SECOND SEMESTER-2005

CHEMISTRY -1

Question 1

a) Give an example of oblate symmetric top molecule. Give the relationship between moment of inertia of this molecule.
b) Calculate the energy of the photon of the light of the wavelength 400nm.
c) Find the degree of dissociation of 0.01 M CHCOOH solution.
d) At the triple point of water, which of the following curve gas a larger slope and why:
   Solid → vapour, Liquid→vapour.
e) The plot of 1 n vs 1/T gave a straight line and the slope was found to be. Calculate the activation energy.
f) The unit cell of gold has a FCC structure. Calculate the mass of a gold unit cell().
g) Heat of neutralization of NHOH and CHCOOH is 51.46kj/mol. Calculate H=57.1 of NHOH (for strong acid and strong baseH=-57.1 kj/mol)
h) Write down the net cell reaction for
i) Write down the reaction involved in a dry cell.

Question 2

a) Write down the molecular orbital configuration of N and NO molecule. Compare their stability and magnetic properties.(3)
b) Calculate the voltage required to accelerate an electron to have velocity of 1.87x10 m/s . what will be the deBroglie wavelength ?(3)
c) Calculate the uncertainty in the velocity of the particle with mass 6x 10 kg , If the uncertainty in the position is 1nm.
d) Discuss the physical significance of

Question 3

a) The force constant of HF and DF molecules are same i.e 9.7x10 Nm. Calculate the zero point energy of the DF molecule and compare the value with that of HF molecule.(4)
b) The separation of line in the microwave spectra of CO molecule was found to be 198m. Calculate the bond length of CO molecule.(3)
c) A compound with molecular formulae XY shows two IR active bands at 667 cm (degenerate) and 2349 cm .Speculate the structure of the molecule and assign the bands to its molecular vibrations.(3)

Question 4

a) For the reaction , the equilibrium constant is  at 727 C. If one mole of I is taken in two liter flask, Calculate the equilibrium concentration of I2 and I.(4)
b) Show that:

c) Show that W> W for an ideal gas.(3)


## Question 5

a) If V=f(P,T), then show that dV is an exact differential for an ideal gas.(2)
b)  Two moles of and ideal gas at one atmospheric pressure and 27 C undergoes the following process ;
   (i)     Heat is absorbed at constant volume till the pressure is doubled.
   (ii)    Isothermal and reversible expansion till the pressure is reduced to 0.8 atm.
   (iii)   Adiabatic compression till initial stage is reached .

   Calculate for the cycle.()(4)

c) Calculate
   (i)     G
   (ii)    Minimum temperature at which the reaction is reversible for the reaction


   From the following data:

## Question 6

a) The emf of the following cell is 0.445 v:
   Pt,H(1 atm) | H (unknown) ||Kcl(satd.) |HgCl |Hg . Calculate the pH of the solution.
b) The voltage of a cell at 25 C and 20 C are 0.35252 V and 0.35333 respectively, If the no of electrons involved in the following  reaction is two, Calculate at 25 C(4)
c) The equilibrium constant for the reaction



   Find out the standard electrode potential of , If the standard reduction potential of Ag.(3)

## Question 7

a) Calculate the order of the reaction from the following data:
   Which of the following mechanism agree with the rate law?
b) The values of the rate constants of a reactions at 356C and 443 C are respectively. Calculate Ea for forward and backward reaction if H is 16.32kj/mol.(4)
c) Differentiate between the catalytic poisoning and negative catalyst with example.(2)

## Question 8

a) Find out the pH of the buffer solution containing 0.2 M formic acid and  0.1 M sodium formate solution.(3)

b) Draw a neat sketch and discuss the equilibrium phase diagram of water system.(3)
c) Predict the kind of tradition taking place in
(i)      Cl molecule and
(ii)      Carbonyl group in electronic spectroscopy .(2)
d) What are the coordination number of each ion present in rutile TiO molecule at ordinary temperature and pressure?(2)