Name: **Student Number:**

7/10

APS104S - Introduction to Materials and Chemistry

Pop Quiz #2

Tuesday February 10th, 2009 – 11:45am to 12pm

Instructions:

- Write your name and student number at the top in the space provided
- You are not allowed to use calculator, aid sheet, notes, handouts or textbook
- Choose your answers to the questions and explain in no more than 2 sentences why you made that choice. You can use sketches, diagrams or formulas in your explanation.

G Saini 10/2/09

Problem #1: (2.5 points)

An ideal gas expands isothermally and reversibly, indicate whether each of the following is greater than, equal to, or less than zero.

(a) ΔS_{system}

>0 ✓

$\Delta S = nC_v \ln \frac{T_2}{T_1} + nR \ln \frac{V_2}{V_1}$

If V_2 increases then $\frac{V_2}{V_1}$ increases

(b) $\Delta S_{surroundings}$

=0 ✓

$\Delta S_{surr} = \frac{Q_{surr}}{T_{surr}}$

It is isothermal rev, so no Q.

(c) $\Delta S_{universe}$

>0 ✓

$\Delta S_{universe} = \Delta S_{system} + \Delta S_{surroundings}$

= greater than 0 + 0

= greater than 0.

0.5

Problem #2: (2.5 points)

Indicate if the following statements are true or false

(a). $\Delta_{vap}S$ is always greater than zero.

(b). A process is spontaneous if $\Delta S_{universe} = 0$.

a) True $\Delta S_{vap} = \frac{\Delta H_{vap}}{T_{vap}}$ ✓

b) False A process is spontaneous if $\Delta S_{universe} > 0$ ✓

2.5

Problem #3: (2.5 points)

Which of the following will produce an increase in the entropy of a system

(a). Increase temperature
(b). Sublimation (evaporation of solids)
(c). An increase in the volume of the system

1.5

$\Delta S = nC_v \ln\frac{T_2}{T_1} + nR\ln\frac{V_2}{V_1}$

Increasing T and V means that $\frac{T_2}{T_1}$ and $\frac{V_2}{V_1}$ increase.

what happens in case of sublimation?

Problem #4: (2.5 points)

Classify the following processes as reversible (**R**), irreversible or spontaneous (**S**) or impossible (**I**)?

(a) A "super" heat conductor material is discovered that allows heat to flow from a cold system at low temperature to the surrounding room at a higher temperature.

(b) The average temperature of the Earth is increased by a huge volcanic eruption, which deposits a large amount of molten lava on the Earth's surface.

(c) A process in an isolated system for which ΔS_{system} is zero

a) I Heat always flows from area of high to low concentration (second law).

b) S This is spontaneous since Q is positive $\therefore \frac{Q}{T} = \Delta S$

c) R

An adiabatic system can have $\Delta S = 0$ since $\Delta S \frac{Q_{rev}}{T}$

2.5