**Chemistry 6854**

**Physical Chemistry Alfred State College**

***Trends and Basic Calculations Involving the First and Second Law***

**0)What are true statements below ?**

a) The computation of the entropy, or energy of any system undergoing irreversible change must be computed using reversible pathways.

b) The exchange of heat, Q, occurring between system and surroundings is always viewed by

 the surroundings as reversible, whether the exchange occurs reversibly or irreversibly.

c)An adiabatic expansion occurs only if the temperature of the system decreases.

d) In an adiabatic process involving an ideal gas, T2/T1 = (V1/V2)2/3

e) In an adiabatic process involving an ideal gas: T2/T1 = (V1/V2)R/Cv

f) In an adiabatic process, the surroundings can still exchange work with the system, just not

 heat.

g) In an adiabatic process, the surroundings undergoes no entropy change.

h) Expansion of a differential dG(x,y) of two variables has the form:

$$\frac{∂G}{∂x}dx+ \frac{∂G}{∂y}dy$$

 =M(x,y) dx + N(x,y) dy

i) G above is a path independent if:

$$\frac{∂M}{∂y}=\frac{∂N}{∂x}$$

j) path independence for G means the change in G occurs infinitely slowly.

k) path independence means a change in G from state 1 to state 2 does not depend of either the rate of change or how state 2 is reached from state 1.

**1) In an isothermal, reversible expansion of an ideal gas from V1🡪V2 , what things are true below ?**

a) Wsystem = -P(V2-V1) b) ΔSsystem = 0 c) ΔEsystem = 0 d) Qsystem = -Wsystem

e) ΔSsurroundings  = 0 f) ΔSsurroundings + ΔSsystem = 0 g) Wsystem = -RT ln V2/V1

h) ΔSsystem = R ln V2/V1 i) Qsystem = -Qsurroundings j) maximum Q is exchanged

**2) If the above change is achieved by alternate path `2’ shown here:** path 2

a) W2 =W1 b) Q2> Q1 c) W2> W1 d)ΔE2 >ΔE1

e) W2 < W1 f) ΔS1 > ΔS2 g)ΔSsurroundings,2 > ΔSsurroundings, 1

T reversible isotherm

(path 1)

 V1 V2

**3) In an adiabatic, reversible expansion of an ideal gas from V1🡪V2, what things are true below?**

a) The surroundings does work on the system b) The system gives heat to the surroundings.

1. Qsystem = 0 d) Qsystem + Qsurroundings = 0 e) The system gains heat from the

 surroundings

f) The system gains work from the surroundings g) The system converts internal heat to

 work

1. h) ΔSsystem = 0 i) the temperature of the system decreases substantially j) ΔSsurroundings = 0

**4) In an adiabatic, irreversible expansion of an ideal gas from V1🡪V2:**

a)The final temperature of the gas is higher than achieved via reversible adiabatic expansion

b)ΔSsurroundings = 0 c) ΔSsystem > 0 d) |ΔEsystem,irrev| < |ΔEsystem,rev|

1. You need to use several reversible legs to reach the irreversible state

5) For an ideal gas:

At constant P, the sign of the energy for gas heating from T1🡪T2 is: (+) (-) (no change)

At constant P, the sign of the work for heating from T1🡪T2 is: (+) (-) (no change)

At constant P, the energy change of gas heating from T1🡪T2 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

At constant P, the entropy change of gas heating from T1🡪T2=\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

At constant V, the sign of the energy for gas heating from T1🡪T2 is: (+) (-) (no change)

At constant V, the sign of the work heating from T1🡪T2 is: (+) (-) (no change)

At constant V, the energy change of gas heating from T1🡪T2 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

At constant V, the entropy change of gas heating from T1🡪T2 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_