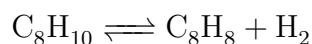


Applied reaction kinetics, written exam.

- Only paper, pen, calculator and your own brain are allowed to be used. Interaction with your colleagues is strongly prohibited
- If necessary, additional paper could be provided
- Answers, intermediate results and used (derived) equations should be expressed and written clearly
- Assume ideal gas behavior in all cases

Question 1. (10 pts.)

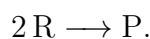
Ethylbenzene (EB) dehydrogenation to styrene is carried out in gas phase under isothermal-isobaric conditions in a flow equipment in the presence of steam (inert)



Inlet mixture contains 20%(molar) of EB and 80% of steam. Determine the conversion of EB if the outlet molar fraction of EB is 0.035.

Question 2. (10 pts.)

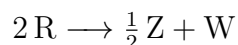
Following gas phase reaction is carried out in isothermal-isobaric plug flow reactor (PFR)



Reaction rate is expressed by $r_V = k c_R$, where k is $3 \cdot 10^{-3} \text{ s}^{-1}$. Inlet volumetric flow rate at reaction temperature and pressure is $1 \cdot 10^{-3} \text{ m}^3\text{s}^{-1}$. Feed composition is 100% of R. Determine the reactor volume needed for a conversion of R equal to 0.75.

Question 3. (10 pts.)

Consider a gas phase reaction



occurring in ideal, isothermal and constant volume BATCH reactor. The initial reaction mixture composition is 70% (molar) of R and 30% (molar) of an inert. Determine the reaction rate constant if the pressure decreases by 10% after first 3 min. Reaction rate is described by the first order kinetic equation $r_V = k c_R$.