國立勤益科技大學九十八學年度研究所碩士班招生筆試試題卷

所別：化工與材料工程系碩士班　　組別：化工科技組

科目：　化工動力學與化工熱力學

准考證號碼：□□□□□□□□（考生自填）

考生注意事項：

一、考試時間 100 分鐘。

二、可使用計算機。

化工動力學

試題一：〈10 分〉

Liquid A decomposes in a batch reactor 50% of A is converted in a 5-minute run. How much longer would it take to reach 75% conversion by second order kinetics?

試題二：〈10 分〉

Show the diagram of steps of a heterogeneous catalytic reaction ?

試題三：〈15 分〉

Derive the rate equation of the decomposition of azomethane (A) via Pseodo-Steady-State Hypothesis(PSSH). From the experimental result the reaction is apparent first-order at high azomethane concentrations and apparent second-order at low azomethane concentrations. The mechanism of the decomposition of azomethane is shown from equation (1) to (3).

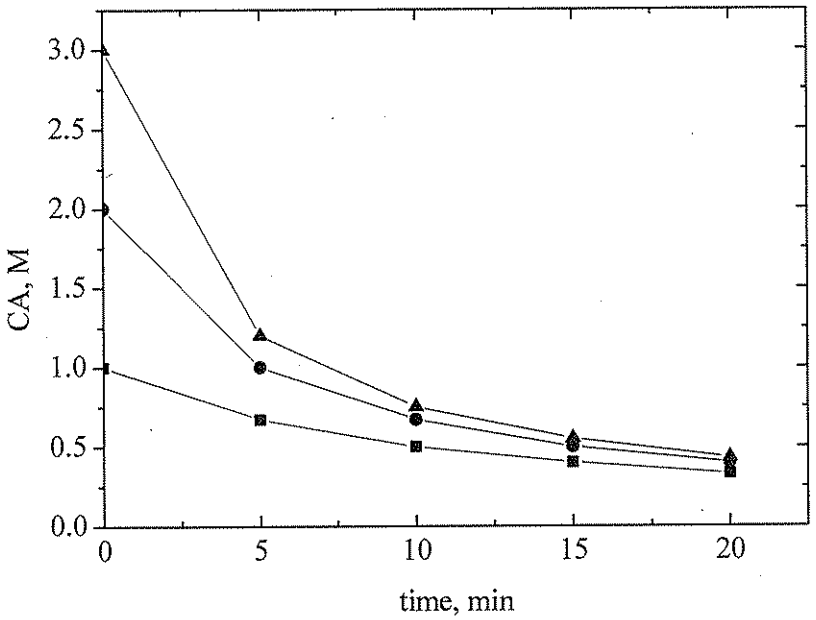
$$A + A \xrightarrow{k1} A^* + A \qquad (1)$$

$$A^* + A \xrightarrow{k2} A + A \qquad (2)$$

$$A^* \xrightarrow{k3} P \qquad (3)$$

試題四：〈15 分〉

The first-order irreversible liquid reaction $A \xrightarrow{k_1} B$ take place in a batch reactor. Find the rate equation for this reaction by using the half-life method. The concentration of A of the reactor is monitored at various times of the experimental data, as shown below:



化工熱力學

試題五：〈10 分〉

Write out the conditions for equilibrium between phases.

試題六：〈10 分〉

Water at 370K is pumped from a storage tank at the rate of 0.18m^3/min. The motor for the pump supplies work at the rate of 1.5KW. The water goes through a heat exchanger, giving up heat at the rate of 700KW, and is delivered to a second storage tank at an elevation 15m above the first tank. What is the temperature of the water delivered to the second tank?

試題七：〈15 分〉

A tank of 0.1m^3 volume contains air at 101.3kPa and 300K. The tank is connected to a compressed air line and the air in the line is maintained at 1500kPa and 320K. A valve in the line is crack so that air flows slowly into the tank until the pressure equals the line pressure. If the process occurs slowly enough that the temperature in the tank remains at 300K, how much heat is lost from the tank? Assume air to be an ideal gas for which Cp = 7R/2.

試題八：〈15 分〉

Derive a relation for the change of enthalpy of a pure substance as a function of volume and temperature. What is the result of application of this equation to an ideal gas?

$$\left(\frac{\partial P}{\partial T}\right)_V = \left(\frac{\partial S}{\partial V}\right)_T \; ; \; \left(\frac{\partial V}{\partial T}\right)_P = -\left(\frac{\partial S}{\partial P}\right)_T$$