GENERAL PHYSICS PH1110

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2. THERMODYNAMICS

2.3 SECOND LAW OF THERMODYNAMICS

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- The two postulates were shown to be equivalent by Fermi.

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- Entropy of a system is equal to the sum of entropies of all of its subsystems.

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$$1-\frac{Q_2'}{Q_1}\leq 1-\frac{T_2}{T_1} \quad\rightarrow\quad \frac{Q_1}{T_1}\leq\frac{Q_2'}{T_2} \quad\rightarrow\quad \boxed{\frac{Q_1}{T_1}+\frac{Q_2}{T_2}\leq 0}$$

- For a cycle of n isothermal processes in alternate between n adiabatic processes:

$$\frac{Q_1}{T_1}+\frac{Q_2}{T_2}+\ldots+\frac{Q_n}{T_n}\leq 0 \qquad \text{or} \qquad \boxed{\sum_{i=1}^{n}\frac{Q_i}{T_i}\leq 0}$$

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  - ▹ So, for an irreversible process: $\boxed{\dfrac{\delta Q}{T} < \mathrm{d}S}$

4. Entropy and statement of the second law

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4. Entropy and statement of the second law

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The total entropy of an isolated system can never decrease over time, and is constant if and only if all processes within the system are reversible.

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The total entropy of an isolated system can never decrease over time, and is constant if and only if all processes within the system are reversible. Isolated systems spontaneously evolve towards thermodynamic equilibrium, the state with maximum entropy.

2. THERMODYNAMICS

2.3 SECOND LAW OF THERMODYNAMICS

5. Change in entropy of an ideal gas

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- In an adiabatic process:

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