Chem 203
First Exam-Part A
Friday October 5, 1990

Name ___________

R=8.314 J/K mol
=1.98 cal/K mol
=0.082 lt atm/K mol

Full credit will be given to correct answers only when ALL the necessary steps are shown. DO NOT GUESS THE ANSWER.

This is a closed book exam, and you are responsible to be sure that your exam has no missing pages(5 pages). During the first 5 minutes read all the questions. Once you start answering, you have up to 50 minutes to finish the exam.

If you consider that there is not enough information to solve a problem, you have to specify the missing information and describe the problem solving procedure.

Honor Statement

I have neither give nor received aid in this examination.

Full signature ________________________________

Problem 1 (20 points) Compute ΔH°_{rxn} for $AgNO_3(aq)$ + $KBr(aq)$ ∅ $AgBr(s)$ + $KNO_3(aq)$ Given: 50 ml of 1mol/L $AgNO_3(aq)$ is added to 50 ml of 1mol/L KBr(aq) in a calorimeter(heat capacity 1.42 kJ/K) and the temperature increases 1.19K.

a) -1.69 kJ
b) 1.69 kJ
c) - 33.8kJ
d) 33.8 kJ
e) - 3.38 kJ

Problem 2 (20 points) The enthalpy change for the combustion of CH_3 $NO_2(l)$ is -638.5 kJ/mol (nitrogen gas is a product). If ΔH°_f of $CO_2(g)$ and H_2 O(g) is -393.5 and -241.8kj/mol, calculate ΔH°_f of CH_3 $NO_2(l)$.
a). +3.2 kj/mol
b). -117.7 kj/mol
c). -726.2 kj/mol
d). -638.5 kj/mol
e). -1394.7 kj/mol

Problem 3 (20 points) Derive an expression for $(\partial V/\partial T)_{P\ n}$ for an ideal gas. Evaluate the cubic expansion coefficient

$$\alpha = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_{P\ n}$$

for an idela gas at 0°C.

a) 0
b) 0.00366/K
c) 3.66/K
d) 273/K
e) ∞

Problem 4 (20 points) Given that the equation of state for a gas is

$$P(V- nb) = nRT,$$

where b is a constant. Obtain an expresion for the work done by the gas in a reversible, isothermal expansion from V_1 to V_2 . Given that the internal energy of a fixed mass of the gas depends only on T, obatined expressions for ΔU and ΔH for the gas in the reversible, isothermal expansion. Compare the results to those obtained for an ideal gas.

Problem 5 (30 points) Calculate the change of entropy when 50.0 g of water at 0^{o} C is dropped into 50 g of water at 100^{o} C in an insulated vessel. The enthalpy of fusion of ice is 6.01 kJ mol^{-1} , and the heat capacity of water is 75.4 J mol^{-1} K^{-1} .