TABLE 5 Enthalpies of Solution (kJ/mol solute at 25°C)

Substance	Enthalpy of solution	Substance	Enthalpy of solution
$AgNO_3(s)$	+22.59	$KOH(s)$	–57.61
$CH_3COOH(l)$	–1.51	$MgSO_4(s)$	+15.9
$HCl(g)$	–74.84	$NaCl(s)$	+3.88
$HI(g)$	–81.67	$NaNO_3(s)$	+20.50
$KCl(s)$	+17.22	$NaOH(s)$	–44.51
$KClO_3(s)$	+41.38	$NH_3(g)$	–30.50
$KI(s)$	+20.33	$NH_4Cl(s)$	+14.78
$KNO_3(s)$	+34.89	$NH_4NO_3(s)$	+25.69

The net amount of energy absorbed as heat by the solution when a specific amount of solute dissolves in a solvent is the **enthalpy of solution.** From the model in **Figure 16,** you can see that the enthalpy of solution is negative (energy is released) when the sum of attractions from Steps 1 and 2 is less than Step 3. The enthalpy of solution is positive (energy is absorbed) when the sum of attractions from Steps 1 and 2 is greater than Step 3.

You know that heating decreases the solubility of a gas, so dissolution of gases is exothermic. How do the values for the enthalpies of solution in **Table 5** support this idea of exothermic solution processes for gaseous solutes?

In the gaseous state, molecules are so far apart that there are virtually no intermolecular forces of attraction between them. Therefore, the solute-solute interaction has little effect on the enthalpy of a solution of a gas. Energy is released when a gas dissolves in a liquid because attraction between solute gas and solvent molecules outweighs the energy needed to separate solvent molecules.

SECTION REVIEW

1. Why would you expect a packet of sugar to dissolve faster in hot tea than in iced tea?
2. a. Explain how you would prepare a saturated solution of sugar in water. b. How would you then make it a supersaturated solution?
3. Explain why ethanol will dissolve in water and carbon tetrachloride will not.
4. When a solute molecule is solvated, is energy released or absorbed?
5. If a warm bottle of soda and a cold bottle of soda are opened, which will effervesce more and why?

Critical Thinking

6. **PREDICTING OUTCOMES** You get a small amount of lubricating oil on your clothing. Which would work better to remove the oil—water or toluene? Explain your answer.
7. **INTERPRETING CONCEPTS** A commercial "fizz saver" pumps helium under pressure into a soda bottle to keep gas from escaping. Will this keep CO_2 in the soda bottle? Explain your answer.