

Use the Matlab techniques we just introduced to solve these reaction engineering problems:

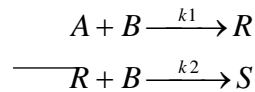
1. For a liquid phase reaction  $A \rightarrow R$ , the rate of reaction is as follows:

$C_A$ , mol/L	$-r_A$ , mol/L min
0.3	0.5
0.4	0.6
0.5	0.5
0.6	0.25
0.7	0.10
0.8	0.06
1.0	0.05
1.3	0.045

How long does it take for reactant A in a batch reactor to drop from 1.3mol/L to 0.3mol/L? Use Matlab numerical integration.

(For a batch reactor,  $t = \int_{C_A}^{C_{A0}} \frac{dC_A}{-r_A}$  )

2. Reaction



For a batch reactor the mass balances for the components are given by

$$\frac{d[A]}{dt} = -k_1 \cdot [A] \cdot [B]$$

$$\frac{d[B]}{dt} = -k_1 \cdot [A] \cdot [B] - k_2 \cdot [R] \cdot [B]$$

$$\frac{d[R]}{dt} = k_1 \cdot [A] \cdot [B] - k_2 \cdot [R] \cdot [B]$$

$$\frac{d[S]}{dt} = k_2 \cdot [R] \cdot [B]$$

Given  $k_1 = k_2 = 1 \text{ m}^3/\text{mol s}$

At  $t=0$ ,  $[A]_0 = 1 \text{ mol/m}^3$ ,  $[B]_0 = 2 \text{ mol/m}^3$ ,  $[R]_0 = [S]_0 = 0 \text{ mol/m}^3$ .

Solve for the concentration profiles of each component as function of time.

What are the concentrations in the reactor at  $t=10$ secs?