系別：化學工程與材料工程學系　　科目：化學反應工程

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1. For those ideal flow reactors, (20%)

   (a) List three types of ideal flow reactors, and describe their operation characteristics.

   (b) In order to find what a reactor is able to do, what do we need to know?

2. For the decomposition $A \rightarrow R$, $C_{A0} = 1$ mol/liter, in a batch reactor conversion is 75% after 1 hour, and is just complete after 2 hours. Find a rate equation to represent these kinetics. (20%)

3. At 649°C gaseous A decomposes as follows:

   $$4A \rightarrow B + C, \qquad -r_A = (10\,hr^{-1})C_A$$

   What size of plug flow reactor operating at 649°C and 11.4 atm is needed for 75% conversion of 10 mol/hr of A in a 2/3 A − 1/3 inert feed? (20%)

4. The elementary liquid-phase reaction $A + 2B \underset{k_2}{\overset{k_1}{\rightleftharpoons}} R$ with rate equation

   $$-r_A = -\frac{1}{2}r_B = (12.5\ \text{liter}^2/\text{mol}^2 \cdot \text{min})C_A C_B^2 - (1.5\ \text{min}^{-1})C_R, \qquad \left[\frac{\text{mol}}{\text{liter} \cdot \text{min}}\right]$$

   is to take place in a 6-liter steady-state ideal mixed flow reactor. Two feed streams, one containing 2.8 mol A/liter and the other containing 1.6 mol B/liter, are to be introduced at equal volumetric flow rates into the reactor, and 75% conversion of limiting component is desired. What should be the flow rate in liter/min of each stream? (20%)

5. For the parallel reactions $A + B \xrightarrow{k_1} D$ and $A + B \xrightarrow{k_2} U$, where D is a desired product while U is an unwanted product. The rate equations are

   $$r_D = k_1 C_A^{\alpha_1} C_B^{\beta_1}$$

   $$r_U = k_2 C_A^{\alpha_2} C_B^{\beta_2}$$

   Consider all possible combinations of reaction orders and select the reaction scheme that will maximize the rate selectivity parameter for desired product. (20%)