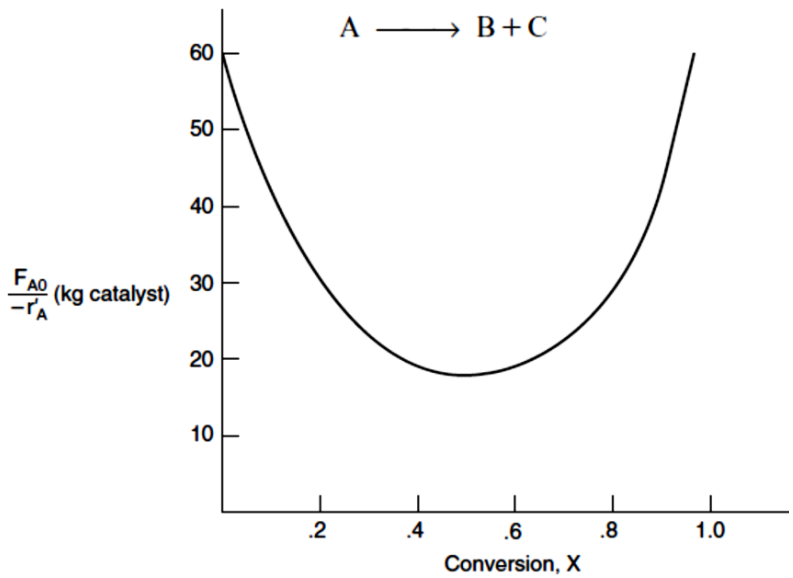
CRDI Q BANK

Q: The curve shown in the Figure below is typical of a reaction carried out isothermally, it is typical of a gas-solid catalytic exothermic reaction carried out adiabatically.

(a) Assuming that you have a **fluidized CSTR** and a **PBR** containing equal weights of catalyst, how should they be arranged for this adiabatic reaction? Use the smallest amount of catalyst weight to achieve **80%** conversion of ***A***.

(b) What **PBR** weight is necessary to achieve **80%** conversion?

Additional information: F_{A0} = 2 mol/s.



Q: The initial reaction rate for the elementary reaction

2A + B → 4C

was measured as a function of temperature when the concentration of ***A*** was **2*M*** and that of ***B*** was **1.5*M*.**

(a) What is the activation energy?

(b) What is the frequency factor?

$-r_A(\text{mol/dm}^3 \cdot s)$:	0.002	0.046	0.72	8.33
T(K):	300	320	340	360

Q: Carbon disulfide is produced in a steady-flow reactor by following reactions,

$$CH_4 + 2S \longrightarrow CS_2 + 2H_2$$
$$H_2 + S \longrightarrow H_2S$$

Methane is fed to the reactor at a rate of 90 mol/min and vapor sulfur at a rate of 380 mol/min. The fraction of the methane converted in the reactor is 75%, and the hydrogen mole fraction in the product stream is 12%.
Determine:
a. The production rate of carbon disulfide.
b. The compositions of the outlet stream.

Q: A 50 mol/s stream consisting of 90% ethane and 10% nitrogen is mixed with a 40 mol/s air stream and fed into a catalytic reactor. The following reactions take place in the reactor:

$$2C_2H_6 + O_2 \longrightarrow 2C_2H_5OH$$
$$2C_2H_5OH + O_2 \longrightarrow 2CH_3CHO + 2H_2O$$
$$2CH_3CHO + O_2 \longrightarrow 2CH_3COOH$$

The oxygen conversion is 80%, and the concentration of the ethanol in the product stream is three times that of the aldehyde and four times that of the acetic acid. Calculate: **(*a*) The ethane conversion. , and (b) the production rate of the ethanol.**

Q: The ideal gas-phase decomposition reaction

$$C_2H_6 \longrightarrow C_2H_4 + H_2$$

is takes place in a batch reactor at constant ***P***, and ***T***. Initially, 10 mol of ethane (pure) are charged into the reactor. If the final volume of the reactor is 80% larger than the initial volume, calculate; -
(*a*) the conversion, (b) the reaction extent, and (c) the mole fraction of H_2 at the end of the operation.