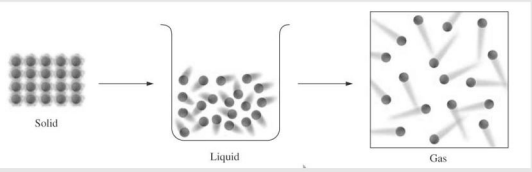
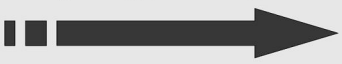
Entropy

- Entropy can be thought of as a measure of the randomness of a system.
- It is related to the various modes of motion in molecules.



Increasing entropy; increasing disorder



Increasing Entropy

- • Molecules that are farther apart
- • Substances whose volume increases
- • Molecules that are mixed up (mixtures)
- *How to increase entropy of a system?*
  - Expand it, heat it, mix it,
  - break up intermolecular forces.

Entropy

- For a process occurring at constant temperature

$$\Delta S = \frac{q_{rev}}{T}$$

q_{rev} = the heat that is transferred when the process is carried out **reversibly** at a constant temperature.
T = temperature in Kelvin.

- A tub of water is heated over a campfire, and 1000. J of energy is added as heat at 25 ^{o}C. What is the increase in entropy of the water?

$$\Delta S = \frac{q_{rev}}{T}$$

Entropy

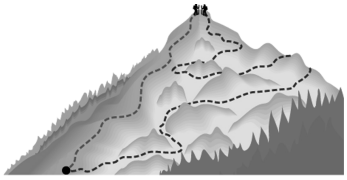
- Like total energy, *E*, and enthalpy, *H*, entropy is a state function.
- Therefore,

$$\Delta S = S_{final} - S_{initial}$$

Thermodynamics

State functions are properties that are determined by the state of the system, regardless of how that condition was achieved.

energy, pressure, volume, temperature



Potential energy of hiker 1 and hiker 2 is the same even though they took different paths.

6.7