Assignment 4

The deadline for submitting this assignment has passed.

Due on 2021-02-17, 23:59:00 IST.

1) A strain of bacteria was used to convert a substrate to a product in a 10-L closed continuous stirred tank reactor (CSTR). At steady state, the specific 1/p growth rate of the bacteria is 0.04/h and the substrate concentration inside the reactor is 3 g/L. Determine the steady state flow rate in this CSTR (in terms of V at 1/h).

   - A) 10
   - B) 20
   - C) 3

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   25

   Bacteria culture is grown in a 10-L liter bioreactor. The growth kinetics of the bacteria can be expressed as:

   \[ \frac{dN}{dt} = k \cdot N \cdot (S - \frac{N}{K}) \]

   where \( N \) is the substrate concentration (mg/L) and \( k \) is the specific growth rate (h⁻¹). The kinetic parameter \( k \) is 0.04 h⁻¹. The yield parameter is 0.6 g/g and the substrate concentration inside the reactor is 3 g/L. Determine the steady state flow rate in this CSTR (in terms of V at 1/h).

   - A) 4.45
   - B) 9.85
   - C) 38.4

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   5

2) What is the volumetric soil mass productivity (in terms of mg/L) of the system?

   - A) 0.214
   - B) 0.596
   - C) 0.046
   - D) 0.262

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   4

3) What is the volumetric soil mass productivity (in terms of mg/L) of the system?

   - A) 0.214
   - B) 0.596
   - C) 0.046

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   10

4) What is the volumetric productivity of the system (in terms of mg/L) of the system?

   - A) 0.214
   - B) 0.596
   - C) 0.046

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   10

5) What is the washout dilution rate (in terms of V at 1/h)?

   - A) 0.2
   - B) 1.2
   - C) 0.1

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   10

Express your answer in megacolons of water that arrives the influent regulation:

\[ \frac{dN}{dt} = \frac{k}{V} \frac{S}{K} \cdot (V - \frac{S}{K}) \]

where \( k \) is 0.04 h⁻¹ and \( V \) is the volume of the CSTR in litre. If you want to cultivate this microorganism in a two fermenters in series, the flow rate and the substrate concentration of the first bioreactor should be 100 L/h and 80 g/L, respectively. The substrate concentration of the exit stream must be 1 g/L. If you use two CSTRs in series, what size of the two fermenters will be most productive? Let V1 and V2 be the volume of the first, second CSTR respectively and V be the exit substrate concentration at the end of first CSTR.

4) Determine V1 (in terms of V at 1/h).

   - A) 240
   - B) 960
   - C) 180
   - D) 40

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   14

5) Determine V2 (in terms of V at 1/h).

   - A) 180
   - B) 600
   - C) 500
   - D) 110

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   14

6) If you use a CSTR followed by plug flow reactor (PFR), what sizes of the two fermenters will be most productive? Let V3 and V4 be the size of the CSTR and second PFR, respectively.

   - A) 400
   - B) 960
   - C) 500
   - D) 600

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   14

7) Determine V3 (in terms of V at 1/h).

   - A) 240
   - B) 110
   - C) 780
   - D) 295

   No. the answer is incorrect.
   Grade: 0
   Accepted Answers:
   17

8) Determine V4 (in terms of V at 1/h).

   - A) 240
   - B) 110
   - C) 780
   - D) 295