

Entropy and spontaneity · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; current brief acquired; full Chemistry guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Entropy · 1.1

Reasoning

A reaction can be endothermic and still be thermodynamically favourable. Enthalpy alone does not determine the direction favoured at a given temperature. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Entropy · 2.1

Reasoning

Entropy is associated with energy dispersal and the number of accessible microscopic arrangements. Gibbs energy combines enthalpy, entropy and absolute temperature for a process at constant temperature and pressure. entropy: A state property related to energy dispersal and accessible arrangements; Gibbs energy: A thermodynamic quantity combining enthalpy and entropy contributions.

Entropy · 3.1

Reasoning

Use $\Delta G = \Delta H - T\Delta S$ with consistent energy units. A negative Gibbs energy change indicates thermodynamic favourability for the stated conditions, not a fast rate. An activation barrier can make a favourable process slow. State whether values are standard-state quantities and record temperature in kelvin. Convert entropy from joules per kelvin per mole into kilojoules per kelvin per mole when enthalpy is in kilojoules per mole.

Entropy · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: $\Delta H = +20$ kJ per mole, $\Delta S = +100$ J per kelvin per mole and $T = 300$ K. Convert $\Delta S = 0.100$ kJ per kelvin per mole. $\Delta G = \Delta H - T\Delta S = 20 - 300 \times 0.100 = -10$ kJ per mole. The process is favourable under the stated approximation.

Entropy · 4.2

Reasoning

$\Delta H=30$ kJ per mole, $\Delta S=0.10$ kJ per kelvin per mole and $T=400$ K. Find ΔG . Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Entropy · 5.1

Reasoning

Thermodynamic favourability does not establish reaction rate. Celsius cannot replace kelvin in $T\Delta S$, and a unit conversion error can change the result by a factor of 1,000. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Entropy · 5.2

Reasoning

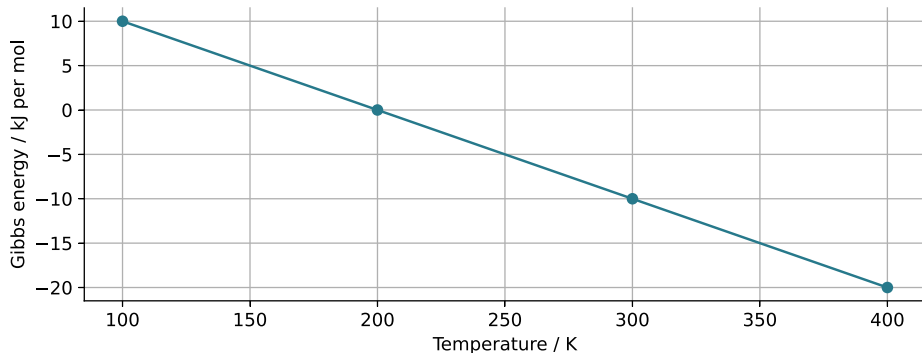
A thermodynamically favourable reaction must be fast. This claim is false:
Thermodynamic favourability does not establish reaction rate. Celsius cannot replace kelvin in $T\Delta S$, and a unit conversion error can change the result by a factor of 1,000.

Entropy · 5.3

Reasoning

Entropy, Gibbs energy and feasibility: Use $\Delta G = \Delta H - T\Delta S$ with consistent energy units. A negative Gibbs energy change indicates thermodynamic favourability for the stated conditions, not a fast rate. An activation barrier can make a favourable process slow.

Entropy · diagram



- Original teaching diagram: Entropy, Gibbs energy and feasibility
- Use the labels and the stated model together.

Entropy · original transfer

Your turn

Assume $\Delta H = +24 \text{ kJ/mol}$ and $\Delta S = +80 \text{ J/(K mol)}$ are temperature independent. Find the crossover temperature and predict favourability at 250 K and 400 K.

Entropy · transfer reasoning

Method and interpretation

Convert $\Delta S = 0.080 \text{ kJ}/(\text{K mol})$; $T = 24/0.080 = 300 \text{ K}$. $\Delta G = +4 \text{ kJ/mol}$ at 250 K and -8 at 400 K . Thermodynamic favourability does not imply a fast reaction.

Check yourself

- Explain entropy using the stated model.
- Explain Gibbs energy using the stated model.
- Change one value in the original transfer; explain which assumption still matters.