國立成功大學

114學年度碩士班招生考試試題

編　號：203

系　所：環境醫學研究所

科　目：普通化學

日　期：0211

節　次：第 2 節

注　意：1.不可使用計算機
　　　　2.請於答案卷(卡)作答，於
　　　　　試題上作答，不予計分。

1. Describe Beer's Law and Henry's Law. (10%)

2. Describe the three laws of thermodynamics. (10%)

3. Describe the Diels-Alder reactions and Woodward–Hoffmann rules. (10%)

4. A 1.00-g sample of ^{226}Ra emits 3.7 x 10^{10} alpha particles per second. Find the decay constant and the half-life. (10%)

5. Calculate the activation energy for a reaction whose rate at room temperature is doubled by a 10°C increase. (10%)

6. What is a first-order reaction? Explain why the concentration of the reactant decreases exponentially with time. (10%)

7. What is Gibbs distribution? Describe the distribution using a mathematical equation with Boltzmann constant. (10%)

8. Find the osmotic pressure at 25°C and 1 atm of a solution of 1.8016 g of glucose ($C_6H_{12}O_6$) in 1000.0 g of water. The solution is contained in membrane equilibrium with pure water. (R = 82.06 cm^3 atm mol^{-1} K^{-1}) (10%)

9. Describe how Michaelis constant, K_M, and the maximal rate, V_{max}, can be readily derived from rates of catalysis measured at different substrate concentrations if the kinetic behavior of an enzyme follows Michaelis-Menten model. (10%)

10. Give the definitions of pH and pKa. What are the differences between these two terms? Calculate the pH of salicylic acid solution when the solution is titrated to contain only 1.0% of salicylates. Use the fact, pKa (salicylic acid) = 2.97, in your calculation. (10%)