Unit 9 - Week 7

Assignment 7

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-11-04, 23:59 IST.

1) 1 point

In an ideal CSTR model, the fluid elements do not all have the same……..in the reactor.

(a) Composition
(b) Temperature
(c) Residence time
(d) None of the above

a)
b)
c)
d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
c)

2) 1 point

For an ideal CSTR model, the value of recycle ratio (R) is ……

(a) R = 1
(b) R = 0
(c) R = ∞
(d) R = 2

a)
b)
c)
d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
c)

3) 1 point

Select the correct option about the order of a chemical reaction.

I. The order of a reaction is derived experimentally.
II. The order of a reaction with respect to a species may be a non-integer value.
III. For a first order reaction, the unit of rate constant reciprocal of time.

(a) Only statement – I and statement –II are true
(b) Only statement - II and statement – III are true
(c) Only statement - I and statement - III are true
(d) All the statements are true

a)
b)
c)
d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
d)

4) 1 point

The temperature dependency of rate constant is given by Arrhenius Equation $k = A\,[\exp(-E_a / RT)]$, where

k denotes specific rate constant,
A denotes frequency factor,
E_a denotes activation energy
R denotes ideal gas law constant
T denotes absolute temperature

Select the correct option about the units of (E_a/RT):

(a) Has same units as k
(b) Has same units as A
(c) Dimensionless
(d) Has same unit has R

a)
b)
c)
d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
c)

5)

Consider the liquid phase reaction of the type A → B. The reaction is of 2nd order with respect to reactant A and the rate constant for the reaction is k = 0.08 L $(mol)^{-1}(min)^{-1}$. This reaction is carried out under isothermal conditions in a Continuous Stirred Tank Reactor (CSTR) followed by a Plug Flow Reactor (PFR) in series. Pure A with an initial concentration C_{A0} = 5 mol/L and a Volumetric flow rate of 2.5 L/min is fed to a CSTR and the output of this CSTR is fed to a PFR. The concentration of A in the outlet stream of the PFR is 0.6 mol/L. If the CSTR has a volume of 20 Litres, the Volume of PFR (in Litres) will be _____.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 30,45

1 point

6)

A liquid phase 2nd order reaction gives 75% conversion when the reaction is carried out in a PFR. The same reaction now is carried out in a CSTR, with the same inlet conditions as that of PFR. To obtain the same conversion as in case of PFR, the ratio of Volume of CSTR to the Volume of PFR should be _____.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 3.8,4.2

1 point

7) 1 point

Select the correct option about the Attainable Region Theory.

I. The mixing may be viewed as a linear process.
II. The PFR rate vectors are always normal to the PFR trajectory.
III. The CSTR rate vectors are always co-linear with the feed and CSTR effluent concentrations.

a) Only statement – I and statement –II are true
b) Only statement - II and statement – III are true
c) Only statement - I and statement - III are true
d) All the statements are true

a)
b)
c)
d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
c)

8) 1 point

Consider the following multiple reactions where P is the desired product and R is the waste.

$$A \rightarrow P, \quad r_1 = k_1 C_A^{\alpha}$$
$$A \rightarrow R, \quad r_2 = k_2 C_A^{\beta}$$

Given α > β. Which ideal reactor will be more appropriate for production of desired product?

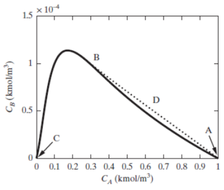
(a) PFR
(b) CSTR
(c) Both CSTR and PFR will be have same performance
(d) None of the above

a)
b)
c)
d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
a)

9) 1 point

Consider the following attainable region for a reaction in a PFR.



I. The region denoted by ABC (thick line) is convex.
II. The composition at point D can be attained by mixing the PFR effluent at point B with feed at point A.

(a) Only statement – I is true
(b) Only statement - II is true
(c) Both the statements are true
(d) Both the statements are false

a)
b)
c)
d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
b)

10) 1 point

A chemical reaction is carried out in 120 litre CSTR and follows 2nd order rate law: $(-r_A) = k\,C_{A0}^2(1-X)^2$, where X is the conversion and C_{A0} is the inlet concentration of the reactant A. To increase the conversion of CSTR, a PFR of the same volume is proposed to be added in series. Which of the following arrangement of the reactors is recommended? Before the addition of the PFR, the initial conversion in CSTR is 80%.

(a) PFR followed by CSTR
(b) CSTR followed by PFR
(c) Addition of another reactor in series will not increase the conversion.
(d) Both the arrangements in (a) and (b) will achieve EXACTLY same conversion.

a)
b)
c)
d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
a)