Chemistry-4311
September 20, 2013

Quiz #3 **Name** Key

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

1. Matching (Use a letter only once)

The enthalpy is defined as h.

Protein unfolding is an i process.

The difference in $C_p - C_v$ for an ideal gas is c.

a is used to measure heat changes for physical and and chemical processes.

f is determined from $\Delta\bar{H}_f^\circ$ values.

a. Calorimetry
b. H = q + PV
c. nR
d. C_p
e. exothermic
f. ΔH_f°
g. Isothermal
h. H = U + PV
i. endothermic
j. PV

2. One mole of an ideal gas is heated from 25 °C to 100 °C at a constant pressure of 1 atm.

(a) Calculate the initial and final volumes of the gas.

$PV = nRT$, $n = 1$

$V = \frac{RT}{P}$

$V_i = 0.08206 \times 298 = 24.45\ L$

$V_f = 0.08206 \times 373 = 30.61\ L$

(b) What are ΔH, ΔU, w, and q for this process. C_v for the gas is 3R/2.

There are different ways to work this.

Equations we know:

$w = -P_{ex}\Delta V = -R\Delta T$

$\Delta U = C_v \Delta T$

$\Delta H = \Delta U + P\Delta V$

$\Delta U = q + w$

$\Delta H = C_p \Delta T$

$\Delta H = q_p$

$\Delta U = C_v \Delta T = 3 \times 0.08206 \times 75/2$

$= 9.23\ L\text{-atm}$

$w = -P_{ex}(V_2 - V_1) = -1\ atm \times (30.61 - 24.45)$

$= -6.16\ L\text{-atm}$

$\Delta U = q + w$

$q = \Delta U - w = 9.23 + 6.16 = 15.39\ L\text{-atm}$

$\Delta H = \Delta U + P\Delta V = q_p = 15.39\ L\text{-atm}$