
The 2nd Law of Thermodynamics

From experience we know...

1. *Spontaneous processes have a preferred direction of change.*
2. *The maximum efficiency of cyclic devices that exchange energy via heat transfer with their surroundings is less than 100%.*
3. *It is impossible for energy to flow spontaneously from a low temperature to a high temperature by heat transfer.*
4. *Isolated systems have a preferred equilibrium state.*

The 2nd law of thermodynamics deals with these experiences. One of the most useful statements of the 2nd law is given below.

1. There exists an _____ property called _____. It can be transported by _____ at non-flow boundaries and by _____ at flow boundaries.
2. The *rate* of entropy transfer by heat transfer is given by

T_j is the _____ temperature at the _____ j .

3. Only in the limit of an _____ process, entropy is conserved. Otherwise entropy can only be _____.

Entropy Accounting

1. What is entropy?

- It depends on the amount of stuff within a system. It's an
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- Given the symbol
- Related to the 2nd Law of Thermo.
- Dimensions of

2. How is it stored? (What is S_{sys} ?)

- *Particles:*
- *Continuum:*

3. How is it transported? (How does it get in or out of a system?)

- *By heat transfer:*
- *By mass flow:*

4. How can it be generated or consumed?

5. Putting it all together.

$$\frac{dS_{sys}}{dt} =$$

