PRINT NEATLY *** **USE A BLACK PEN** *** **DO NOT STAPLE**

Course 565/665 Lecture Number ____ Date 4/10/03

Lecturer Dr. Silvia Cavagnero Note Taker Eric Fulmer

Typo Correction:

$$\Delta G^\circ = \Delta H^\circ_m \left(1 - \frac{T}{T_m}\right) + \Delta C_p \left(T - T_m - T \ln\left(T/T_m\right)\right)$$

(↓ on the T inside the logarithm)

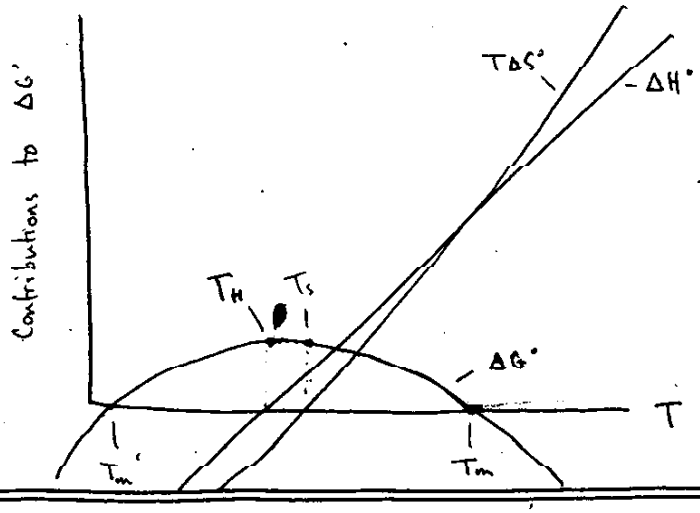
Last Time

$\Delta C_p > 0$ implies the hydrophobic effect.

ΔG° @ T_s (ie. the temperature at which stability is maximized) is approximately 10 kcal/mol for most proteins.

1 covalent bond: 50 to 100 kcal/mol.

1 hydrogen bond in water: 2 - 5 kcal/mol.

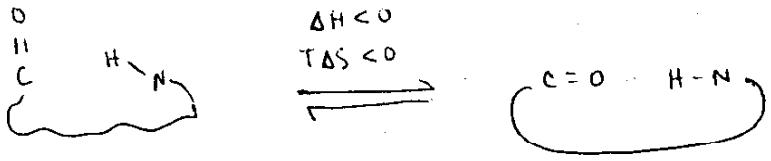


$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$

ΔH° = "strength of interactions"

ΔS° = "Variation in degree of disorder"

Consider a Protein Backbone H-bond Formation:



Not Formed. Many configurations possible.

H-bond formed. Distinct structure required.

{ W large
S large

{ W small
S small

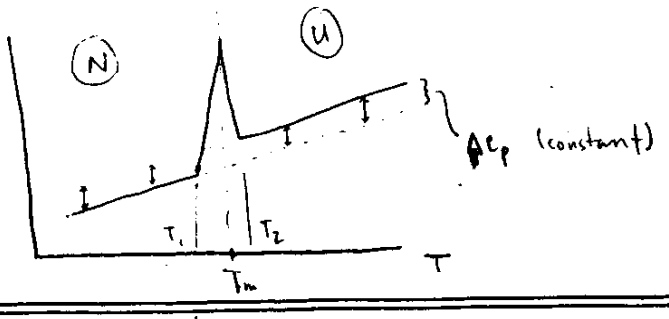
Enthalpic contributions occur.

Enthalpic - Entropic Compensation

- $T\Delta S^\circ$ has the same sign as ΔH°
- $|T\Delta S^\circ| \approx |\Delta H^\circ|$

Differential Scanning Calorimetry (DSC)

$$\left(\frac{\partial H}{\partial T}\right)_{P,N} = C_P$$



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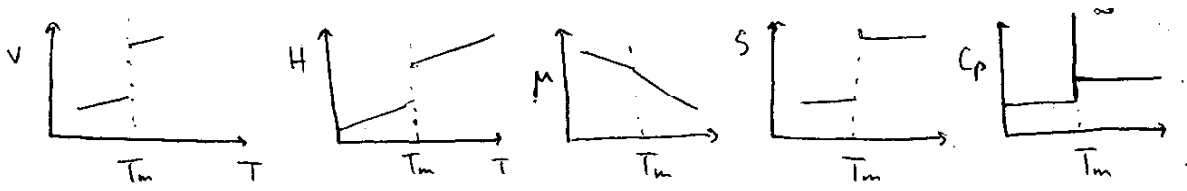
$$\Delta H_m^\circ \Rightarrow \Delta C_{p\,T_m} = \left(\frac{\partial \Delta H_{T_m}}{\partial T}\right)_p$$

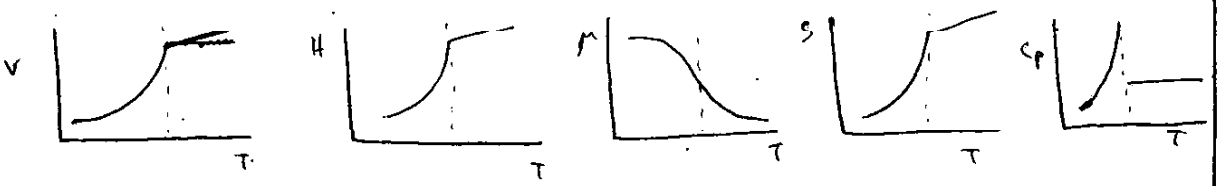
$$\Delta C_p\,(T_2 - T_1) = \Delta H^\circ_{(T_2 - T_1)} \equiv \Delta H_m^\circ$$

1st Order Phase Transition



These plots assume perfect cooperativety. Proteins undergo a psendo-1st order phase transitions.

2nd Order Phase Trasitions



1st Order

Water
Metals
Organic Solvents

2nd Order

Superconducting materials
Metal Alloys (Special Alloys)
He fluid/s. fluid transitions