

淡江大學九十四學年度碩士班招生考試試題

31-1

系別：化學學系

科目：物理化學

准帶項目請打「V」	
×	簡單型計算機
本試題共 / 頁	

Answer the following questions, 10% for each problem.

- List 3 intensive properties and 2 extensive properties.
- Briefly describe the third law of thermodynamics.
- Derive the second-order integrated reaction rate law, $[A] = \frac{[A]_0}{1 + kt [A]_0}$, where A is reactant and k is rate constant.
- Briefly describe the two assumptions for ideal gas.
- At 0 K, what kind of energy is not zero? How much is it? How do you call this energy?
- In quantum mechanics, Ψ is a state function, what are its variables? $\Psi^* \Psi = ?$ If Ψ is well-behaved, what does it mean?
- There is no classical analog of spin. In quantum mechanics, we postulate that for a single electron there are only two simultaneous eigenfunctions of \hat{S}^2 and \hat{S}_z . These are called α and β and have eigenvalue equations: $\hat{S}_z \alpha = ?$ $\hat{S}_z \beta = ?$ $\hat{S}^2 \alpha = ?$ $\hat{S}^2 \beta = ?$
- Briefly describe the variation principle, which is an approximation method of quantum mechanics.
- Draw a simplest two component (A and B) liquid-solid phase diagram at constant pressure. An eutectic point (E) is found at 40% B at temperature T_e . The melting point of A and B are T_A and T_B , respectively. Give the materials existing in each area on the phase diagram.
- Use the Boltzmann distribution law (or Arrhenius equation) to find the ratio of two reaction rate constants k_1 and k_2 at T_1 and T_2 , respectively, if the activation energy of the reaction is 100 kJ/mol. (List the mathematics equation with proper numbers only.)