

## Summary of the Four Scenarios for Enthalpy and Entropy Changes

|                                         | $\Delta H > 0$<br>(endothermic)                                                                                          | $\Delta H < 0$<br>(exothermic)                                                                                          |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| $\Delta S > 0$<br>(increase in entropy) | $\Delta G < 0$ at high temperature<br>$\Delta G > 0$ at low temperature<br>Process is spontaneous<br>at high temperature | $\Delta G < 0$ at any temperature<br><br>Process is spontaneous<br>at any temperature                                   |
| $\Delta S < 0$<br>(decrease in entropy) | $\Delta G > 0$ at any temperature<br>Process is nonspontaneous<br>at any temperature                                     | $\Delta G < 0$ at low temperature<br>$\Delta G > 0$ at high temperature<br>Process is spontaneous<br>at low temperature |