Chemistry-4311
October 7, 2016

Quiz #4 **Name** Key

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

1. Matching (Use a letter only once)

With increase in entropy there is a (an) h in disorder

According to the 2nd Law of thermodynamics dS equals f.

The Gibbs free energy G equals a.

ΔS for heating a pure substance at constant P is e, d

At 0 K the entropy of a perfect crystalline solid is j.

a. H - TS
b. dU/T
c. decrease
d. positive
e. $\int C_P \ln(T_2/T_1)$
f. dq_{rev}/T
g. U - TS
h. increase
i. $\int C_P dT$
j. zero

2. Show that for a reversible process, with only P,V work, that:

a. $dU = TdS - PdV$

$dS = dq_{rev}/T$

$dw_{rev} = -PdV$

$dU = dq_{rev} + dw_{rev}$

$= TdS - PdV$

b. $dH = TdS + VdP$

$H = U + PV$

$dH = dU + PdV + VdP$

$= TdS - PdV + PdV + VdP = TdS + VdP$

3. A quantity of 0.50 moles of an ideal gas at 315 K is expanded from 2.0 L to 6.0 L isothermally and reversibly; $w_{rev} = -nRT\ln(V_2/V_1)$.

a. Give the expression for q for this expansion

For ideal gas, isothermal

$\Delta U = 0$

$\Delta U = q + w$

$q_{rev} = -w_{rev}$

$= nRT \ln(V_2/V_1)$

b. Calculate ΔS.

$$\Delta S = \frac{q_{rev}}{T} = nR \ln\left(\frac{V_2}{V_1}\right)$$

$= 4.57$ J/K

$= 0.0451$ l-atm/K