KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks scored:

Level : B.E.
Year : III

Course : CHEG 304
Semester: I

Exam Roll No.:

Time: 30 mins.

F. M. : 10

Registration No.:

Date MAR 16 2018

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose the most appropriate answer from the given choices.

1. A bioreactor to which fresh medium is continuously added, while culture liquid containing leftover nutrient, metabolic and products and microorganism are continuously removed at the same rate is called
[ ] cryostat [ ] chemostat [ ] fed-batch fermenter [ ] continuous fermenter

2. The average concentration of oxygen in the boundary layers surrounding the bubbles in a reactor is determined by
[ ] ultra-small dissolved oxygen probe
[ ] laser-based photographic system
[ ] measuring the steady state concentration of oxygen in the bulk prior to inoculation in reactor.
[ ] measuring the steady state concentration of oxygen in the bulk after inoculation in Reactor

3. The time interval required to double the cell population can be calculated using
[ ] $\ln 2/\mu$ [ ] $\ln 2$ [ ] $\ln \mu$ [ ] $\mu / \ln 2$

4. Which of the following steps are involve in anaerobic methane production?
(i) Hydrolysis (ii) acidification (iii) acetogenesis (iv) methanogensis
[ ] I, ii and iii [ ] i and ii [ ] i, iii and iv [ ] i, ii, iii and iv

5. The rate limiting step in the movement of oxygen from the gas phases in a bubble to the cell is the movement of oxygen molecules through
[ ] gas-liquid interface [ ] bubble boundary layer
[ ] bulk liquid [ ] gas phase

6. In anaerobic environment, sugar ($C_nH_{2m}O_m$) in dough is converted into
[ ] glucose [ ] water [ ] alcohol [ ] carbon monoxide

7. Steroid hormones are derived from the modification of
[ ] cholesterol [ ] flavonoids [ ] alkaloids [ ] amino acid

8. Settling velocity u_s is given by
[ ] kc^{-m} [ ] kc [ ] k/c [ ] kc/m

9. A torsion dynamometer is used to measure

[ ] viscosity [ ] foam level [ ] gas flow rate [ ] shaft power input

10. Which of the following has more tolerance for acidic pH?

(i) Yeast (ii) Bacteria (iii) E. coli (iv) moulds

[ ] i and iii [ ] i, ii and iii [ ] i and iii [ ] i and iv

Fill in the blank by most appropriate VALUE or WORD

11. The oxygen transfer rate per unit of reactor volume is given by_____.
12. The amount of antifoam entering fermenter is controlled by_____.
13. For single reaction with ordinary kinetic, PFTR provide _____ and _____than the CSTR of equal volume.
14. Secondary metabolites which inhibits growth of other microbial species, even at low level are called _____.
15. Partition chromatography relies on the _____of solute between two _____solvent.
16. _____is used to remove cells from fermentation broth.
17. _____, in which heat released by the enzyme-catalyzed reaction is detected by a calorimeter.
18. Protein and nucleic acid can be analyzed using _____ detection.
19. In Contois growth kinetic model specific growth rate (μ) = _____.
20. _____, is used for the removal of bacteria.

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Level : B.E.
Year : III
Time : 2 hrs. 30 mins.

Course : CHEG 304
Semester: I
F.M. : 40

SECTION "B"
[8 Q. × 5 = 40 marks]

Attempt any *EIGHT* questions.

1.a. Consider an organism that follows the Monod growth law with $\mu_{max} = 1\ h^{-1}$, $K_s = 0.25$ g/L and $Y_{c/s} = 0.5$ g/g. The reaction is to be carried out in CSTR with a feed substrate concentration of 20 g /L. [3]
(i) Calculate the dilution rate for an existing cell concentration of 9.5 g/L.
(ii) What is the dilution rate that will give the maximum product yield?
(iii) What is the dilution rate at which wash out occurs?

b. Discuss the different membrane separation technique used in bioprocess. [2]

2.a. Consider the growth of aerobic microorganism. Describe with suitable example the oxygen utilization rate during the batch culture. [3]

b. Write a note on reactor dynamics and indicate condition for stability. [2]

3.a. Give some example of bio-production of fine chemicals. Also shed light on the biological significance of these metabolites. [3]

b. Write down the mass balance equation for CSTR with recycle and wall growth. [2]

4.a. Distinguish between structured and unstructured growth model. Briefly explain the toxin effect on cell growth. [0.5+1.5]

b. Describe the Gas-Liquid mass transfer in cellular system. How would you determine the volumetric rate of oxygen consumption in bioreactor? [1+2]

5.a. What are the advantages and disadvantages of PFTR with respect to CSTR? Shed light on different CSTR model used for enzyme-catalyzed reactor with neat diagram. [1+2]

b. Briefly explain the typical growth curve for batch cultivation. What is the case of multiple lag phase? Explain with suitable example. [1.5 + 0.5]

6.a. Distinguish between continuous rotary vacuum filter and plate and frame filter. [2]

b. Describe the major steps involved in anaerobic methane production [3]

7.a. What are the major steps involve in downstream processing. Briefly explain salting out methods used for the recovery of protein. [1+2]

b. What are the major control operation used in bioreactor? How would you monitor dissolved oxygen concentration in bioreactor. [0.5+ 1.5]

8.a. What are single cell proteins? Explain with suitable example. [2]

b. What are the online and offline analytical methods used in analysis of bioreactor parameters. Briefly explain the two analytical method used for the measurement of cell properties. [3]

9.a. Describe the major steps involve in brewing and wine making process. Draw the process flow chart. [3]

b. Write short notes monoclonal antibody. [2]