**Entropy**

**YOYO:** Looking at the gif of the dog sledding, make a prediction, which process is spontaneous, which is non-spontaneous. Write at least 2 complete sentences explaining your reasoning.

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Spontaneous Reactions vs. Non-Spontaneous Reactions

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is one that is able to proceed without needing an outside source of energy (exothermic reaction)
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** needs an input of energy. (endothermic reaction)

Spontaneous reactions happen when…

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**(lower enthalpy): exothermic reactions are favored
* Greater randomness, disorder



Entropy

* Entropy is the measure of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* In nature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ entropy is favored.

Entropy Increases...

* When the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** increases during a reaction.
	+ NaCl(s) 🡪 Na+(aq) + Cl-(aq)
* With an increase in **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* When a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is formed from a liquid or a solid.

Entropy Regents Questions

1. Given the balanced equation representing a phase change:
C6H4Cl2(s) + energy 🡪 C6H4Cl2(g)

Which statement describes this change?

* 1. It is endothermic, and entropy decreases.
	2. It is endothermic, and entropy increases.
	3. It is exothermic, and entropy decreases.
	4. It is exothermic, and entropy increases
1. The entropy of a sample of H2O increases as the sample changes from a
	1. gas to a liquid
	2. gas to a solid
	3. liquid to a gas
	4. liquid to a solid

1. Which 1-mole sample has the least entropy?
	1. Br2(s) at 266 K
	2. Br2(l) at 266 K
	3. Br2(l) at 332 K
	4. Br2(g) at 332 K
2. A thermometer is in a beaker of water. Which statement best explains why the thermometer reading initially increases when LiBr(s) is dissolved in the water?
	1. The entropy of the LiBr(aq) is greater than the entropy of the water.
	2. The entropy of the LiBr(aq) is less than the entropy of the water.
	3. The dissolving of the LiBr(s) in water is an endothermic process.
	4. The dissolving of the LiBr(s) in water is an exothermic process.
3. In terms of energy and entropy, systems in nature tend to undergo changes toward
	1. higher energy and higher entropy
	2. higher energy and lower entropy
	3. lower energy and higher entropy
	4. lower energy and lower entropy

More Entropy Practice

|  |  |  |
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| **Reaction** | **Change in Entropy** | **Reasoning** |
| Ag+(aq) + Cl-(aq)🡪 AgCl(s) |  |  |
| H2O(l) 🡪 2 H2(g) + O2(g) |  |  |
| CO(g) + 3 H2(g) 🡪 CH4(g) + H2O(g) |  |  |
| 2 NaHCO3(s) 🡪 Na2CO3(s) + H2O(g) + CO2(g) |  |  |
| CO(g) + H2O(g) 🡪 CO2(g) + H2(g) |  |  |
| CaCO3(s) 🡪 CaO(s) + CO2(g) |  |  |
| 2NH3(g) + CO2(g) 🡪 NH2CONH2(aq) + H2O(l) |  |  |
| H2O(l) 🡪 H2O(s) |  |  |