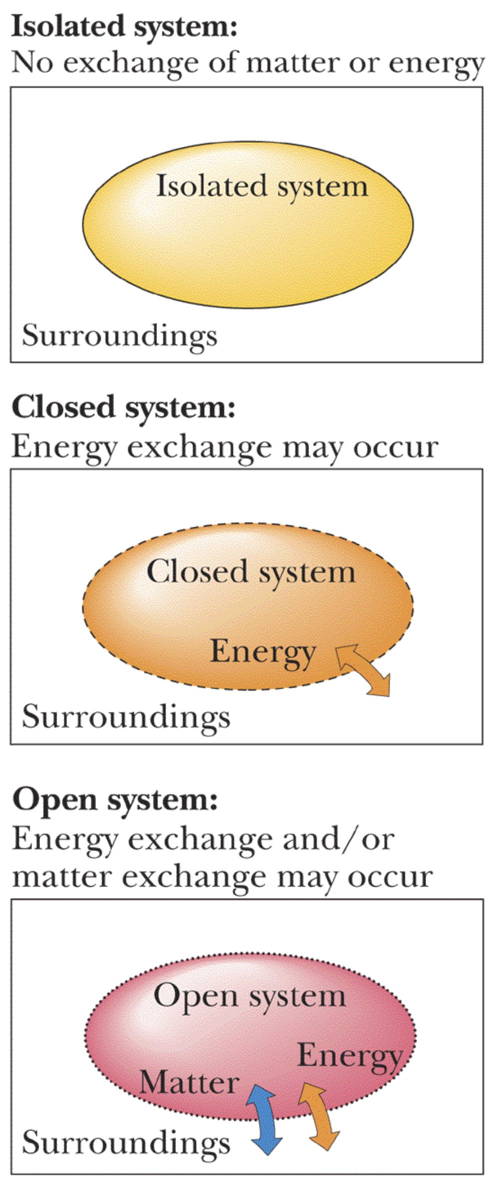
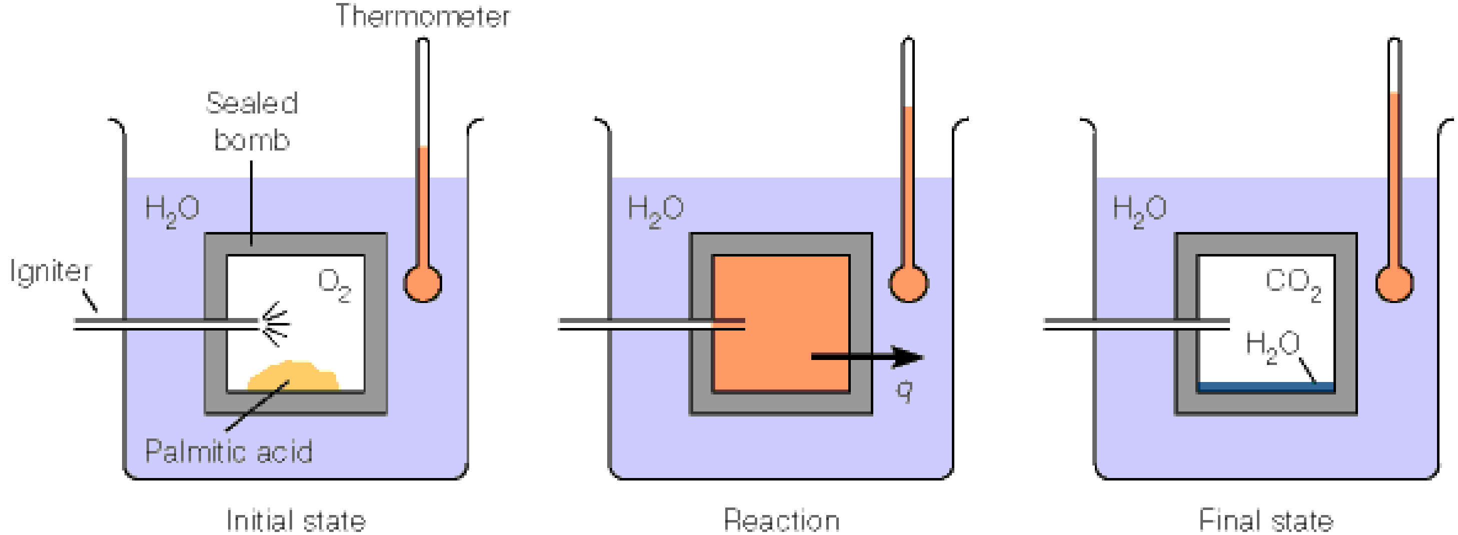
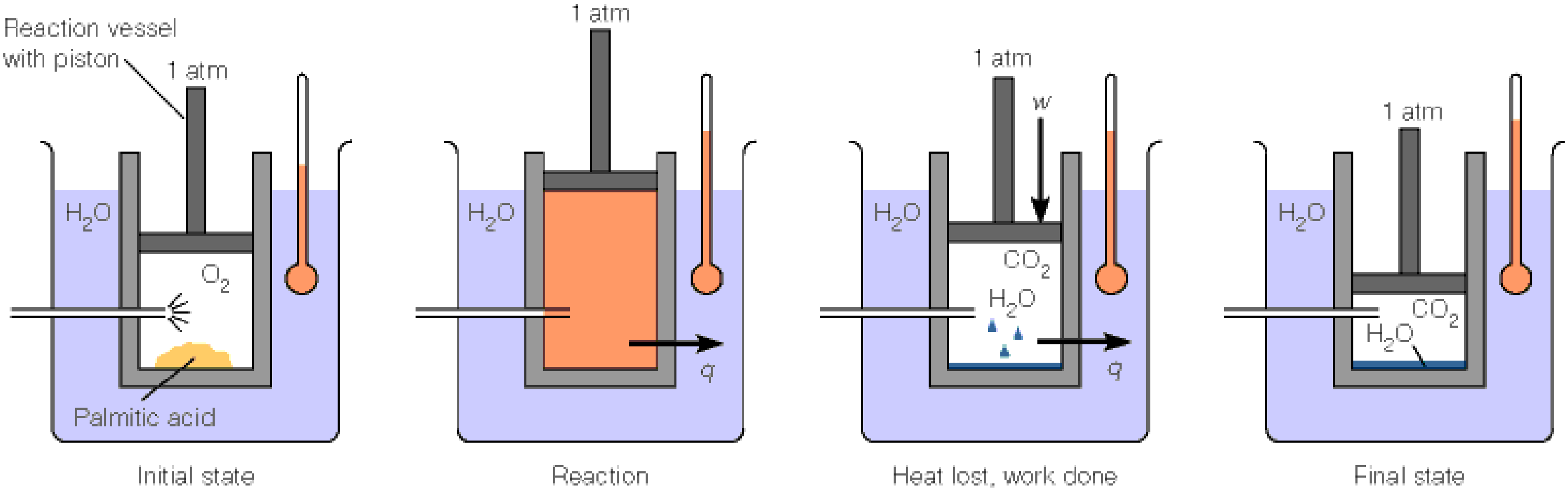
Garrett/Grisham, Biochemistry with a Human Focus
Figure 3.1





(a) Reaction at constant volume



(b) Reaction at constant pressure

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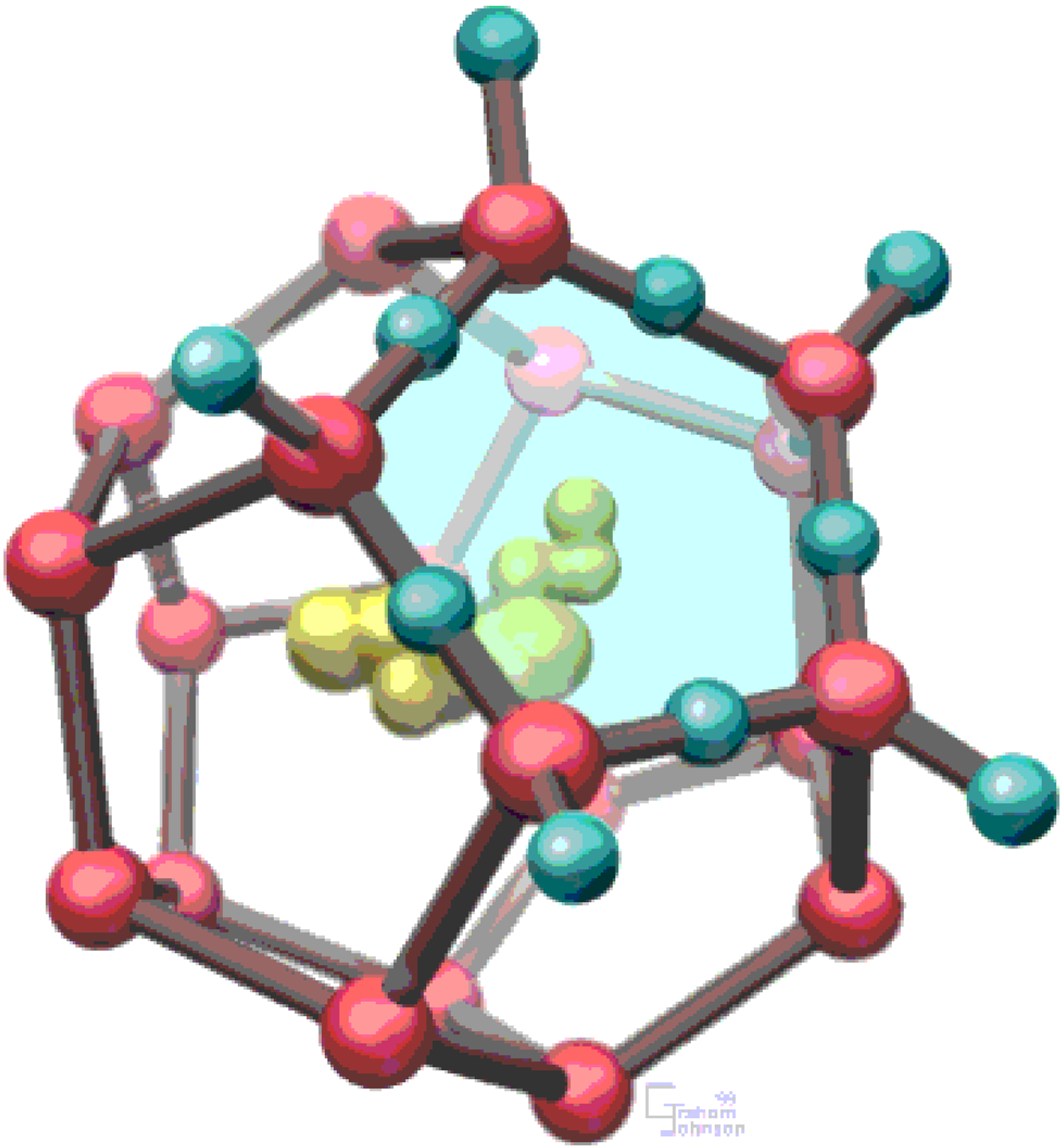

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Figure 2.5

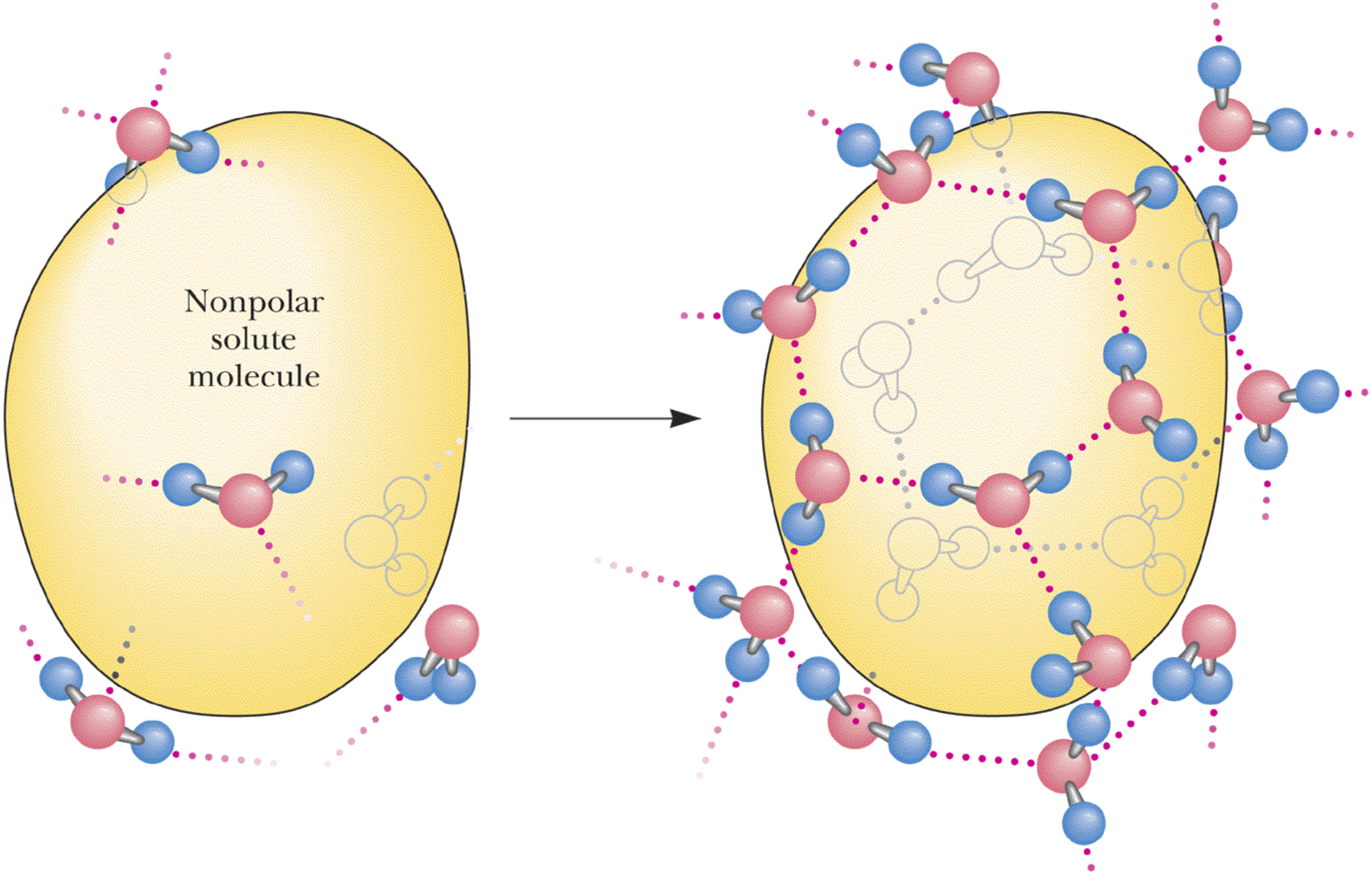

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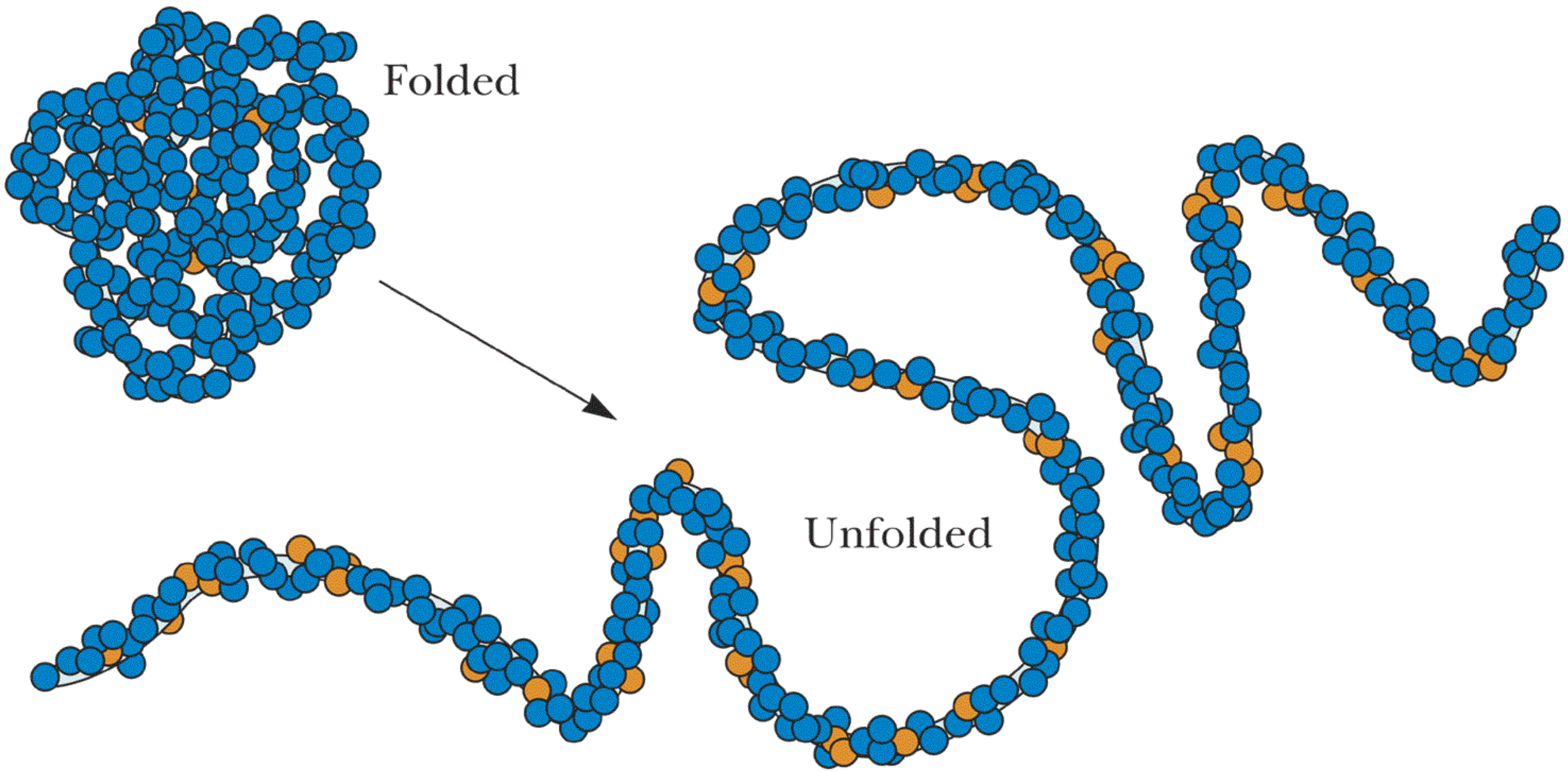
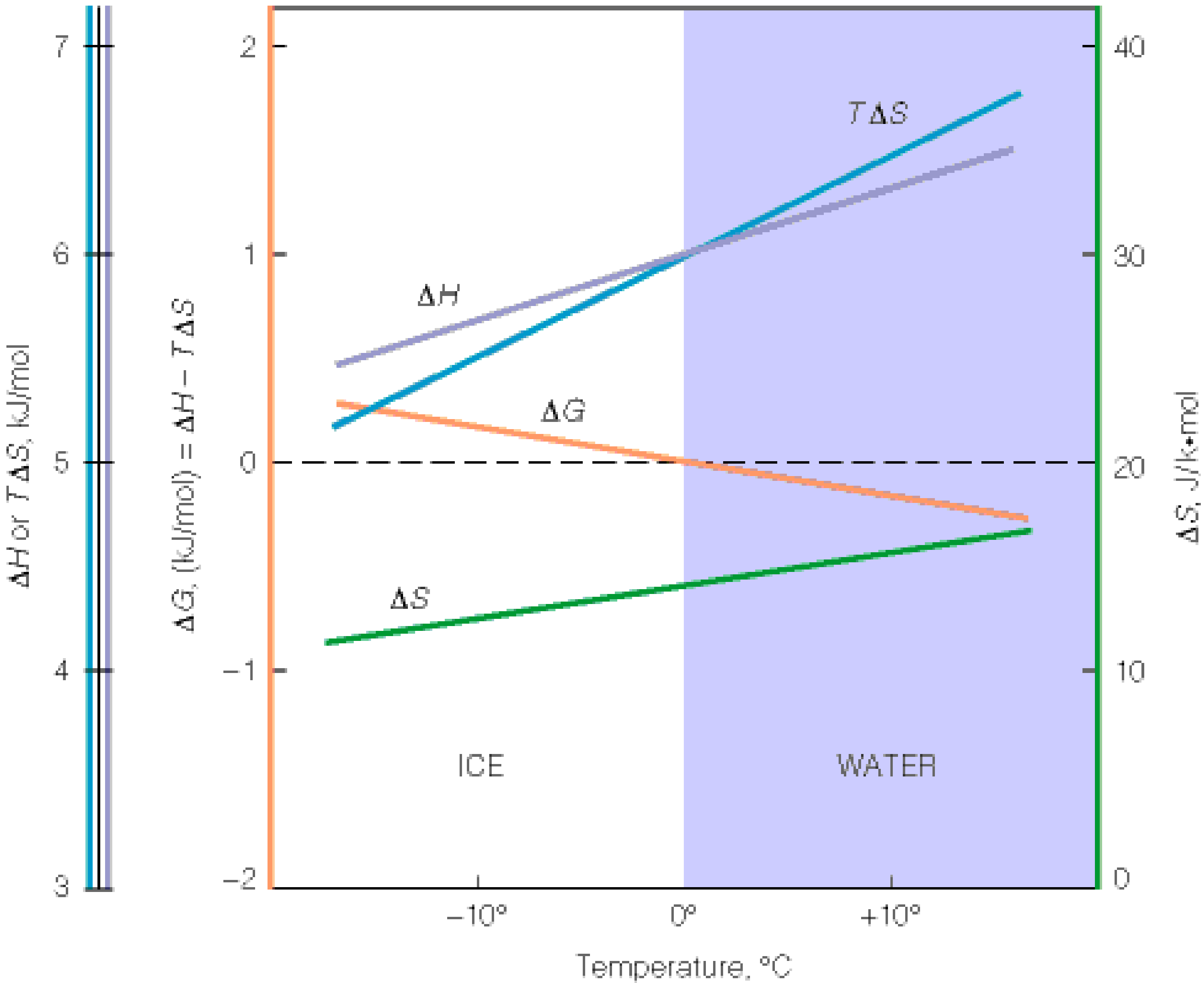
Figure 3.6

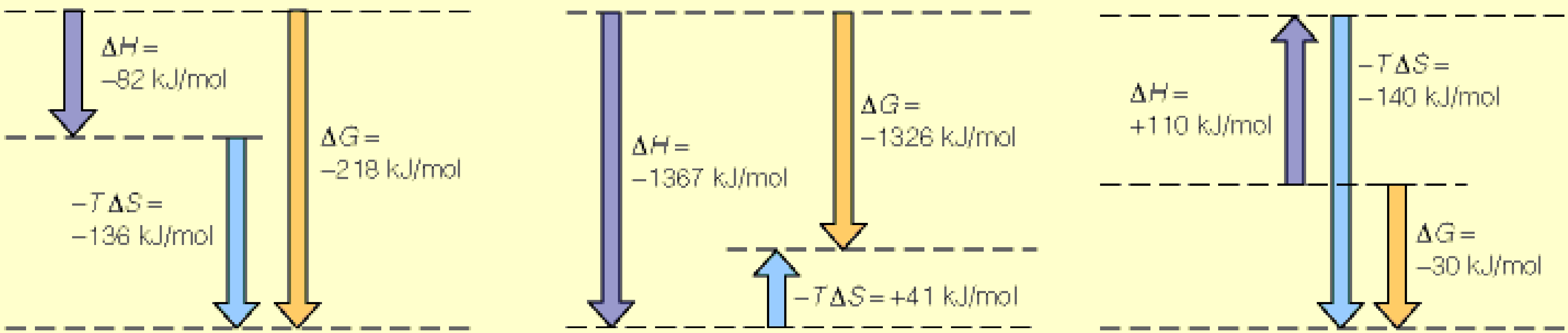


ΔH	ΔS	Low T	High T
+	+	ΔG positive; not favored	ΔG negative; favored
+	−	ΔG positive; not favored	ΔG positive; not favored
−	+	ΔG negative; favored	ΔG negative; favored
−	−	ΔG negative; favored	ΔG positive; not favored

From Biochemistry, Matthews/VanHolde



From Biochemistry, Matthews/VanHolde



(a) Fermentation of glucose to ethanol

$C_6H_{12}O_6(s) \rightarrow 2C_2H_5OH(l) + 2CO_2(g)$

Both enthalpy and entropy changes favor the reaction.

(b) Combustion of ethanol

$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$

Enthalpy favors this reaction, but entropy opposes it. We could call this an "enthalpy-driven" reaction. If water *vapor* were the product, an entropy increase would favor the reaction as well.

(c) Decomposition of nitrogen pentoxide

$N_2O_5(s) \longrightarrow 2NO_2(g) + 1/2O_2(g)$

This is a somewhat unusual chemical reaction in that it is "entropy-driven." The reaction actually absorbs heat but is favored by the large entropy increase resulting from the formation of gaseous products.

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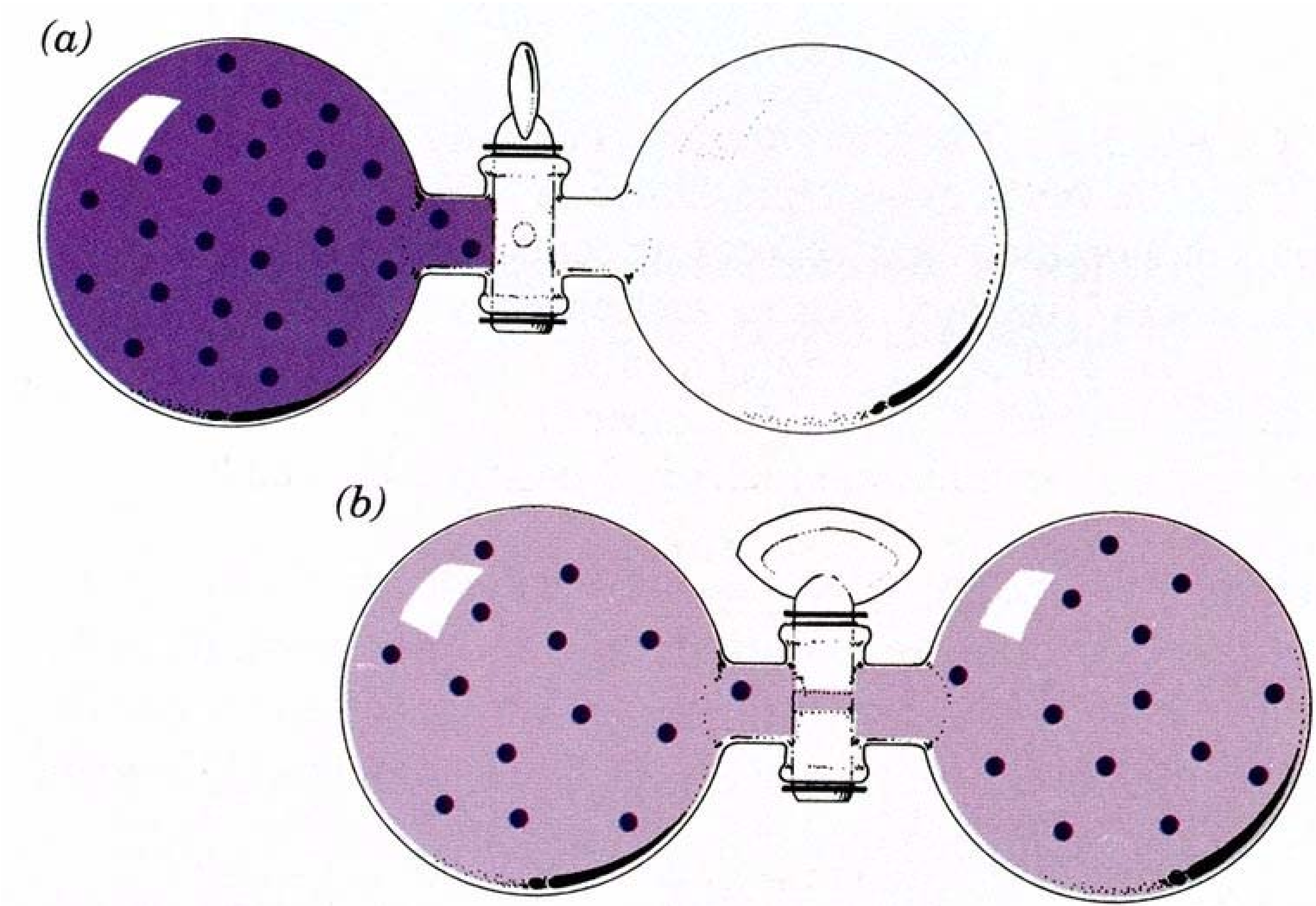
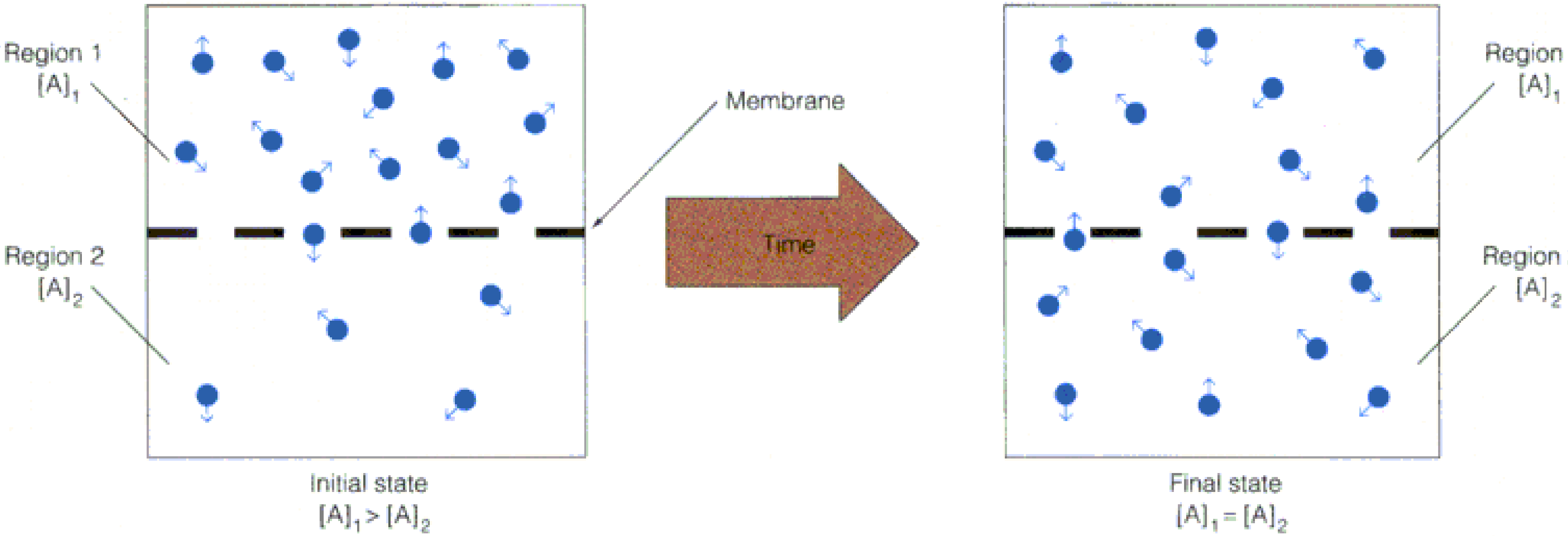


Biochemistry 2nd ed, Voet/Voet



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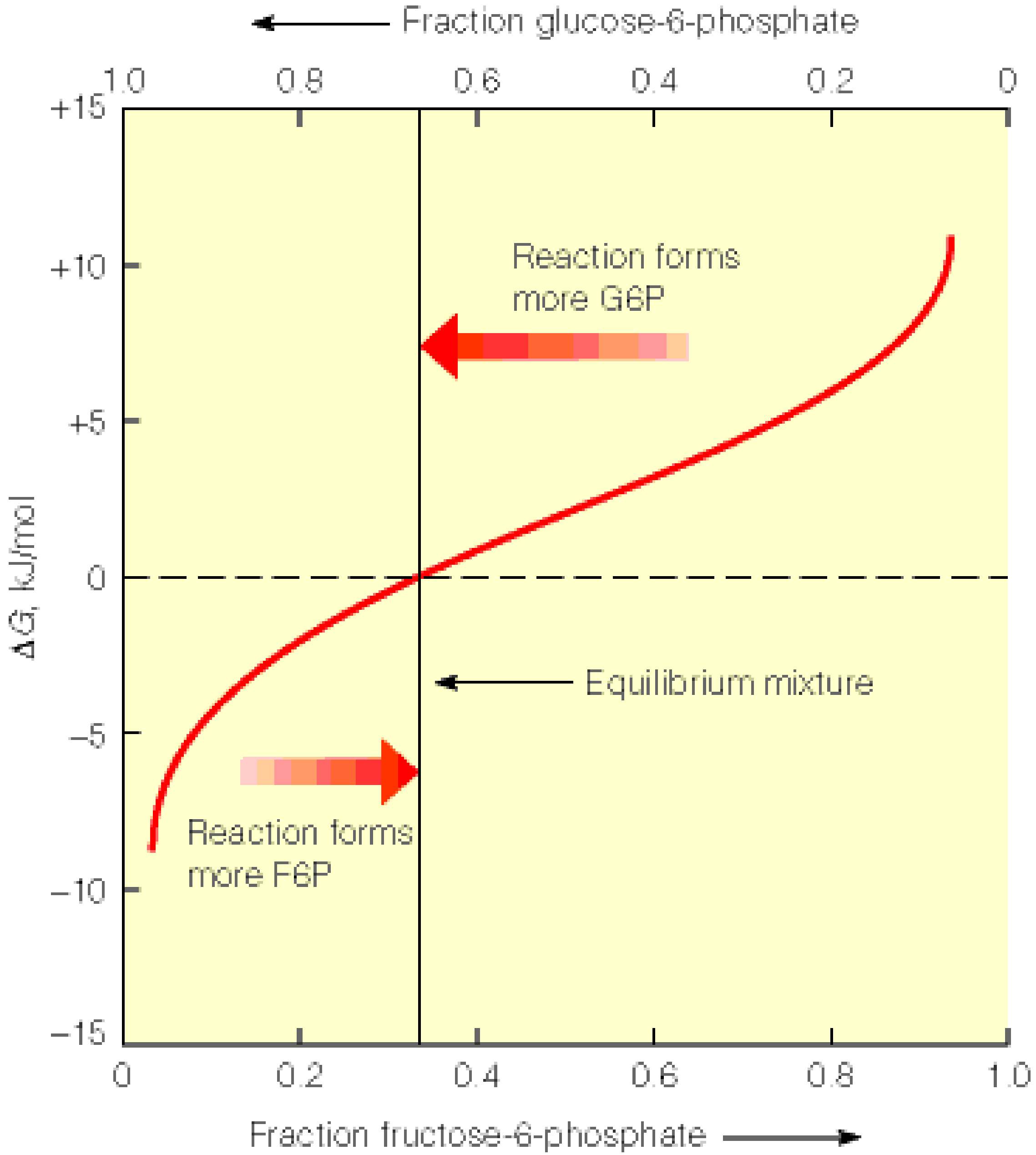

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Table 3.1 **Thermodynamic Parameters for Protein Denaturation***

Protein (and conditions)	$\Delta H°$ kJ/mol	$\Delta S°$ kJ/mol · K	$\Delta G°$ kJ/mol	ΔC_p kJ/mol · K
Chymotrypsinogen (pH 3, 25°C)	164	0.440	31	10.9
β-Lactoglobulin (5 *M* urea, pH 3, 25°C)	−88	−0.300	2.5	9.0
Myoglobin (pH 9, 25°C)	180	0.400	57	5.9
Ribonuclease (pH 2.5, 30°C)	240	0.780	3.8	8.4

*Adapted from Cantor, C., and Schimmel, P., 1980. *Biophysical Chemistry*. San Francisco: W. H. Freeman, and Tanford, C., 1968. Protein denaturation. *Advances in Protein Chemistry* **23:**121–282.