

NATIONAL INSTITUTE OF TECHNOLOGY CALICUT
I MID SEM EXAM – SEPTEMBER 2014
B.Tech Chemical Engineering VI Semester

CH3003/CHU312 CHEMICAL REACTION ENGINEERING

Time: 1 hour

Maxi. Mark : 20

1. Determine the rate constant and order of the reaction for the following concentration-time data. (5)

| | | | | | | | | | | | |
|--------------------------|------|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Time min | 0 | 1 | 2 | 4 | 5 | 6 | 8 | 10 | 20 | 40 | 50 |
| Concentration mol/lit | 1000 | 568 | 385 | 226 | 185 | 155 | 117 | 92 | 43 | 19 | 14 |

2. Identify the variables affecting the rate of reaction. (2)

3. With neat sketches explain about the ideal reactor types. (3)

4. The experimental rate of the reaction $\text{H}_2 + \text{Br}_2 \rightarrow 2\text{HBr}$ is determined as

$$r_{\text{HBr}} = \frac{k_1[\text{H}_2][\text{Br}_2]^{1/2}}{k_2 + [\text{HBr}]/[\text{Br}_2]}$$

Identify a reaction mechanism for the above reaction. (4)

5. Aqueous A reacts to form R ($\text{A} \rightarrow \text{R}$) and in the first minute in a batch reactor its concentration drops from $C_{A0} = 2.03$ mol/liter to $C_{Af} = 1.97$ mol/liter. Find the rate equation for the reaction if the kinetics is second order with respect to A. (3)

6. Find out the activation energy from the below table. (3)

| | | | | | |
|-------------------|-----|-----|-----|-----|-----|
| Speed m/hr | 150 | 160 | 230 | 295 | 370 |
| Temperature °C | 13 | 16 | 22 | 24 | 28 |