NAVRACHANA UNIVERSITY
a UGC recognized University

School:	School of Science
Program:	M.Sc. in Chemistry
Year: 2nd	**Semester:** 3rd
Examination:	End Semester Examination
Examination year:	December - 2021

Course Code: CH244   **Course Name:** SEPARATION TECHNIQUE II
Date: 07/12/2021
Time: 08:30 am to 10:30 am

Total Marks: 40
Total Pages: 3

Instructions:

→ Write each answer on a new page.
→ Use of a calculator is not required.
→ * COs=Course Outcome mapping. # BTL=Bloom's Taxonomy Level mapping

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Q. No.	Details	Marks	COs*	BTL#
Q.1	Choose the most appropriate answers	8		
	A. In a mixture of the five proteins listed below, which should elute second in size-exclusion (gel filtration) chromatography? Mr = Molecular weight a) cytochrome c Mr = 13,000 b) immunoglobulin G Mr = 145,000 c) ribonuclease A Mr = 13,700 d) RNA polymerase Mr = 450,000 e) serum albumin Mr = 68,500 B. When the feed and solvent are fully miscible, is extraction still possible? a) Yes, since only the difference in solubility of the solute in the two solvent matters. The higher the difference in solubility, the better the separation. b) No. In this case there will be only one phase after the settler instead of two. No extract or raffinate phases can be formed. c) It depends on the density difference between the two liquids. If this difference is higher than 25%, extraction is possible. d) No, extraction is not possible anymore, since if the two liquids are fully miscible, the solute has also the same solubility in both liquids. C. Supercritical fluid chromatography is particularly good for preparative separations because: a) one can use open tubular columns b) efficiency and/or flow rates typically are much higher than HPLC c) large variety of mobile phases are used unlike with HPLC		CO1, CO2, CO3, CO4	BT1, BT2, BT3, BT4, BT5

d) all the above

D. Which of the following is not an application of transport in membranes?

   a) Microfiltration

   b) Reverse osmosis

   c) Dialysis

   d) Fractional distillation

E. At equilibrium the total Gibb's free energy for all phases is

   a) Minimum

   b) Maximum

   c) Infinity

   d) Zero

F. Which of the following methods are to be applied to separate Oxygen rich components and Nitrogen rich components?

   a) Crystallization

   b) Zone melting

   c) Magnetic separation

   d) Distillation

G. Two or more substances mingled together, but not chemically combined are known as a

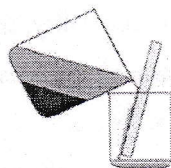   a) residue

   b) solution

   c) mixture

   d) distillate

H. Which one of the following shows the separation technique of decanting?
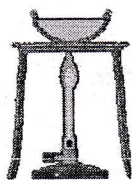
| A | B | C | D |

   a) A   b) B   c) C   d) D

Q.2	Fill in the blanks	2		

A. Chlorines, acids, and bases are the chemicals used for _____ membranes.

B. A miscible mixture of isopropyl alcohol and water is be separated by _____.

CO1, CO2

BT1, BT2, BT3, BT4,

Q.3	Match the following		2		
	a) Naphthalene	i. Acetone and chloroform		CO1, CO2, CO3, CO4,	BT1, BT2, BT3, BT4
	b) EDTA	ii. Sublimation			
	c) Azeotropes	iii. Ion Exchange chromatography			
	d) Zeolite	iv. Sequestering agents			
Q.4	Define A. Log P B. Supersaturation C. Nuclear Reprocessing D. Hapten		8	CO1, CO2, CO3, CO4	BT1, BT2, BT3, BT4
Q.5	A. Differentiate between gel permeation and gel filtration chromatography B. A solute S has a partition coefficient of 3 between toluene and water. If you have 100 mL of a 0.010 M solution of S in water (1) What fraction of the solute remains in H_2O after a 500 mL extraction with toluene? (2) What fraction of the solute remains in H_2O after 5 times 100 mL extractions with toluene?		4	CO1, CO4	BT1, BT2, BT3, BT4, BT5
Q.6	Write a short note on A. Can lanthanides and actinides be separated using Ion exchange chromatography? Justify your answer B. Illustrate the instrumentation of SFC and label it properly.		6	CO2, CO4	BT1, BT2, BT3, BT4, BT5, BT6
Q.7	Explain in detail A. Describe various factors affecting counter current extraction B. What do you mean by fouling of resin and describe the measures to avoid it?		10	CO1, CO3	BT1, BT2, BT3, BT4, BT5

************End of Question Paper************