**Chemistry-4311**
**November 6, 2015**

**Quiz #6** **Name** Key

$R = 1.987 \text{ cal } K^{-1} \text{ mol}^{-1} = 8.314 \text{ J } K^{-1} \text{ mol}^{-1} = 0.08206 \text{ L atm } K^{-1} \text{ mol}^{-1}$
$K = {}^{\circ}C + 273.15$

1. Matching (Use a letter only once)

$\Delta G_r$ for a chemical reaction is given by h.

If the chemical reaction is endothermic, the equilibrium constant j with increase in temperature.

The equilibrium constant varies versus temperature according to a.

The standard state activity of $H_2O(l)$ is b.

At equilibrium d is zero.

a. $\ln(K_2/K_1) = (-\Delta H_r^{\circ}/R)[T_2^{-1} - T_1^{-1}]$
b. unity
c. decreases
d. $\Delta G_r$
e. $-RT\ln K$
f. zero
g. $K_2/K_1 = R\ln(T_2/T_1)$
h. $\Delta G_r^{\circ} + RT\ln Q$
i. $\Delta G_r^{\circ}$
j. increases

2. The folded ↔ unfolded equilibrium constant for a certain peptide is 0.001 at 298 K and 1.0 at 350 K.

a. What is $\Delta G_r^{\circ}$ for this reaction at 298 K?

+2 $\Delta G_r^{\circ} = -RT\ln K = -8.314 \times 298 \times \ln(0.001)$
$= 17,114 \text{ J} = 17.114 \text{ kJ}$

b. What is $\Delta H_r^{\circ}$ for this reaction?

+2 $\ln\left(\frac{K_2}{K_1}\right) = -\frac{\Delta H_r^{\circ}}{R}\left[\frac{1}{T_2} - \frac{1}{T_1}\right]$

$\ln\left(\frac{1.0}{0.001}\right) = -\frac{\Delta H_r^{\circ}}{R}\left[\frac{1}{350} - \frac{1}{298}\right]$

$R = 8.314$

$\Delta H_r^{\circ} = 115,193 \text{ J}$
$= 115.193 \text{ kJ}$

c. What is $\Delta S_r^{\circ}$ for this reaction?

+1 $\Delta G_r^{\circ} = \Delta H_r^{\circ} - T\Delta S_r^{\circ}$

$17,114 \text{ J} = 115,193 \text{ J} - 298\ \Delta S_r^{\circ}$

$\Delta S_r^{\circ} = 329.12 \text{ J/K}$