

所別： 化工研究所 組別： × 科目： 化工動力學

注意： ☐ 不准 ☐ 一般計算器 ☒ 工程用計算器，考試時間總計：100 分鐘。試題共 2 頁，第 頁

100 分

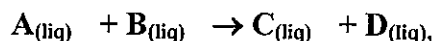
I. 解釋名詞 (20%)

1. Reversible reaction and irreversible reaction
2. Homogeneous and heterogeneous reactions
3. Arrhenius equation
4. Reaction mechanism
5. Limiting reactant
6. Mean residence time and space time
7. Recycle reactor
8. Series reaction and parallel reaction
9. Fractional yield and selectivity
10. Physical and chemical adsorption

II. 計算題 (80%)

1. (20%) There is a chemical reaction $A + 1/3B \rightarrow C + 1/3D$ in a batch reactor operated at isobaric and isothermally condition. At $t=0$, it was found $C_{A0} = 1 \text{ mM}$, $C_{B0} = 0.3 \text{ mM}$ without any C and D products. During a period reaction, calculate the concentrations of C_A , C_B , C_C , and C_D when the conversion is (1). $X=0.2$; (2). $X=0.99$?

2. (20%) The reaction in the batch reactor is as follows:



At $t=0$, the $C_{A0} = C_{B0} = 0.01 \text{ mol/L}$, the concentration of B species vs. time was recoded as follow:

Time/ min:	0	5	9	13	20	25	33	37
$C_B / \text{mol L}^{-1}$:	0.01	0.00755	0.00633	0.00541	0.00434	0.00385	0.00320	0.00296

Please find the rate constant (k) and the reaction order (n) for the reaction (the rate equation).

3. (20%) A liquid reaction $A \rightarrow P$, in a CSTR, the rate equation is $-r_A = 0.5C_A, \text{ mol L}^{-1} \text{ s}^{-1}$. If the

input conversion of A is $X_{A0}=0$, the initial concentration of A is 1 mol/L, the volumetric flow rate is 1 L/s, and also the reactor volume is 1 L. Calculate the fractional conversion X_A for (1).CSTR; (2). PFR reactors?

4. (20%) A liquid reaction $A \rightarrow P$, in a CSTR, but the rate equation is $-r_A = 0.5C_A^2$, mol L⁻¹ s⁻¹. If the input conversion of A is $X_{A0}=0$, the initial concentration of A is 1 mol/L, the volumetric flow rate is 1 L/s, and the reactor volume is 1 L. Calculate the fractional conversion X_A for (1).CSTR; (2). PFR reactors?