KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level : B.Tech.
Year : III

Course : BIOT 301
Semester : I

Exam. Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date FEB 2 7 2019

SECTION "A"
[20Q. × 0.5 = 10 marks]

Choose and mark [X] in the box with appropriate answer among the given choices.

1. Alcoholic fermentation is an example of
   [ ] Reactive bioprocessing [ ] Extractive Bioprocessing
   [ ] Semi reactive Bioprocessing [ ] Semi Extracting Bioprocessing

2. All are characteristics of bio separation except
   [ ] Complex component [ ] Few steps
   [ ] High level of purification [ ] Large volume processing

3. Which of the following is a low resolution high through put screening techniques
   [ ] Ultrafiltration [ ] Chromatography
   [ ] Electrophoresis [ ] Supercritical fluid extraction

4. All the following techniques are used to identify the molecular weight of macromolecules except
   [ ] Ultrafiltration [ ] Size exclusion chromatography
   [ ] Hydrodynamic chromatography [ ] Ultra centrifugation

5. Sedimentation Coefficient of a biomolecule is directly proportional to
   [ ] Angular velocity [ ] Sedimentation velocity
   [ ] Friction factor [ ] Molecular weight

6. Which of the following property is important in ion exchange chromatography of protein
   [ ] Size [ ] Molecular weight
   [ ] Isoelectric point [ ] Hydrophobicity

7. Which of the following mathematical model is used for estimation of maximum concentration of released product during cell disruption
   [ ] Kick's Law [ ] Fick's Law [ ] Ritinger's law [ ] Empirical model

8. The frequency used for cell disruption by ultra-sonication is usually
   [ ] 15KHz [ ] 20KHz [ ] 25KHz [ ] 30Khz

9. Which of the following is the densest biomolecules
   [ ] Lipid [ ] Proteins [ ] DNA [ ] RNA

10. Which of the following has the highest sedimentation coefficient
    [ ] Precipitated proteins [ ] Cells
    [ ] Cell organelles [ ] Insoluble Starch

11. Sigma factor of a tubular bowl centrifuge is independent of
[ ] Angular velocity [ ] Radius of rotation
[ ] Length [ ] Density of solid

12. Packed beds of granulated kieselguhr used as filtration aid have porosity of
[ ] 15% [ ] 65% [ ] 85% [ ] 95%

13. Which of the following parameter is usually time independent during filtration
[ ] Cake resistance [ ] Membrane resistance
[ ] Pressure drop [ ] Volumetric flow rate

14. The standard reference chemical potential _____ during addition of salts during precipitation.
[ ] Increases [ ] is independent
[ ] Decreases [ ] Depends on salt type

15. An example of adsorption exchange group that are pH independent is
[ ] Carboxylic acid group [ ] Carboxyl methyl group
[ ] Sulpho propyl group [ ] Quaternary amino ethyl group

16. Protein A/G based adsorption is based on
[ ] Ion exchange interaction [ ] Affinity interaction
[ ] Size exclusion [ ] Hydrophobic interaction

17. The breakthrough concentration during adsorption separation typically falls in the range of
[ ] 0.5-5% [ ] 1-10% [ ] 5-15% [ ] 10-20%

18. During penicillin extraction the partitioning from organic phase to aqueous phase is favored at
[ ] Neutral pH [ ] Acidic pH
[ ] Alkaline pH [ ] Acidic and neutral pH

19. The membrane filtration used for sterilization is
[ ] Ultra filtration [ ] Micro filtration
[ ] Reverse osmosis [ ] Nano filtration

20. Linear salt gradient is used for elution in
[ ] Affinity chromatography [ ] Adsorption chromatography
[ ] Ion exchange chromatography [ ] Reverse phase chromatography

SECTION "B"

[10Q. × 1 = 10 marks]

Fill in the blanks with suitable word(s) or value(s) or symbol(s).

21. An example of downstream processing based on volatility is _____.

22. The expression of stoke Einstein diameter in terms of diffusivity(D) and viscosity(u) is _____.

23. An example of poly dispersed biological molecule is _____.

24. One base pair of nucleic acid is roughly equivalent to _____.

25. Some solvents like _____ are known to disrupt fungal cell walls.

26. Typical rotating speed for preparative centrifuges is _____.

27. If the filter cake is _____the specific cake resistance a does not vary with pressure drop across the filter

28. The equilibrium relationship between the solute concentration in solution and that adsorbent surface is called _____.

29. Polymer-Polymer two phase system can be generated by adding _____.

30. The theoretical plate height can be determined from _____ equation.

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SECTION "C"
[3Q. × 8 = 24 marks]

Attempt *ANY THREE* questions.

1. An intracellular antibiotic is being recovered by ultra-sonication from 5 liters of bacterial cell suspension having a cell concentration of 15 gL^{-1}. Past experiences have shown that 50% of the antibiotic can be recovered in 40 minutes. Predict the time required for 90% recovery of the antibiotic.

2. A suspension of yeast cells is to be filtered at a constant filtration rate of 50 L min^{-1}. The suspension has a solid content of 70 kgm^{-3} of suspension and the yeast cells have a bulk density of 800 kg/m^{-3}. Laboratory tests indicate that the specific cake resistance is 40 mkg^{-1} and the viscosity of the filtrate is 2.9 x 10^{-3} $kgm^{-1}s^{-1}$. The filter has an area of 0.1 m^2 and the medium offers negligible resistance. How long can the filtration rate be maintained before the pressure drop exceeds 1 N/m^2? What volume of cake and filtrate are collected during this time?

3. Explain the theory of precipitation of biological molecules using organic solvents and anti-chaotropic salts with their application.

4. What are advantages and disadvantages of adsorption process in downstream processing? Explain the various types of adsorption process with example.

SECTION "D"
[31 marks]

Attempt *ALL* questions.

5. Write short notes on [2×3=6]
   a. Sedimentation Coefficient
   b. Hydrodynamic chromatography

6. Explain the process of cell disruption using bead mill. Explain the theories and models for estimation of energy requirement and completion time for cell disruption. [5]

7. Explain the working principle of tubular bowl centrifuge. [5]

8. Explain the filtration theory used for the estimation of filtration time. Differentiate between constant rate filtration and constant pressure filtration. [5]

9. What are the various stages of extraction process? How extraction of penicillin is done in large scale? [5]

10. Explain briefly the various types of membrane based bio separation with their application. [5]