Week 4 Assignment 1

The due date for submitting this assignment has passed. Due on 2018-02-21, 23:59 IST.

Submitted assignment

1) The following process is suitable for secondary metabolites production

- [ ] Batch
- [ ] Fed-batch
- [ ] Continuous flow stirred tank reactor
- [ ] None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
Fed-batch

2) In a continuous flow stirred tank reactor the composition of exit stream under steady state condition

- [ ] Is same as that in the reactor
- [ ] Is different than that in the reactor
- [ ] Depends upon the reactor volume
- [ ] None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
Is same as that in the reactor

3) In the fluidized bed, the velocity of the fluid varies in the range

- [ ] 6-20 m/h
- [ ] 3-6 m/h
- [ ] 1-3 m/h

No, the answer is incorrect.
4) Most suitable reactor for algae cultivation is
- Trickle bed reactor
- Packed bed reactor
- Airlift reactor
- None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
Airlift reactor

5) Space time of 3 h for continuous flow reactor means that
- The time required to process one reactor volume of feed is 3 h
- Three reactor volumes of feed can be processed every hour
- It takes 3 h to dump the entire volume of the reactor with feed
- Substrate conversion is 100% after three hours

No, the answer is incorrect.
Score: 0
Accepted Answers:
The time required to process one reactor volume of feed is 3 h

6) The performance equations for constant density systems are identical for
- PFR and CSTR
- PFR and batch reactor
- PFR, batch reactor and CSTR
- Batch reactor and CSTR

No, the answer is incorrect.
Score: 0
Accepted Answers:
PFR and batch reactor

7) In an ideal tubular flow reactor
- There is no mixing in longitudinal direction
- Mixing takes place in radial direction
- There is uniform velocity of fluid in axial direction
- All of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of these

8) The following reaction rate curve is shown for a reaction \( A \rightarrow P \). Here, \((-r_A)\) and \(X_A\) represent reaction rate and fractional conversion, respectively. The feed is pure \( A \) and 90% conversion is desired
Which amongst the following reactor configuration gives the lowest total volume of the reactor(s)?

- CSTR followed by PFR
- Two CSTRs in series
- PFR followed by CSTR
- A single PFR

No, the answer is incorrect.
Score: 0
Accepted Answers:
CSTR followed by PFR

9) The degree of conversion when feed (80 g/L) is converted to product (30 g/L) is

- 50%
- 62.5%
- 72.5%
- 52.5%

No, the answer is incorrect.
Score: 0
Accepted Answers:
62.5%

10) A homogeneous liquid phase reaction $A \rightarrow R$ takes place with 50% conversion in an isothermal CSTR. What will be the conversion if the reactor is replaced by a PFR of equal size all else remaining the same?

- 50%
- 42%
- 67%
- 90%

No, the answer is incorrect.
Score: 0
Accepted Answers:
67%

11) In an aqueous solution, reaction $P \rightarrow Q$ occurs under isothermal conditions following first order kinetics. The feed rate is 500 mL/min and the concentration of P in the feed is $1.5 \times 10^{-4}$ mol/mL. The reaction is carried out in a 5 L CSTR. At steady state, 60% conversion of P is observed. The rate constant (min$^{-1}$) of the reaction is

- 0.25
- 0.15
12A liquid phase reaction $A \rightarrow B$, is conducted isothermally in a CSTR having residence time 2 s. 

The inlet concentration of species $A$ is 2 mol/L, and the outlet concentration is 1 mol/L. The rate equation for the reaction is $r_A = \frac{k_1 C_A}{k_2 + C_A}$. Where, $k_1 = 5$ mol/L.s. The value of $k_2$ in mol/L is 

- 11
- 9
- 5
- 2

No, the answer is incorrect.
Score: 0
Accepted Answers: 0.15

13Time required for 50% decomposition of reactant in liquid phase isothermal batch reactor following first order kinetics is 2 min. The time required for 75% decomposition will be about __________ min.

- 3
- 6
- 4
- 8

No, the answer is incorrect.
Score: 0
Accepted Answers: 9

14The plug flow reactor may be replaced by

- CSTR in parallel
- CSTR in series
- Single CSTR
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers: CSTR in series

15Under steady state condition, the following parameter is zero

- Rate of disappearance of substrate
- Rate of output of substrate
- Rate of accumulation of substrate
- All the above

No, the answer is incorrect.
16 A pollutant P degrades according to first order kinetics. An aqueous stream containing P at 2 kmol/m$^3$ and volumetric flow rate 1 m$^3$/h requires a mixed flow reactor of volume V to bring down the pollutant level to 0.5 kmol/m$^3$. The inlet concentration of the pollutant is now doubled and the volumetric flow rate is tripled. If the pollutant level is to be brought down to the same level of 0.5 kmol/m$^3$, the volume of the mixed flow reactor should be increased by a factor of

- 7
- 6
- 3
- $\frac{7}{3}$

No, the answer is incorrect.

Score: 0
Accepted Answers: 7

17 Decomposition of the reactant follows irreversible first order kinetics and the half-life period of this reaction is 8 min. The time requires for 75% conversion of the liquid will be

- 4 min
- 8 min
- 12 min
- 16 min

No, the answer is incorrect.

Score: 0
Accepted Answers: 16 min

18 The conversion of A for a first order liquid phase reaction $A \rightarrow B$ in a CSTR is 50%. If another CSTR of same volume is connected in series, then the overall conversion will be

- 60 %
- 75 %
- 90 %
- 100 %

No, the answer is incorrect.

Score: 0
Accepted Answers: 75 %

19 The liquid phase reaction, $A \rightarrow B$, is governed by the kinetics, $(-r_A) = kC_A^{1/2}$. If the reaction undergoes 75% conversion of A in 10 min in an isothermal batch reactor, the time (in min) requires for the complete conversion of A is

- $\frac{40}{3}$
- 20
- 30
- Infinite

No, the answer is incorrect.

Score: 0
The liquid phase reaction, $A \rightarrow B + C$, is conducted isothermally at 50 $^\circ$C in a continuous flow stirred tank reactor (CSTR). The inlet concentration of $A$ is 8.0 g-mol /L. At a space-time of 5 min, the concentration of $A$ at the exit of CSTR is 4.0 g-mol/L. The kinetics of the reaction is $-\frac{d[A]}{dt} = k[A]C$. The rate constant ($k$) for this reaction at 50 $^\circ$C is:

- 0.1 min$^{-1}$
- 0.4 min$^{-1}$
- 0.3 min$^{-1}$
- 0.2 min$^{-1}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.2 min$^{-1}$