

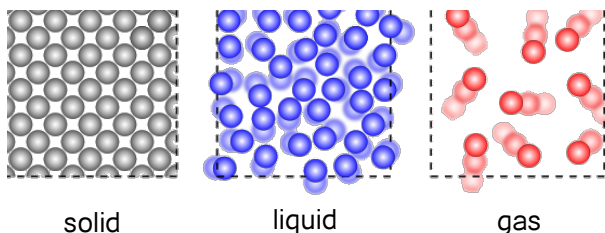
2nd Law of Thermodynamics

- Entropy (S) is a measure of the **disorder** or **randomness** of the particles that make up a system.
- Entropy is the driving force in all **spontaneous** processes.
- **The law of disorder:** spontaneous processes proceed in a way that the disorder of the universe increases.
- Entropy is all about probability.
- This is the **Second** Law of Thermodynamics.

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Measuring Entropy

- Change of state.
 - > What state has the most entropy??
- Solids dissolving to form a solution.
 - > solutions have more entropy than solids and liquids
 - > $s < l < \text{aq (solution)} < g$
- Big particles broken down into little pieces.
 - > $\text{CaCO}_3(s) \rightarrow \text{CaO}(s) + \text{CO}_2(g)$
 - > more parts = more entropy
- Spreading out gases.
 - > great volume = greater entropy



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Calculating Entropy

$$\Delta S = \Sigma \Delta S_f(\text{products}) - \Sigma \Delta S_f(\text{reactants})$$

What it means:

- > $-\Delta S$ = getting more **ordered**
- > $+\Delta S$ = getting more **disordered**

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Practice

Which has more entropy?

- solid CO_2 or gaseous CO_2

- ~~H_2 gas at 1 atm~~ or H_2 gas at 0.001 atm

$P \uparrow V \downarrow$

$P \downarrow V \uparrow$

Predict the sign of the entropy change:

- Solid NaCl is added to water to form a solution.

$+\Delta S$

$g \rightarrow s$

- Water vapor condenses on a cold surface to form crystals.

$-\Delta S$

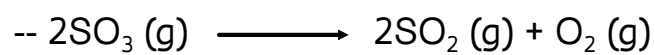
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Practice

Which has more entropy?

-- A solution of potassium nitrate or solid potassium nitrate?

What is the sign of the change in entropy?



+ ΔS

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