國立臺灣大學98學年度碩士班招生考試試題

1. Please give the definitions of "entropy", "enthalpy", "chemical potential" and "osmotic pressure". (15%)
2. What is the difference between the Gibbs free energy and Helmholtz free energy? Please answer it in detail. (10%)
3. What is the Maxwell relation for thermodynamic properties? (10%)
4. Use the first law of thermodynamics and other relevant definitions to derive the following expression for C_V,

$$C_V = -\left(\frac{\partial U}{\partial V}\right)_T \left(\frac{\partial V}{\partial T}\right)_U$$

where U is the internal energy (15%)

5. Derive the expression $C_P - C_V = \frac{\alpha^2 TV}{\kappa}$, where $\alpha = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_P$, $\kappa = -\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$ (15%)
6. What are the colligative properties of simple mixtures? Please answer it in detail. (10%)
7. What is the regular solution? Please explain it in detail. (10%)
8. A strip of rubber may be regarded as thermodynamically analogous to a confined gas. Stretching the rubber corresponds to compressing the gas. The work done on the rubber is –dW=fdl, where f is the contractile force exerted by the rubber and l its length. Please show

$$\left(\frac{\partial U}{\partial l}\right)_T = -T\left(\frac{\partial f}{\partial T}\right)_l + f$$ (15%)

試題隨卷繳回