MODEL QUESTIONS ON THERMODYNAMICS (sem 3)

1. Given the state function *U(S, V) : dU = TdS – PdV*. Apply Legendre transformation to get functions *X(T, V)* and *Y(T, P).*
2. Given the state function *H(S, P) : dH = TdS +VdP*. Apply Legendre transformation to get functions *X(T, V)* and *Y(T, P).*
3. Given the state function *S(U, V) : dS = (1/T)dU –(P/T)dV*. Apply Legendre transformation to get functions *X(T, V).*
4. Show that $\mu_i = (\partial A/\partial n_i)_{T,V,n} = (\partial U/\partial n_i)_{S,V,n} = T(\partial S/\partial n_i)_{U,V,n}$
5. How does μ depend on *T* and *P*?
6. Discuss whether μ is an extensive/intensive property.
7. Define a partial molar quantity. Discuss whether μ is a partial molar quantity.
8. Discuss the physical significance of μ.
9. What is fugacity and fugacity coefficient of a real gas? How can you determine the fugacity coefficient of a real gas.
10. How will you determine the fugacity coefficient of a gas obeying *van der Waals* eqn. ?
11. How does μ/T depend on *T* at a constant *P*?
12. How does *lnf* depend on *T* and *P*?
13. Derive Gibbs Duhem eqn.
14. $\mu = \mu^0 + RT \ln P.$ Hence a plot of μ vs T would give a straight line with a positive slope. Justify or criticize.
15. Calculate the value of $(\mu - \mu^0)$ of an ideal gas in J mol^{-1} at 300K and 76 cm of Hg