MSC-III
25/09/2025

Equation of Second law of thermodynamics

The second law of thermodynamics states that the entropy of the universe increases in the course of a spontaneous change that is, $\Delta S_{univ} \geq 0$

Mathematically.

$$\Delta S_{univ} = (\Delta S_{sys} + \Delta S_{surr}) \geq 0$$ (for

For a reversible process, i.e. it can proceed in both the direction spontaneously, so this can happen only when there will be no change in the entropy of universe.

$$\Delta S_{univ} = (\Delta S_{sys} + \Delta S_{surr}) = 0$$ (for a reversible spontaneous change).

For an irreversible process, i.e, it can proceed only in the forward direction spontaneously. So this happens as the change in entropy is greater than zero.

$$\Delta S_{univ} = (\Delta S_{sys} + \Delta S_{surr}) > 0$$ (for an irreversible spontaneous change)

for an isolated system. as there is no interaction between the system and the surroundings, the system itself is considered as the universe, Hence $\Delta S_{sys} > 0$ i.e, for a spontaneous process in an isolated system, the entropy of a system always increases constant (increases of the irreversible process)