系組：應用化學研究所碩士班　　日期節次：98 年 3 月 21 日第 4 節 15:30-17:00

科目：物理化學[2231]

1. What are the term symbols ${}^{2S+1}L_J$ of the electron configuration $2s^1 2p^1$? (20%)

2. Prove that $[\hat{A}\hat{B},\hat{C}] = \hat{A}[\hat{B},\hat{C}] + [\hat{A},\hat{C}]\hat{B}$. (15%)

3. Prove that we do not exactly know the momentum of a free particle with wave function $\cos kx$. (15%)

4. Prove that $\left(\frac{\partial U}{\partial T}\right)_p = \left(\frac{\partial U}{\partial T}\right)_v$ for an ideal gas, where U is the internal energy. (15%)

5. The Lindemann mechanism is

$$A + M \xrightarrow{k_1} A^* + M$$
$$A^* + M \xrightarrow{k_{-1}} A + M$$
$$A^* \xrightarrow{k_2} P$$

Prove that $\frac{d[P]}{dt} = \frac{k_2 k_1 [A][M]}{k_{-1}[M] + k_2}$ (15%)

6. What is standard boiling point? What is normal boiling point? (10%)

7. What is ideal solution? What is ideal-dilute solution? (10%)