

Unit 5 Extensive vs. Intensive / Spontaneity

Extensive properties depend directly on the amount of a substance. (Energies: ΔH , ΔG , ΔS depend on the amount of reactants/products, mass, volume)

If a system is split in half, the extensive properties would be half as much!

Intensive properties are not related to the amount of a substance. (density, temperature, pressure, ϵ voltage for galvanic cells, viscosity, malleability, concentration, specific heat, melting point, boiling point)

If a system is split in half, the intensive properties would remain the same!

Often an intensive property can be found by dividing 2 extensive properties. ($D = m/V$)

Spontaneity

$$\Delta G = \Delta H - T\Delta S$$

$$\Delta G = (-\Delta H) - T(+\Delta S)$$

$$\Delta G = -\Delta H - T\Delta S$$

$\Delta G =$ always (-), always spontaneous.

$$\Delta G = (+\Delta H) - T(+\Delta S)$$

$$\Delta G = +\Delta H - T\Delta S$$

$\Delta G =$ (-), only at high temperatures!

$$\Delta G = (-\Delta H) - T(-\Delta S)$$

$$\Delta G = -\Delta H + T\Delta S$$

$\Delta G =$ (-), only at low temperatures!

$$\Delta G = (+\Delta H) - T(-\Delta S)$$

$$\Delta G = +\Delta H + T\Delta S$$

$\Delta G =$ always (+), so non-spontaneous.

ΔH	ΔS	ΔG
(-)	(+)	(-) spontaneous at all temperatures
(+)	(+)	(-) spontaneous, only at high temperatures
(-)	(-)	(-) spontaneous, only at low temperatures
(+)	(-)	(+) non-spontaneous, at all temperatures

End of Notes