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Y. T. Lin's Presentation

Reference Books

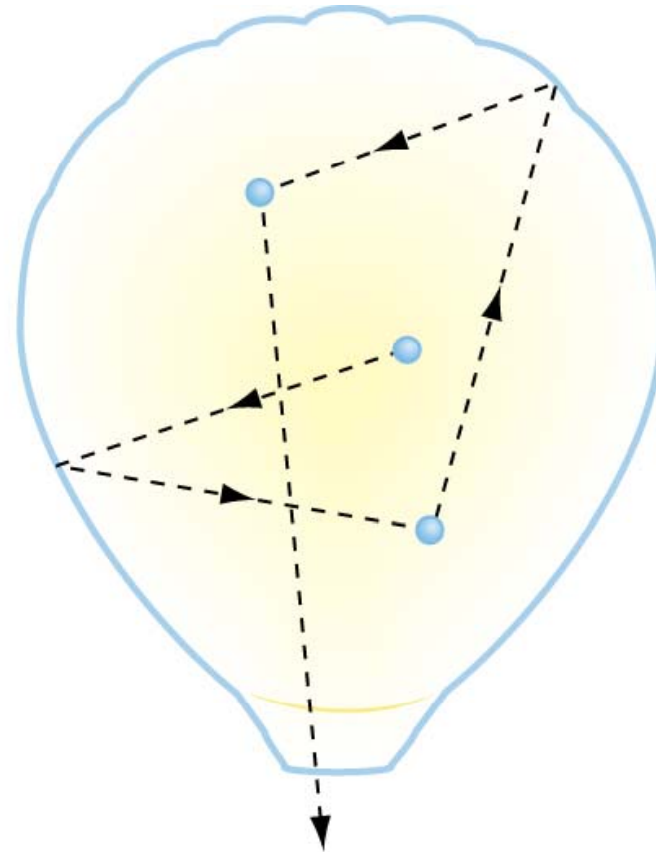
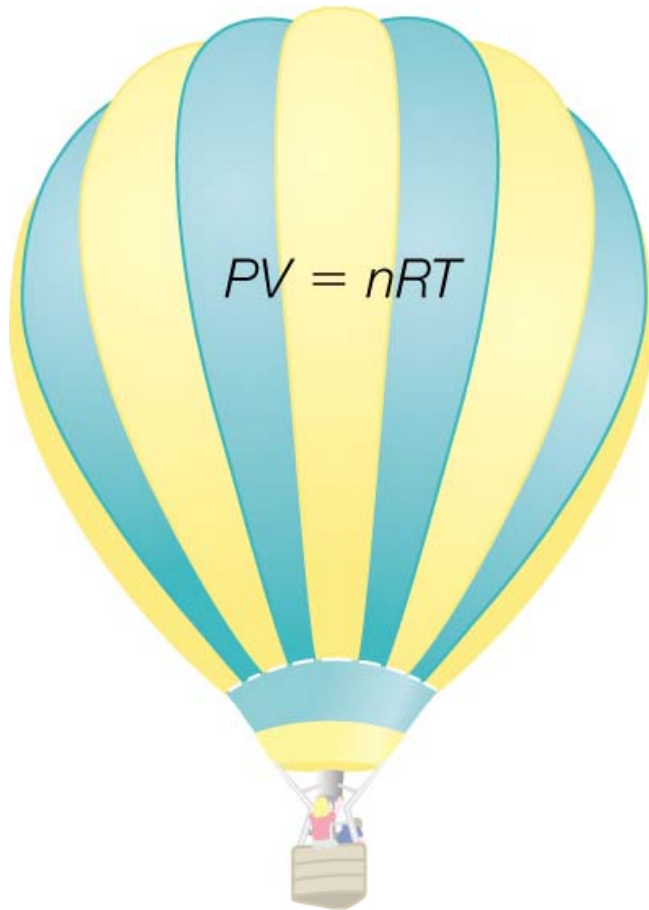
- Physical Chemistry for the Life Sciences
(Engel, Drobny and Reid)
- Biophysical Chemistry
(James P. Allen)

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Lecture

Thermodynamics

Macroscopy vs Microscopy



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熱力學的四個法則

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The Zeroth Law of Thermodynamics

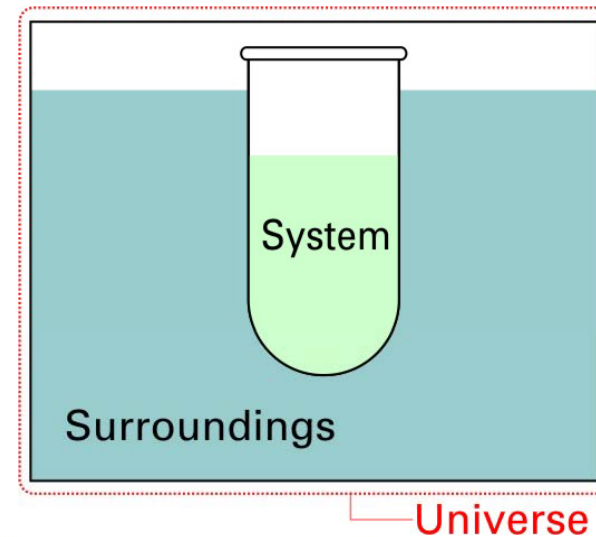
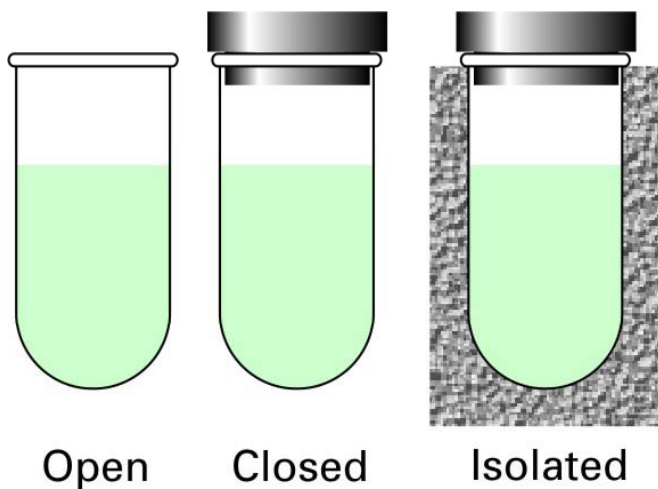
- Two systems that are separately in thermal equilibrium with a third system are also in thermal equilibrium with one another.

$$\begin{array}{l} A = B \\ B = C \end{array} \quad \Rightarrow \quad B = C$$

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The First Law of Thermodynamics

- The internal energy, U , of an isolated system is constant.



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The Second Law of Thermodynamics

- It is impossible for a system to undergo a cyclic process whose sole effects are the flow of heat into the system from a cold reservoir and the flow of an equivalent amount of heat out of the system into a hot reservoir.

$$\Delta S > 0$$

y.□

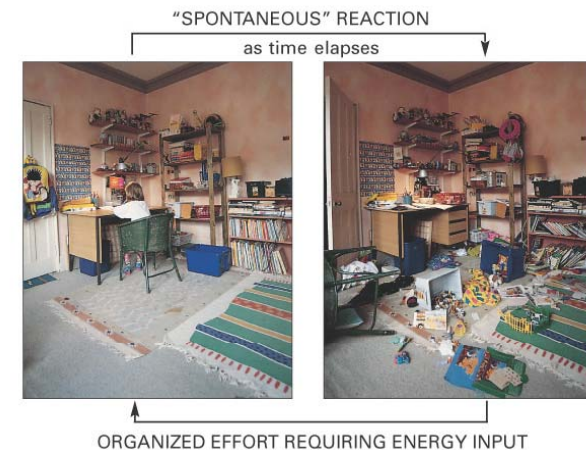


Figure 3-5 Essential Cell Biology, 2/e. (© 2004 Garland Science)

“SPONTANEOUS” REACTION

as time elapses



ORGANIZED EFFORT REQUIRING ENERGY INPUT

Figure 3-5 Essential Cell Biology, 2/e. (© 2004 Garland Science)

The Third Law of Thermodynamics

- The entropy of a pure, perfectly crystalline substance (element or compound) is zero at 0K.

$S = 0$, when crystalline at 0K

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End of Lecture

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