Thermodynamics
True / False

Chapter 19

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- False
- Larger molecules do generally exhibit more entropy, but $O_{2(g)}$ has more entropy because the fact that it is a gas is far more significant than the size factor.

In this reaction entropy decreases:

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- True
- Because a solid crystal has far less entropy than a gas and a metallic solid.

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- False
- Because two gas molecules are converted into three gas molecules.

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- True

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- True
- This is an equilibrium situation, and ΔG is always 0 at equilibrium.

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- True
- ΔG reverses its sign when the reaction is reversed.

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- False
- Entropy of the universe is always increasing, however, this is the Second Law of Thermodynamics

ΔG°_{f} , ΔH°_{f}, and S° for an element like $O_{2(g)}$ in their standard state are 0

ΔG^{o}_{f} , ΔH^{o}_{f}, and S^{o} for an element like $O_{2(g)}$ in their standard state are 0

- False
- ΔG_{f}^{o} , ΔH_{f}^{o} are 0, but S^{o} has a positive value because oxygen at 25ºC has far more entropy than a pure crystal of O_2 at 0 K

$N_{2(g)} + 3\ H_{2(g)} \rightarrow 2\ NH_{3(g)}$

$N_{2(g)}$ S° = 200 J, $H_{2(g)}$S° = 125J
and ΔS_{rx} = -200
then S° for $NH_{3(g)}$ must be 125

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- False - what is it then?
- $2(xNH_3) - [200\ J + 3(125\ J)] = -200\ J$
- Solve for $(xNH_3) = 187.5\ J$

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- False
- If a reaction has +ΔH and -ΔS, the reaction can only be nonspontaneous. More on this on the next slide….

Increasing temperature may be able to make a nonspontaneous reaction that has $-\Delta H$ and $-\Delta S$ become spontaneous.

Increasing temperature may be able to make a nonspontaneous reaction that has -ΔH and -ΔS become spontaneous.

- False
- Increasing the temperature will increase the already unfavorable entropy factor making ΔG even more positive.
- It is possible that lowering the temperature may reduce the unfavorable entropy factor enough to change the ΔG sign to negative.

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- True
- This would be true for a reactions that has a
  - ✓negative ΔH (favorable) and a
  - ✓positive ΔS (favorable)

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$CO_{2(g)} \rightarrow CO_{2(aq)}$

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- False
- Dissolving of solids and liquids is an increase in entropy but the dissolving of a gas actually decreases its disorder when dissolved in solution.

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- True