

大同大學 100 學年度研究所碩士班入學考試試題

考試科目：反應工程

所別：生物工程研究所

第1/1頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算器。

(以下每題 25 分)

1. The rate constant for the reaction $2 \text{N}_2\text{O}_5(\text{g}) \rightleftharpoons 4 \text{NO}_2(\text{g}) + \text{O}_2(\text{g})$ is reported in units of $(\text{s})^{-1}$. What is the overall order of the reaction?

2. The kinetics of the hydrolysis of methyl methanoate, $\text{CH}_3\text{COOCH}_3$, in aqueous solution were investigated by measuring the concentration of the ester after different time intervals. The reaction was found to be first order in the concentration of the ester. Use the data below to determine the rate constant for the reaction.

time, t / s	0	1800	3600	5400	7200	9000
concentration, $c / \text{mol dm}^{-3}$	0.300	0.191	0.135	0.081	0.055	0.035

3. A substrate (S) is decomposed in the presence of an enzyme according to the Michaelis-Menten equation with the following kinetic parameters: $K_m = 10 \text{ g/L}$, $V_m = 7 \text{ g/(L min)}$

If we operate a 2-liter batch reactor, what will be the time of the reaction for 95% conversion? The initial substrate concentration is 50 g/L .

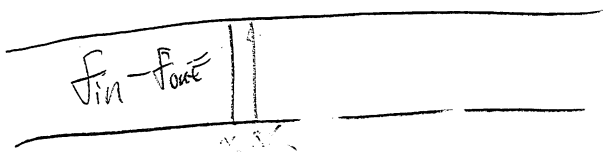
Hint: The Michaelis-Menten reaction :

$$\frac{dS}{dt} = - \frac{V_m S}{K_m + S}$$

4. An aqueous feed containing reactant A (1 mol/L) enters a one liter plug flow reactor and reacts away ($2\text{A} \rightarrow \text{R}$, Rate = $3C_A^2 \text{ mol/(L min)}$)

(a) Find what feed rate (L/min) will give an outlet concentration of $C_A = 0.5 \text{ mol/L}$

(b) Find what the outlet concentration of A (mol/L) for a feed rate of 0.5 L/min .



$$\frac{1 \pm \sqrt{1-6}}{6}$$

$$\frac{dV}{dt}$$

$$F_{in} - F_{out} = \int V dt$$

$$F_{in} - 0.5 = 3 \int C_A^2 dt$$