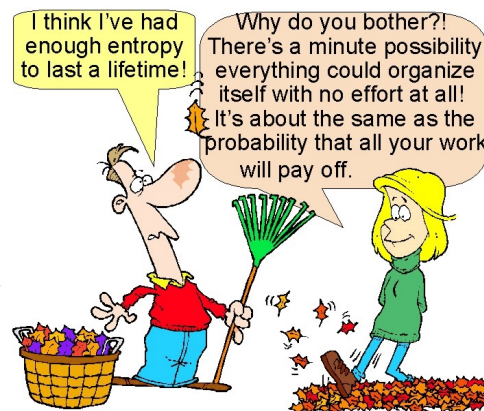


A Fine Mess

No matter how careful you are, your room always becomes messy. It's not surprising. There are very few arrangements of all your things that are organized. There are thousands of arrangements that are disorganized. Probability favors disorganization or randomness, also known as **entropy**. In nature, high entropy is favored, yet many things that occur naturally are quite organized. This is because nature also favors low potential energy or **enthalpy**. Entropy and enthalpy sometimes conflict with each other. Consider steam and snowflakes, both arrangements of water. Steam has very high entropy. The particles are spread out randomly. Snowflakes have low entropy. The particles are arranged in repeating geometric patterns. In order to spread the particles out, as in steam, it is necessary to overcome the hydrogen bonds that hold water molecules together. This requires a lot of energy. As a result, water has a high boiling point. Snowflakes, therefore, have low enthalpy, while steam has high enthalpy.



Answer the questions below based on your reading above, and on your knowledge of chemistry.

- Dry ice is solid carbon dioxide $[\text{CO}_2(s)]$. Carbon dioxide occurs naturally as a gas in the atmosphere $[\text{CO}_2(g)]$.
 - Which form of carbon dioxide has higher entropy? _____
 - Which form of carbon dioxide has higher enthalpy? _____
- Gasoline burns according to the following equation: $2\text{C}_8\text{H}_{18}(l) + 25\text{O}_2(g) \rightarrow 16\text{CO}_2(g) + 18\text{H}_2\text{O}(g)$.
 - What happens to the enthalpy during this reaction. Explain. _____

 - What happens to the entropy during this reaction. Explain. _____

- For each of the following, the products have higher entropy than the reactants. Explain why.
 - $\text{H}_2\text{O}(s) \rightarrow \text{H}_2\text{O}(l)$ _____
 - $2\text{C}_2\text{H}_6(g) + 7\text{O}_2(g) \rightarrow 4\text{CO}_2(g) + 6\text{H}_2\text{O}(g)$ _____
 - $\text{I}_2(s) \rightarrow \text{I}_2(g)$ _____