

Entropy

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| <p>1 Entropy is a measure of</p> <p>(1) accuracy
(2) precision
(3) the disorder of a system
(4) the attraction of a nucleus for an electron</p> <p>2 Which phase change results in an increase in entropy?</p> <p>(1) $I_2(g) \rightarrow I_2(s)$ (3) $Br_2(l) \rightarrow Br_2(g)$
(2) $CH_4(g) \rightarrow CH_4(l)$ (4) $H_2O(l) \rightarrow H_2O(s)$</p> <p>3 During which phase change does the entropy of a sample of H_2O increase?</p> <p>(1) $H_2O(g) \rightarrow H_2O(l)$ (3) $H_2O(l) \rightarrow H_2O(g)$
(2) $H_2O(g) \rightarrow H_2O(s)$ (4) $H_2O(l) \rightarrow H_2O(s)$</p> <p>4 The amount of randomness of the atoms in a system is an indication of the</p> <p>(1) entropy of the system
(2) polarity of the system
(3) excited state of the atoms
(4) ground state of the atoms</p> <p>5 Which term is defined as a measure of the randomness of a system?</p> <p>(1) heat (3) pressure
(2) entropy (4) temperature</p> <p>6 Entropy is a measure of the</p> <p>(1) acidity of a sample
(2) disorder of a system
(3) concentration of a solution
(4) chemical activity of an element</p> | <p>7 Which term is defined as a measure of the disorder of a system?</p> <p>(1) heat (3) kinetic energy
(2) entropy (4) activation energy</p> <p>8 Given the balanced equation representing a reaction:</p> <p style="text-align: center;">$2H_2O(l) + 571.6 \text{ kJ} \rightarrow 2H_2(g) + O_2(g)$</p> <p>What occurred as a result of this reaction?</p> <p>(1) Energy was absorbed, and entropy increased.
(2) Energy was absorbed, and entropy decreased.
(3) Energy was released, and entropy increased.
(4) Energy was released, and entropy decreased.</p> <p>9 Which equation represents a change that results in an increase in disorder?</p> <p>(1) $I_2(s) \rightarrow I_2(g)$
(2) $CO_2(g) \rightarrow CO_2(s)$
(3) $2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$
(4) $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$</p> <p>10 Systems in nature tend to undergo changes toward</p> <p>(1) lower energy and less randomness
(2) higher energy and less randomness
(3) lower energy and greater randomness
(4) higher energy and greater randomness</p> <p>11 In terms of disorder and energy, systems in nature have a tendency to undergo changes toward</p> <p>(1) less disorder and lower energy
(2) less disorder and higher energy
(3) greater disorder and lower energy
(4) greater disorder and higher energy</p> |
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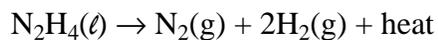
Base your answers to questions 12 on the information below and on your knowledge of chemistry.

Fruit growers in Florida protect oranges when the temperature is near freezing by spraying water on them. It is the freezing of the water that protects the oranges from frost damage. When $H_2O(l)$ at 0°C changes to $H_2O(s)$ at 0°C , heat energy is released. This energy helps to prevent the temperature inside the orange from dropping below freezing, which could damage the fruit. After harvesting, oranges can be exposed to ethene gas, C_2H_4 , to improve their color.

- 12 Explain, in terms of particle arrangement, why the entropy of the water decreases when the water freezes.

Base your answers to questions 13 on the information below and on your knowledge of chemistry.

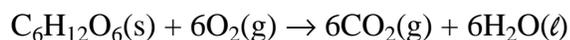
Hydrazine, N_2H_4 , is a compound that is very soluble in water and has a boiling point of 113°C at standard pressure. Unlike water, hydrazine is very reactive and is sometimes used as a fuel for small rockets. One hydrazine reaction producing gaseous products is represented by the balanced equation below.



- 13 Compare the entropy of the products to the entropy of the reactant for this reaction.
- 14 Explain, in terms of particle arrangement, why a sample of solid NaCl has less entropy than a sample of aqueous NaCl.

Base your answers to questions 15 on the information below and on your knowledge of chemistry.

The balanced equation below represents the reaction of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$, with oxygen at 298 K and 101.3 kPa.



- 15 Compare the entropy of the reactants to the entropy of the products.

Answer Keys

1 3

2 3

3 3

4 1

5 2

6 2

7 2

8 1

9 1

10 3

11 3

12 Allow 1 credit. Acceptable responses include, but are not limited to:

- The arrangement of the $\text{H}_2\text{O}(\ell)$ molecules is more random than the $\text{H}_2\text{O}(\text{s})$ molecules.
- The molecules in ice have a rigid, orderly arrangement.

13 Allow 1 credit. Acceptable responses include, but are not limited to:

- The gaseous products have greater entropy than the liquid reactant.
- The products are more disordered.

14 Allow 1 credit. Acceptable responses include, but are not limited to:

- Solid NaCl has less entropy because the particles have a more ordered arrangement than aqueous NaCl.
- $\text{NaCl}(\text{aq})$ is a mixture that contains water molecules and ions moving more randomly.
- Particle arrangement in $\text{NaCl}(\text{s})$ is less random.

15 Allow 1 credit. Acceptable responses include, but are not limited to:

- The entropy of the reactants is less than the entropy of the products.
- The reactants are more ordered.
- The products have greater entropy.