

國立臺北科技大學

九十三年年度生物科技研究所入學考試

反應工程試題

填 准 考 證 號 碼

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注意事項：

1. 本試題共 4 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. The first-order reaction $A \rightarrow B$ is carried out in a tubular reactor in which the volumetric flow rate, v , is constant. (a) Derive an equation relating the reactor volume to the entering concentration C_{A0} and exiting concentration C_A of A, the rate constant k , and the volumetric flow rate v . (10%) (b) determine the reactor volume necessary to reduce the exiting concentration to 10% of the entering concentration when the volumetric flow rate is $10 \text{ dm}^3/\text{min}$ and the specific reaction rate, k , is 0.23 min^{-1} . (10%)
2. The exothermic reaction $A + 2B \rightarrow 2D$ is virtually irreversible at low temperatures and the rate law is $-r_k = k_A C_A^{1/2} C_B$. Please determine a rate law that is valid at high temperatures, where the reaction is reversible: $A + 2B \rightleftharpoons 2D$ (Hint: derive from the equilibrium relationship of the reaction)(15%)
3. The oxidation of ethanol to form acetaldehyde is carried out on a catalyst. Unfortunately, acetaldehyde is also oxidized on this catalyst to form carbon dioxide. The reaction is carried out in a threefold excess of oxygen and in dilute concentrations. Consequently, the volume change with the reaction can be neglected. The reactions are irreversible and first-order in ethanol and acetaldehyde, respectively. Please determine the concentration of acetaldehyde as a function of space-time. (20%)

