THERMODYNAMICS

SECOND LAW OF THERMODYNAMICS

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The First Law of Thermodynamics is all about saving energy. It tells us that energy can't just appear or disappear, but it doesn't tell us everything. There are some things that could happen according to this law, like a book on a table jumping up all by itself, but that never actually occurs. This is because there's another important rule, the Second Law of Thermodynamics, which prevents certain things from happening even if they follow the First Law. This second law stops things that might seem okay according to the First Law but don't really happen in the real world.

The Second Law of Thermodynamics sets a fundamental limit on how well heat engines and refrigerators can work. In simple words, it means that a heat engine can never be 100% efficient, and a refrigerator can never be perfect. This law is basically saying that there are limits to how well these machines can perform. It's like saying a perfect heat engine or a perfect refrigerator is not possible, and this idea is summed up by statements from Kelvin, Planck, and Clausius.

Kelvin-Planck statement

You can't have a process where the only thing that happens is taking heat from a source and turning all of it into useful work.

Clausius statement

You can't have a process where the only thing that occurs is moving heat from something colder to something hotter. Both of these statements mean the same thing.