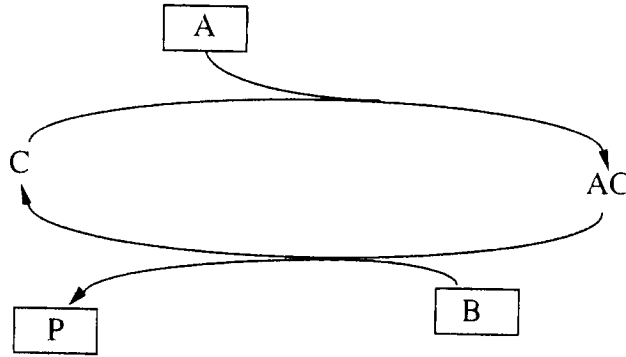
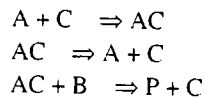


化工動力

1. A hypothetical catalytic cycle for the reaction $A + B \Rightarrow P$ is represented as follows:

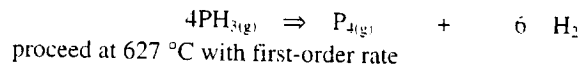


The elementary steps are formulated in the following:



Where C is the active site of the catalyst. If the surface reaction is the rate control step, what is the rate expression for the reaction.
15%

2. The homogeneous gas decomposition of phosphine



$$\text{rate of PH}_3 = -(20/\text{hr}) [\text{PH}_3]$$

What size of plug flow reactor operating at 627 °C and 5 atm can produce 80% conversion of a feed of 5 kg-mol of pure phosphine per hour. 20%

國立中正大學八十六學年度碩士班考試試題

所 別：化學工程研究所

科 目：化工熱力學與化工動力學

3. The data attached are the reaction results of hydrodesulfurization of diesel catalyzed by a Co-Mo/alumina catalyst at 280 °C and 35 atm. Please develop a rate expression to describe the reaction kinetics. In addition, you need to rationalize the assumption that you made in developing the model. 15%

LHSV, h ⁻¹	sulfur in oil, Wt%
infinite	1.50
4.0	0.90
2.0	0.67
1.3	0.48
1.0	0.40

*LHSV: liquid hourly space velocity

*you may formulate the rate expression based on empirical power law.

*suitable assumptions regarding mass transfer are necessary since internal and external mass transfer limitation may be important in the reaction.

*can sulfur compounds in diesel be regarded as one species?

化工熱力

1. Prove that $(\partial P/\partial T)_p = C_p - P(\partial V/\partial T)_p$ 7%

2. Derive the Joule coefficient $(\partial T/\partial V)_U$ for a van der Waals gas $(P + n^2a/V^2)(V - nb) = nRT$. 13%

3. Derive a formula for the fugacity of a gas which obeys the equation of state: $PV = RT + AP + BP^2$ 15%

4. An ideal heat engine operates between -40 °C and 40 °C. How much work is obtained if 100 Joules of heat is provided at the upper T? 10%

5. Given $\Delta_m G^{ex} = (n_1 + n_2)RTx_1x_2 \{A_0 + A_1(x_2 - x_1) + \dots\}$
Derive formulae for $\Delta_m S^{ex}$ in terms of $(\partial A_{n, n=0,1,2,\dots} / \partial T)_P$. 5%

P.2
(共2頁)