

Chemistry-4311
November 1, 2013

Quiz #7

Name Ker

$R = 8.314 \text{ J/mol-K} = 0.08206 \text{ L-atm/mol-K} = 1.987 \text{ cal/mol-K}$, $N_A = 6.02 \times 10^{23}$

1. Matching (Use a letter only once)

At constant T, ΔG , ΔH , and ΔS are related by h.

$\ln(K_2/K_1)$ equals f.

ΔG_r equals a.

ΔG_r° equals e.

The activity of $\text{H}_2\text{O}(l)$ is b.

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

2. For a reaction $K = 0.143$ at 25°C and $K = 0.193$ at 45°C .

a. Calculate ΔG_r° at 25°C .

2

$$\Delta G_r^\circ = -RT \ln K = \frac{-8.314 \text{ J}}{\text{mol-K}} \times 298 \text{ K} \times \ln(0.143)$$

$$= 4,819 \text{ J/mol} = \underline{\underline{4.819 \text{ kJ/mol}}}$$

b. Calculate ΔH_r° .

2

$$\ln \frac{K_2}{K_1} = \frac{-\Delta H_r^\circ}{R} \left[\frac{1}{T_2} - \frac{1}{T_1} \right], \quad \ln \frac{0.193}{0.143} = \frac{-\Delta H_r^\circ}{8.314} \left[\frac{1}{318} - \frac{1}{298} \right]$$

$$0.2998 = -\Delta H_r^\circ \left[-2.54 \times 10^{-5} \right]$$

$$\Delta H_r^\circ = 11,810 \text{ J/mol} = \underline{\underline{11.81 \text{ kJ/mol}}}$$

c. Calculate ΔS_r° .

1

use 25°C

$$\Delta G_r^\circ = \Delta H_r^\circ - T\Delta S_r^\circ$$

$$4,819 \frac{\text{J}}{\text{mol}} = 11,810 \text{ J/mol} - 298 \Delta S_r^\circ$$

$$\Delta S_r^\circ = \underline{\underline{23.46 \frac{\text{J}}{\text{mol-K}}}}$$