編號:		89		立成功大學一〇〇	學年度碩士班招生考	试试题	共 2 頁・第 /頁					
系所約 考試和	且別 斗目	: 化學工和 : 化學反應	呈學系甲組 團工程			考	試日期:0219,節次:3					
※ 考	生言	注意:本	試題 ①可	□不可 使用計算机	幾							
1.	Two The reac high	a) identical p (a) A → se two reac tors. With ter conversi	lug flow reac 2B tions have the out deriving on? (6 %)	etors are used to carr (b) $A \rightarrow B$ e same rate constant any design equation	y out two gas-phase re t, and the feed conditi n, how do you judge v	eactors separately ions are the sam which reactor w	y: e in these two ill achieve the					
2.	(a) (b) 1	What condit and operatio What condi reactor desi	ions should a on? (2%) tions should a gn and operat	an ideal plug flow re an ideal continuous- tion? (2%)	actor follow? How t stirred tank reactor fo	o make it in the llow? How to	reactor design make it in the					
3.	In a The cond (a) 1 (b) 1 (c) 1	liquid solu product B centration o Derive an volumetric : What is the mass tra reactor l concent Discuss the	tion, component returns to the f A on the infection to a equation to a flow rate (V _o) concentration insfer coefficient ength = 100 of ration of feed effect of the	then A is converted for the bulk solution. The mer wall surface is as show the conversion), reactor length (L), in of A at the outlet we itent = 0.01 cm/sec , cm, l = 0.5 mole/liter. flow speed (v) on the	to B on the inner wall the diffusion of A is sumed zero. on (X) in terms of n and the inner radius of vith the following cond volumetric flow rate inner radius = 1 cm, e conversion with the	l of a tubular rea the rate-limiting mass transfer co of the reactor (R) dition? (3%) $a = 3 \text{ cm}^3/\text{sec.}$ same reactor. (actor, $A \rightarrow B$. g step and the sefficient (k _c), (15%) (6%)					
4.	Three species were found in a CSTR. The following concentration data were obtained as a function of temperature. The initial concentration of the single reactant, A, was the same at all temperatures. Both B and C are products. $C_{A0} = 2 \text{ moles/dm}^3$											
		Rur	T (°C)	C _A (mole/dm ³)	$C_B (mole/dm^3)$	C _C (mole/dm ³						
		1		1.70	0.01	0.29	4					
		2		1.40	0.03	0.57	1999 1991 1992					
		3		0.50	1.25	1.25	2					
		5		0.10	1.80	0.10	1					

(a) Please draw the concentration profile (C_i v.s. T) of each species. (2 %)

0.01

(b) What is the effect of temperature on the reaction rate? (2 %)

6

(c) Is the reaction independent, complex, series or parallel? Why? (5 %)

(d) How does temperature affect the reaction constants in the reactions you suggested in (c)? (6 %)

(背面切有翅目,請繼續作答)

1.98

0.01

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糸所組別:	化學工種	呈學系甲組				
16試科目:	化學反應	應工程				考試日期:0219,節3
2 书子:建议	+音·木	भूषा जिल		田計管機		
《 写出調(工局、中			口口 并 1%		
5. The a	cia catar	yzed irrevers	ible liquid j	phase reactio	n, $A \rightarrow B$, was carried out	t adiabatically in a
CSTR	. The rea	iction is seco	nd order in A	A. The feed,	which is equal molar in wa	ter (which contains
the ca	talyst) ar	nd A, enters f	he reactor a	t a temperatu	re of 52°C and a total volu	metric flow rate of
100 dr	n³/min. I	The concentra	tion of A ent	tering the read	ctor is 4 molar.	
(a) Fre	om the m	ole balance,	derive the re	lationship be	tween conversion (X_A) and	Da (Da = τkC_{Ao} , τ
is	the space	time = reacte	or volume / f	eed flow rate) (6 %)	
(b) Fre	om the er	nergy balance	, derive the r	elationship b	etween X _A and Temperature	e. (6 %)
(c) W	hat conve	ersion can be	achieved in a	a 1000 dm ³ C	STR? What is the exit temp	erature? (6 %)
Δ	ditional	information:				
710		2000 cal/amo	1 Cn = 1	e col /amol .	°C	
2	$M_{RX} =$	$\frac{4}{4}$ of 25 °C	$C_{p_W} = 1$	s cal/gmol		
1	() ^ ()	a_{123} C	$Cp_A = 1$	5 car/gmor ·	C	
ŀ	7 - 16000		$C_{-} = 1$	5 and Immal		
ł	$\Xi = 1500($) cal/mol	$Cp_B = 1$	5 cal /gmol · '	² C	
ł I 6. Experi	$\Xi = 15000$) cal/mol ata for the ga	$Cp_B = 1$ s-phase catal	5 cal /gmol · ' lvtic reaction	$^{\circ}C$ A + B \rightarrow C is shown below	w. The limiting step
l F 6. Experi in the	E = 15000 imental d reaction	0 cal/mol ata for the ga is known to	$Cp_B = 1$ s-phase catal be irreversit	5 cal /gmol · ' lytic reaction. ble, so that th	$^{\circ}C$ A + B \rightarrow C is shown below e overall reaction is irreven	w. The limiting step rsible. The reaction
I F 6. Experi in the was ca	E = 15000 imental d reaction urried out	0 cal/mol ata for the ga is known to in a different	$Cp_B = 1$ s-phase catal be irreversib ial reactor to	5 cal /gmol · ' lytic reaction. ble, so that th b which A. B.	^P C A + B \rightarrow C is shown below e overall reaction is irrever and C were all fed.	w. The limiting step rsible. The reaction
l f. Experi in the was ca	E = 15000 imental d reaction urried out	2 cal/mol ata for the ga is known to in a different P. (atm)	$Cp_B = 1$ s-phase catal be irreversibilitial reactor to $P_D(atm)$	5 cal /gmol	$^{\circ}C$ A + B \rightarrow C is shown below e overall reaction is irrever and C were all fed.	w. The limiting step rsible. The reaction
l f. Experi in the was ca	E = 15000 imental d reaction urried out Run	D cal/mol ata for the ga is known to in a different P _A (atm)	$Cp_{B} = 1$ s-phase catal be irreversibilitial reactor to $P_{B}(atm) = 1$	5 cal /gmol lytic reaction ble, so that th which A, B, P_{C} (atm)	$^{\circ}C$ A + B \rightarrow C is shown below e overall reaction is irreven and C were all fed. Reaction Rate (mol)/(g ca	w. The limiting step rsible. The reaction at·s)
l 6. Experi in the was ca	E = 15000 imental d reaction urried out $\frac{Run}{1}$	0 cal/mol ata for the ga is known to in a different P _A (atm) 1	$Cp_{B} = 1$ s-phase catal be irreversibulation for the constant of the catalog	5 cal /gmol · · lytic reaction. ole, so that th o which A, B, P_{C} (atm) 2 2	^P C A + B \rightarrow C is shown below e overall reaction is irrever and C were all fed. Reaction Rate (mol)/(g ca 0.114 1 140	w. The limiting step rsible. The reaction at·s)
l 6. Experi in the was ca	E = 15000 imental d reaction urried out $\frac{Run}{1}$	0 cal/mol ata for the ga is known to in a different P _A (atm) 1 1 10	$Cp_{B} = 1$ s-phase catal be irreversibilitial reactor to $P_{B} (atm)$ 1 10 1	5 cal /gmol lytic reaction ole, so that th o which A, B, P_{C} (atm) 2 2 2 2	^P C A + B → C is shown below e overall reaction is irrever and C were all fed. Reaction Rate (mol)/(g ca 0.114 1.140 0.180	w. The limiting step rsible. The reaction at·s)
l 6. Experi in the was ca	E = 15000 imental d reaction urried out $\frac{Run}{1}$ 2 3 4	0 cal/mol ata for the ga is known to in a different P _A (atm) 1 1 10 1	$Cp_{B} = 1$ s-phase catal be irreversibilitial reactor to $P_{B} (atm)$ 1 10 1 20	5 cal /gmol · · lytic reaction. ble, so that the p which A, B, P_{C} (atm) 2 2 2 2 2 2	^P C A + B → C is shown below e overall reaction is irrever and C were all fed. Reaction Rate (mol)/(g ca 0.114 1.140 0.180 2.273	w. The limiting step rsible. The reaction at·s)
l 6. Experi in the was ca	E = 15000 imental d reaction urried out $\frac{Run}{1}$ 2 3 4 5	0 cal/mol ata for the ga is known to in a different P _A (atm) 1 1 10 1 1 1	$Cp_{B} = 1$ s-phase catal be irreversited ial reactor to $P_{B} (atm)$ 1 10 1 20 20	5 cal /gmol lytic reaction ole, so that the p which A, B, P_{C} (atm) 2 2 2 2 2 10	^P C A + B → C is shown below e overall reaction is irrever and C were all fed. Reaction Rate (mol)/(g ca 0.114 1.140 0.180 2.273 0.926	w. The limiting step rsible. The reaction at·s)
l 6. Experi in the was ca	E = 15000 imental d reaction urried out $\frac{Run}{1}$ 2 3 4 5 6	0 cal/mol ata for the ga is known to in a different P _A (atm) 1 1 10 1 1 20	$Cp_{B} = 1$ s-phase catal be irreversibilitial reactor to $P_{B} (atm)$ 1 10 1 20 20 1	5 cal /gmol · · lytic reaction ble, so that the p which A, B, P_{C} (atm) 2 2 2 2 10 2	^P C A + B → C is shown below e overall reaction is irrever and C were all fed. Reaction Rate (mol)/(g ca 0.114 1.140 0.180 2.273 0.926 0.186	w. The limiting step rsible. The reaction at·s)

(b) Evaluate the rate law parameters. (5%)

(c) Suggest a mechanism and rate-limiting step for this reaction. (8%)

7. A device for measuring the diffusion coefficient of a gas mixture consists of two chambers connected by a small tube, with a cross-sectional area A_c. Initially the chambers contain different proportions of two gases, A and B. The total pressure is the same in each chamber.



Assume that diffusion may be described by the Fick's first law, that the concentration in each flask is uniform, and that the concentration gradient in the tube is linear. Please derive the following equation and state any other assumptions needed. (12%)

$$\ln(C_{A1} - C_{A2}) = -\frac{A_c D_{AB}}{L} \left(\frac{1}{V_1} - \frac{1}{V_2}\right) t + constant$$