1. Please define the activity of the components for the non-ideal solutions. (5%)
2. Please define the ionic strength of the solution. (5%)
3. Please describe the Raoult's law in detail. (5%)
4. Please describe the van der Waals's equation in detail. (5%)
5. Please describe the Clausius-Clapeyron equation in detail. (10%)
6. Please describe the Maxwell's relations for the thermodynamic properties in detail. (10%)
7. Please show that

$$\left(\frac{\partial E}{\partial T}\right)_V \left(\frac{\partial V}{\partial E}\right)_T \left(\frac{\partial T}{\partial V}\right)_E = -1$$

where E=internal energy. (10%)

8. Please describe the Langmuir isotherm in detail. (10%)
9. Prove that

$$\left(\frac{\partial S}{\partial E}\right)_H = \frac{-C_p}{T[C_p(P\beta-1)+PV\alpha(1-T\alpha)]}$$

where $\alpha = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$, $\beta = -\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$, S=entropy, H=enthalpy, and E=internal energy. (20%)

10. An equation for the temperature variation of the latent heat λ of a phase change along the equilibrium PT curve was derived by M. Planck as

$$\frac{d\lambda}{dT} = \Delta C_p + \frac{\lambda}{T} - \lambda\left(\frac{\partial \ln \Delta V}{\partial T}\right)_P$$

Derive the Planck equation, starting from

$$d\lambda = \left(\frac{\partial \lambda}{\partial T}\right)_P dT + \left(\frac{\partial \lambda}{\partial P}\right)_T dP$$ (20%)

試題隨卷繳回