Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Level : B.E.
Year : III
Course : CHEG 304
Semester: I

Exam Roll No. :
Time: 30 mins.
F. M. : 10

Registration No.:
Date FEB 2 7 2019

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose the most appropriate answer from the given choices.

1. Diauxic growth of biomass is associated with
   [ ] Multiple lag phase
   [ ] Absence of lag phase
   [ ] Sequencing utilization of multiple substrate
   [ ] Simultaneous utilization of multiple substrate

2. What do you mean by K_{La}
   [ ] Volumetric mass transfer coefficient
   [ ] Volumetric oxygen transfer coefficient
   [ ] Henry's law coefficient
   [ ] Volumetric solute transfer coefficient

3. What assumption are made when modeling on Ideal tubular reactor?
   [ ] Steady state and no radial variation
   [ ] Gas flow and steady state
   [ ] Plug flow and liquid system
   [ ] Only gas flow

4. Which of the following analytical instruments are used to analyse gases in bioreactor?
   (a) Gas chromatography
   (b) Mass spectrometry
   (c) Column chromatography
   (d) Gel filtration chromatography
   [ ] a, c
   [ ] a, d
   [ ] b, c
   [ ] a, b

5. Lowry reagents is used for the analysis of
   [ ] DNA
   [ ] RNA
   [ ] Protein
   [ ] Carbohydrates

6. Spectrophotometer is used to measure the cell properties in the bioreactor by measuring
   [ ] Optical density
   [ ] Dissolve oxygen
   [ ] pH
   [ ] CO_2

7. Which of the following microorganism is immobilized by attachment to porous acetylcellulose for acetic acid assay?
   (a) Nitrosomonas species
   (b) Trichosporon brassicae
   (c) Citrobacter freundii
   (d) Pseudomonas fluorescence
   [ ] a, b
   [ ] b, c
   [ ] c, a
   [ ] d, a

8. Example of filter for continuous mode of filtration is
   [ ] Plate and frame
   [ ] Spiral wound
   [ ] Rotary vaccum
   [ ] Tubular

9. Which type of liquid–liquid extraction is most efficient?
   [ ] Multistage counter current
   [ ] Multistage co-current
   [ ] Multistage cross current
   [ ] Single stage

10. Which of the following is not one of the ingredients of beers?
    [ ] Hops
    [ ] Yeast
    [ ] Malt
    [ ] Must

Fill in the blanks with appropriate WORDS or VALUES.

11. Ion exchange chromatography is based on the _____.

12. _____process is a section for receiving and storing raw material and _____is final product preparation (formulation), packaging and shipping.

13. _____ is a protein extracted from algae, yeasts or bacteria and used as a substitute for protein rich food.

14. Antibodies are produced in specialized cells known as _____.

15. A completely mixed continuous stirred tank reactor for the cultivation of cells is called _____.

16. _____ size of bubbles is relevant to mass transfer.

17. _____ material balance is the starting point for the characterization of reactor dynamics.

18. Organism growing at the same rate, use of _____permits processing of more feed material per unit time and reactor volume than in the _____situation.

19. In reverse phase chromatography, the stationary phase is _____ in nature.

20. _____ contain material of undefined composition. e.g. mixed with unknown extract chemicals.

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Year : III
Time : 2 hrs. 30 mins.

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

SECTION "B"
[8Q. × 5 = 40 marks]

Attempt *ANY EIGHT* questions.

1.
   a. Consider an organism that follow Monod growth law with $\mu_{max} = 1\ h^{-1}$, $Y_{x/s} = 0.5\ g\ g^{-1}$, $Ks = 0.2\ g\ L^{-1}$, $S_f = 10\ g\ L^{-1}$. Calculate the dilution rate at the cell washout condition. [2]
   b. Derive the kinetics of cell growth model in the presence of endogenous metabolism and maintenance. [3]

2.
   a. How toxin concentration affects the growth phase in batch cultivation? [3]
   b. Briefly explain the gas-liquid contacting modes in bioreactor. [2]

3.
   a. With suitable example, describe the rate of metabolic oxygen utilization in a biological reactor. [3]
   b. Write down the material balance reaction in an ideal plug flow reactor. [2]

4.
   a. Sketch the five different CSTRs design for enzyme catalyzed reaction and explain its application. [3]
   b. What is biosensor? Explain with suitable examples. [2]

5.
   a. How would you extract the protein and RNA from the cell? [3]
   b. Briefly explain the use of spectrophotometer and flurometry for measuring cell properties. [2]

6.
   a. Sketch the process flow chart for antibiotics recovery and explain the major steps involved. [3]
   b. Explain the chromatographic technique used for the protein purification. [2]

7.
   a. What is biofuel? Explain briefly the process of acidogenesis and methanogenesis during anaerobic methane production. [3]
   b. What is bioconversion? Give any three examples of production of protein via recombinant DNA technology. Why *E. coli* is widely used as a host for the recombinant protein production? [0.5+1+0.5]

8.
   a. Sketch the generalized process flow sheet for fermentation process economics. With suitable example, estimate the major manufacture cost associated in the industrial scale fermentation. [3]
   b. How would you measure the performance characteristics of biological reactor? [2]

9. Write short notes on [2.5 ×2 =5]
   (i) Centrifugation and sedimentation (ii) Single step extraction and multistep extraction