

University of Mumbai
Examinations Commencing from
Program: Chemical Engineering
Curriculum Scheme: Rev2019
Examination: TE Semester VI
Course Code:CHC601

Course Name: Mass Transfer Operation-II

Time: 2 hour 30 minutes

Max. Marks: 80

T.E.(Chemical Engineering)(SEM-VI)(Choice Base Credit Grading System) (R-2020-21) ('C' Scheme) / 89241 - Mass Transfer Operations -II DATE: 18/5/2022 QP CODE: 92282

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The significance of leaching in the extraction of aluminium is
Option A:	it helps removing the impurities like SiO ₂ , Fe ₂ O ₃ etc. from the bauxite ore
Option B:	it converts the ore into oxide
Option C:	it reduces melting point of the ore
Option D:	it eliminates water from bauxite
2.	A method to prepare absolute alcohol is
Option A:	vacuum distillation
Option B:	fractional distillation
Option C:	azeotropic distillation
Option D:	None of these
3.	As the reflux ratio in a distillation column is increased from the minimum, the
Option A:	slope of the operating line in stripping section decreases.
Option B:	number of plates decreases very slowly first and then more and more rapidly.
Option C:	total cost first decreases and then increases
Option D:	liquid flow increases while the vapor flow decreases for a system.
4.	In liquid-liquid extraction, the ratio of weight fraction of solute in the extract phase to that in the raffinate phase is called as
Option A:	The distribution coefficient.
Option B:	The separation factor
Option C:	The selectivity.
Option D:	The relative volatility.
5.	In the leaching operation, the exhausted solids phase is called as-
Option A:	The underflow
Option B:	The overflow.
Option C:	The extract.
Option D:	The raffinate.
6.	Fenske equation determines the
Option A:	maximum number of ideal plates
Option B:	height of the distillation column
Option C:	minimum number of theoretical plates.
Option D:	optimum reflux ratio.

7.	The simple distillation is also called as-
Option A:	Equilibrium distillation.
Option B:	Flash distillation.
Option C:	Differential distillation.
Option D:	Continuous rectification.
8.	_____ is the temperature at which a gas-vapor mixture becomes saturated, when cooled at constant total pressure out of contact with a liquid.
Option A:	Dew point
Option B:	Bubble point
Option C:	Dry bulb temperature
Option D:	Wet bulb temperature
9.	In reverse osmosis
Option A:	A porous membrane is used
Option B:	No membrane is required.
Option C:	A semi permeable membrane is used.
Option D:	Solvent moves to the solution side.
10.	A mixture of o-nitrophenol and p-nitrophenol can be separated by
Option A:	sublimation
Option B:	crystallisation
Option C:	steam distillation
Option D:	chromatography

Q2. (20 Marks)	Solve any Two out of Three.(10 marks each)
A	A mixture containing benzene and toluene with 40% benzene and 60% toluene is to be separated in fractionating column to give product containing 96% benzene and bottom product containing 95% toluene. Feed is a mixture of two-third vapour and one third liquid. Find the number of theoretical stages required if the reflux ratio of 1.5 times the minimum is used. (relative volatility=2.5)
B	Explain break through curve for adsorption in fixed bed. Derive equation for length of unused bed(LUB).
C	Experiments with decolorization of oil yielded the following equilibrium relationship $y = 0.5 x^{0.5}$ where y = gm of colour removed / gm adsorbent x = colour in oil/1000 gm colour free oil Calculate % colour removed if 100 kg of oil containing 1 part of colour per 3 parts of oil is agitated in two stages with 12.5 grams of adsorbent each.

Q3. (20 Marks)	Solve any Two out of Three .(10 marks each)							
A	Derive and explain an expression for multistage countercurrent leaching.							
B	Calculate yield of $MgSO_4 \cdot 7 H_2O$ crystals when 1000 kg of saturated solution of Solution of $MgSO_4$ at 353 K ($80^\circ C$) is cooled to 303 K ($30^\circ C$) assuming 10% water is lost by evaporation during cooling.							
C	Nicotine(C) in water(A) solution containing 1% nicotine is to be extracted with kerosene(B) at $20^\circ C$. Water and kerosene are essentially insoluble.(a) Determine percent extraction of nicotine if 100 kg of feed solution is extracted once with 150 kg solvent.(b) Repeat for three theoretical stages with 50 kg solvent in each stage.							
	x' kg C/kg A	0	0.001011	0.00246	0.00502	0.00751	0.00998	0.0204
	y' kg C/ kgB	0	0.000807	0.001961	0.00456	0.00686	0.00913	0.0187

Q4. (20 Marks)	Solve any Four out of Six .(5 marks each)							
A	Explain properties required for ideal solvent in extraction.							
B	Write a note on steam distillation.							
C	Write a note on Electrodialysis.							
D	Explain solubility curves for Crystallisation.							
E	Write a note Characteristics of adsorbents.							
F	Write a note on Ball man Extractor.							