KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks Scored:

Level : B. Tech.
Year : III

Course : BIOT 301
Semester: I

Exam. Roll No.:

Time: 30 mins.

F. M. : 20

Registration No.:

Date. MAR 09 2018

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose and tick the most appropriate answer.

1. Which of the following biomolecule is generally extracted by aqueous two-phase extraction system?
[ ] Antibiotics [ ] Steroids [ ] Proteins [ ] Peptides

2. Which solvent is used for the extraction of penicillin?
[ ] Chloroform [ ] Butyl acetone [ ] Acetone [ ] Ether

3. All are the techniques for separation of biological compounds based on shape except
[ ] Centrifugation [ ] Filtration
[ ] Membrane separation [ ] Sedimentation

4. Which ligand type is used for carbohydrate affinity binding
[ ] Lectins [ ] Poly-Lysine [ ] Poly- Histidine [ ] L-Arginine

5. If the temperature is lowered, partition coefficient
[ ] Decreases [ ] Increases
[ ] Remains constant [ ] First increases then decreases

6. Silica C8 reverse adsorption system is used for the separation of
[ ] Amylase [ ] Albumin [ ] Dnase [ ] Insulin

7. Substances that form foam cannot be filtered by
[ ] Vacuum filtration [ ] Constant pressure filtration
[ ] Constant rate filtration [ ] Positive pressure filtration

8. The equivalent radius (re) of a particle can be estimated from its
[ ] Diffusivity [ ] Viscosity [ ] Density [ ] Terminal velocity

9. A solution of IgG is an example of _____ system.
[ ] Mono-dispersed [ ] Poly-dispersed [ ] Pauci-dispersed [ ] Bi-dispersed

10. The sedimentation coefficient correlates with the material properties except
[ ] Friction factor [ ] Viscosity
[ ] Molecular weight [ ] Density

11. Which is most commonly used for disruption of yeast cells
[ ] Bead Mill [ ] French Press [ ] Detergent [ ] Osmotic Shock

12. Optimum time required for disruption of small sample of *E. coli* cells by ultra-sonication is
[ ] 1 Min [ ] 10 Min [ ] 30 Min [ ] 60 Min

13. Membrane system used for separation of proteins is
[ ] Micro filtration [ ] Nano filtration
[ ] Ultra filtration [ ] Reverse Osmosis

14. During chromatographic separation capacity factor should ideally be between
[ ] 1 and 10 [ ] 10-20 [ ] 20-30 [ ] 30-40

15. Which of the following is not the steps in liquid-liquid extraction
[ ] Mixing [ ] Fermentation [ ] Phase separation [ ] Phase collection

16. Diffusion driven membrane process is
[ ] Dialysis [ ] Ultra filtration [ ] Microfiltration [ ] Reverse osmosis

17. Chaotropic salts are used for the purification of
[ ] Nucleic acids [ ] Proteins [ ] Lipids [ ] Carbohydrates

18. Which isotherm can predict the saturation concentration
[ ] Linear [ ] Freundlich [ ] Langmuir [ ] None Linear

19. Ultrasonic disruption of cells is commonly performed at frequency
[ ] 25 kHz [ ] 20 kHz [ ] 30 kHz [ ] 35 kHz

20. Which method is best suited for periplasmic protein isolation
[ ] Osmotic shock [ ] Bead mill [ ] French mill [ ] Mechanical

## SECTION "B"

[10Q × 1 =10 marks]

Fill in the blanks.

21. Hydrophobic interaction based on adsorption of proteins take place at very high anti-chaotropic salt concentrations, typically greater than _____ Molarity.

22. Proteins have least solubility at _____.

23. Reverse phase and hydrophobic interaction type adsorption generally follow _____isotherm.

24. The theoretical plate height can be determined from the _____equation.

25. Solvents such as ethanol and acetone precipitate proteins by decreasing the _____ of the solution.

26. Salt induced protein precipitation is governed by the _____.

27. An example of dense membrane is _____.

28. For an incompressible cake, the compressibility factor(S) is _____.

29. The normal trans-membrane pressure range in Reverse osmosis is _____psig.

30. A universal way to express the dimension of non-spherical species is in terms of the _____ diameter.

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## SECTION "C"

[7Q.× 4 = 28 marks]

Attempt *ANY FOUR* questions.

1. An intracellular antibiotic is being recovered by ultra-sonication from 5 liters of bacterial cell suspension having a cell concentration of 15 g/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. [7]

2. Explain the principle of cell disruption using French press. Explain kick's law of grinding. [3+4]

3. What are the different factors utilized for precipitation of biological materials? Explain each of them in brief. [3+4]

4. Bacterial cells were centrifuged using 5 cm long centrifuge tubes in a laboratory centrifuge having an angled rotor which held the tubes at 60 degree angle with the axis of rotation. The top of the tubes were 5 cm away from the axis and it took 15 minutes at a rotation speed of 10,000 rpm to completely sediment the cells. Calculate the sedimentation coefficient of the cells. [7]

5. Explain the principle of affinity adsorption with an example. [3+4]

## SECTION "D"

Attempt *ALL* questions.

6. An ultrafiltration membrane separates two dilute myoglobin solution: 0.01 g/1 and 0.05 g/1 respectively, both being maintained at 25 degrees centigrade. Calculate the osmotic pressure across the membrane. [4]

7. Explain the various methods for the improvement of filtration efficiency? [4]

8. Explain briefly on the use of preparative centrifuges in bio-separation. [4]

9. Differentiate between micro-filtration and ultra-filtration. [4]

10. Why anti chaotropic salt is used in the purification of proteins. [4]

11. What is aqueous two phase extraction process? Explain its types in brief. [4]

12. Explain short note on any one
    i. Bead Mill
    ii. Retention time [3]