</sub> H <sub>22</sub> O <sub>11</sub>	179	204	238	287	362	487
Ca(OH) <sub>2</sub>	0.189	0.173	0.141	0.121	—	0.07
Ce <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>	20.8	10.1	—	3.87	—	—
KCl	28.0	34.2	40.1	45.8	51.3	56.3
KI	128	144	162	176	192	206
KNO <sub>3</sub>	13.9	31.6	61.3	106	167	245
LiCl	69.2	83.5	89.8	98.4	112	128
Li <sub>2</sub> CO <sub>3</sub>	1.54	1.33	1.17	1.01	0.85	0.72
NaCl	35.7	35.9	36.4	37.1	38.0	39.2
NaNO <sub>3</sub>	73	87.6	102	122	148	180
CO <sub>2</sub> (gas at SP)	0.335	0.169	0.0973	0.058	—	—
O <sub>2</sub> (gas at SP)	0.00694	0.00537	0.00308	0.00227	0.00138	0.00