

## Answers for Chapter 6 Study Questions

1. Use pictures and words to explain the difference between liquid water and steam (water vapor).  
See fig. 6.1 in the text.

2. Indicate whether heat must be added or removed for each process to occur:  
melting-added      vaporization-added      condensation-removed      freezing-removed

3. Indicate whether each statement about secondary forces is true or false.  
T All secondary forces result from an attraction between opposite charges.  
F Secondary forces explain the shape of a molecule.  
T London forces are the weakest type of secondary forces.  
F All polar molecules can form hydrogen bonds.  
F Dipole-dipole interactions may occur when H is bonded to N, O, or F.  
T London forces exist between all molecules.

4. Describe the attractive forces between molecules for each compound: I<sub>2</sub>, HI, NH<sub>3</sub>

I<sub>2</sub> = London forces      HI= dipole-dipole      NH<sub>3</sub> = hydrogen bonds

5. Predict the order of boiling point for I<sub>2</sub>, HI, NH<sub>3</sub>, from lowest temperature to highest. Explain your reasoning.

I<sub>2</sub> (lowest) → HI → NH<sub>3</sub> (highest)

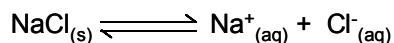
Boiling point increases with strength of attractive forces – it takes more heat energy to separate the molecules.

6. Predict the order of solubility for I<sub>2</sub>, HI, NH<sub>3</sub> in water, from most soluble to least soluble. Explain your reasoning

NH<sub>3</sub> (most soluble) → HI → I<sub>2</sub> (least soluble)

Based on the idea that 'like dissolves like' solubility in water (a very polar solvent) will increase with the polarity of the solute.

7. A chemist would use the symbolism below for a saturated solution of NaCl. Use your own words to describe this equilibrium system.



This is a mixture containing both solid NaCl and individual Na<sup>+</sup> and Cl<sup>-</sup> ions in solution. The solid is dissolving to form ions and the ions are combining to form solid. Since these two processes occur at equal rates, the system does not seem to change.