淡江大學九十學年度碩士班招生考試試題

系別：化學學系

科目：物 理 化 學

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本試題共 頁

1. What are the degeneracies of the first four energy levels for a particle in a 3-D box with a = b = 1.5c. 10%

2. Determine $\hat{H}$ and ϕ for Li atom. 10%

3. Use MO theory to predict whether the molecule Be_2 should exit. 10%

4. Derive an expression for the length of time required for the concentration of a reactant to become half the initial concentration in a first-order reaction 10%.

5. What would be the unit for the rate constant of a 3/2 order reaction? Use concentration in mol/dm^3, time in seconds. 10%

6. Consider the following proposed mechanism $A \underset{k_2}{\overset{k_1}{\rightleftharpoons}} B$, $B + C \xrightarrow{k_3} D$ for the overall chemical equation $A + C \rightarrow D$. Assuming B to be an intermediate described by the steady-state approximation, write the rate expression for C(A). 10%

7. Show that the probability density is independent of time. 10%

8. Show that the entropy change of a van der Waals gas for an isothermal change $V_1 \rightarrow V_2$ is $\Delta S = nR \ln[(V_2 - nb) / (V_1 - nb)]$, b is van der Waals constant. 10%

9. For a gas whose molar heat capacity is represented by $C_p = a + bT + cT^{-2}$, derive a formula for ΔS if the temperature is changed from T_1 to T_2 at constant pressure. 10%

10. What are the permitted J values for the following terms? ^6S, ^1F, ^2H, ^4P and ^3D 10%