ASSIGNMENT FOR III B.TECT 'A' SEC BIOTECH (CH 319 MASS TRANSFER)
SRM University

Reg.No.	Name of the Student	Assignment 1
10905002 10905003 10905004 10905005	ADIT KUMAR RUSTAGI ADITI MURTHY AISHWARYA V AJAYKUMAR DEVARAPU	**Part A** 1. What is diffusion? 2. State Fick's first law of diffusion. **Part B** 1) Derive the rate equation from first principles for the following conditions. Steady state unidirectional laminar flow molecular diffusion for gases and draw the necessary graph. a) For diffusion of A through non diffusing B. b) For Equimolal counter diffusion.
10905006 10905007 10905008 10905009	AKSHAY M JAIN ALEEKYA B AMIL MEHTA AMIT KUMAR ROY	**Part A** 3. State Fick's second law of diffusion. 4. Draw the graph showing Concentration for 1. Equimolar diffusion 2.Unimolar diffusion in gases **Part B** 1) Derive the rate equation from first principles for the following conditions. Steady state unidirectional laminar flow molecular diffusion for gases and draw the necessary graph. a) For diffusion of A through non diffusing B. b) For Equimolal counter diffusion
10905010 10905012 10905013 10905014	AMITAVA BASAK ANAND PRABHU R ANANYA AICH ANIL WILLIAM KUMAR KANDAMALA	**Part A** 5.Eddy diffusivity 6. Define diffusivity and molar flux. **Part B** 3) Oxygen (A) is diffusing through nondiffusing carbon monoxide (B) under steady state conditions. Total pressure is $1x10^5$ N/m^2 and temperature is 0^oc. The partial pressure of oxygen (A) at two planes 2mm apart are 13000,6500 N/m^2 respectively. The diffusivity of the mixture is $1.87x10^{-5}$ m^2/s.Calculate the rate of diffusion of oxygen in kmoles per second through each sq.m of the two planes
10905015 10905016 10905017 10905018	ANJU K PHILIPS ANKIT GUPTA ANKIT JINDAL ANKIT KUMAR	**Part A** 7.What is meant by molecular diffusion and eddy diffusion? 8. Define equimolar diffusion and unimolar diffusion with example. **Part B** 4) Methane diffuses at a steady state through a tube containing helium. At a point (1) the partial pressure is 15.55 kpa and at point (2) which is 30 mm apart the partial pressure of methane is 10 kPa.The total pressure is 101.32 kPa and temperature is 293 K. At this pressure and temperature the calue of diffusivity is 6.75×10^{-5} m^2/sec. Calculate the flux of methane at steady state for equimolal counter diffusion.

10905019 10905020 10905021 10905022	ANKITA DAS ANKITA SUSAN MATHEW ANKUR SOOD APARNA B	**Part A** 9. What are the factor which affects the mass transfer rate between two fluids. 10.For a binary system prove $D_{AB} = D_{BA}$. **Part B** 5). Calculate the rate of diffusion of NaCl per unit area through a stagnant film of water 1mm thick when the concentration are 9% and 3% (wt%) respectively on either side of the film. The diffusivity of NaCl in the solution may be taken as 1.4 x 10-9 m2/sec. The density of 9% NaCl at 18oC = 1012 kg/m3 and 3% solution at 18oC = 1003 kg/m3.
10905024 10905025 10905027 10905028	ARADHANA MISHRA ARCHANA JEEVA S ASHWIN RATHNAM S AYYAM PERUMAL KARTHIK M	**Part A** 11.Write Wilke Chang equation and its use. 12.Write Wilke Lee equation and its use. **Part B** 6) Ammonia is diffusing through non diffusing mixture of N_2 and H_2 containing 30% (vol%) of nitrogen. Calculate the rate of diffusion of ammonia through the mixture of film thickness 0.5mm. When the concentration changes across the film is 10-5% of ammonia volume. The total pressure is 207 kN/m^2 and the temperature is 50°C. The diffusivities at 50°C are D_{NH3-H2} is 4.2x 10-5 m^2/s and D_{NH3-N2} is 1.35 x 10^{-5} m^2/s.
10905029 10905030 10905031 10905032	BARATH BALACHANDRAN.R. BHARGAVI MURTHY CHAKRADHAR C CHAVA ABISHIKTA	**Part A** 12.Write Wilke Lee equation and its use. 13.What is effective diffusivity and mention the equation used to calculate the effective diffusivity? **Part B** 7) What is the rate of diffusion of chloropicrin (ccl_3NO_2) into air at 25°C under the following conditions? Total pressure = 770 mm Hg Vapour pressure at 25oC = 23.81 mm Hg Diffusivity = 0.088 cm^2/s Length of diffusion path = 11.14 cm. Density of chloropicrin = 1.65 g/cm^3 Surface area of liquid exposed = 2.29 cm^2
		Part A 14.What is the effect of temperature and pressure on the diffusivity of gases? 16.Give a special forms of fick's law for the flux N_A that apply to a) Equimolal counter diffusion b) Diffusion of A through Stagnant B **Part B** 8) A gas mixture containing one fifth hydrogen and four fifth methane by volume is prepared through

		which oxygen is allowed to diffuse. The total pressure is $1x10^5$ N/m^2 and temperature is 2oC. Estimate the rate of diffusion of oxygen through the gas film of thickness 3mm when concentration change across the film is 12 to 7% by volume. Diffusivity data at 1 atm,0^oC is Diffusion of oxygen in hydrogen = 7.1 x 10-5 m^2/sec Diffusion of oxygen in methane = 1.88 x 10-5 m^2/sec
10905033 10905034 10905035 10905036	CHINMAYANANDA PATRA CHINTHALA SAHITHI CHITHRA GOMATHI .A DEBASMITA CHAKRABORTY	**Part A** 15.What is the effect of temperature and pressure on the diffusivity of liquids? 16.Give a special forms of fick's law for the flux N_A that apply to a) Equimolal counter diffusion b) Diffusion of A through Stagnant B **Part B** 7) What is the rate of diffusion of chloropicrin (ccl_3NO_2) into air at 25^oC under the following conditions? Total pressure = 770 mm Hg Vapour pressure at 25oC = 23.81 mm Hg Diffusivity = 0.088 cm^2/s Length of diffusion path = 11.14 cm. Density of chloropicrin = 1.65 g/cm^3 Surface area of liquid exposed = 2.29 cm^2
10905037 10905038 10905039 10905040	DEEPA SEKHAR DEEPANWITA BOSE DEEPIKA G S **DEEPIKA SREEDHAR**	**Part A** 1. What is drying? 2. Define equilibrium moisture content **Part B** 9) The open circular tank of 0.25m dia contains benzene at 28oC is exposed to atmosphere in such a manner that the liquid is covered by a stagnant air film of 2 cm high. The concentration of benzene beyond air film may assumed negligible. The following data may be assumed. Vapour pressure of benzene at 28^oC is 100mm Hg Dc6h6- air = 0.09 cm^2/s Density of benzene = 880 kg/m^3 If the cost of benzene is Rs 20 per litre find the loss incurred per year.
10905041 10905042 10905043 10905044	DEEPIKALAL K E DEEPTHI V DIPTI RANJAN SAHOO DIVYA NIVEDITHA E	**Part A** 3. Define moisture content on dry and wet basis. 4. Define bound moisture **Part B** 1. Explain rotary drier with a neat diagram
10905045 10905047 10905048 10905049	DIVYA PRABHA.K.R GANGULA NAGASAHITHI GAYATHRI RAJA GAYATRI S	**Part A** 5. Define free moisture. 6. Define unbound moisture. **Part B** 2. Write the calculation procedure for time of drying for constant and falling rate period.

10905050 10905053 10905054 10905055	GOPI KRISHNA REDDY.D. HARISH K HARSH H.DHAGAMWAR HARSHA VARDHAN SAGI	**Part A** 7. Write about the major classification of driers. 8. What do you mean by constant drying conditions. **Part B** 3. Write short notes on freeze drying.
10905056 10905057 10905058 10905059	HASINA A JANANI GOPALAN JASTI SATISH JAYA KUMAR.P.N.T.	**Part A** 9.. Give examples for continuous driers. 10. Draw a typical rate of drying curve. **Part B** 4. Explain tray drier with a neat diagram.
10905060 10905061 10905074	JAYAKISHORE PREIKALA JAYANTWIN KUNDANA KANCHERLA	**Part A** 1. What is drying? 11. Define critical moisture content. **Part B** 5. Explain spray drier with a diagram

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10905002 10905003 10905004 10905005	ADIT KUMAR RUSTAGI ADITI MURTHY AISHWARYA V AJAYKUMAR DEVARAPU	11. Define critical moisture content. 12. Define rate of drying 6. Write about Continuous distillation
10905006 10905007 10905008 10905009	AKSHAY M JAIN ALEEKYA B AMIL MEHTA AMIT KUMAR ROY	13. Give examples for batch driers. 14. What is distillation 7. Explain Simple and steam distillation.
10905010 10905012 10905013 10905014	AMITAVA BASAK ANAND PRABHU R ANANYA AICH ANIL WILLIAM KUMAR KANDAMALA	15. Define relative volatility. 16. Define total reflux 8.A certain material was dried under constant drying conditions and it was found that 2 hrs are required to reduce the free moisture content from 20% to 10%. How much longer would be required to reduce the free moisture to 4%. Assume that no constant rate period is encountered.
10905015 10905016 10905017 10905018	ANJU K PHILIPS ANKIT GUPTA ANKIT JINDAL ANKIT KUMAR	17. Define reflux ratio and minimum reflux ratio. 18. What is the principle of steam distillation. 9.A 50 Kg batch of granular solids containing 25% of moisture is to be dried in a tray to 12% moisture by a stream of air at 92 degree Celsius tangentially across its surface at a velocity of 1.8 m/s. If the constant rate of drying under these conditions is 0.008 kg moisture/m^2.s and the critical moisture content is 10%, Calculate the drying time. The surface area available is 1.0 m^2
10905019 10905020 10905021 10905022	ANKITA DAS ANKITA SUSAN MATHEW ANKUR SOOD APARNA B	19. what is azeotropic distillation.? 20. What is flash distillation? 10. A wet solid is to be dried from 35% to 10% moisture in 5hrs. the critical and equilibrium moisture contents are 14% and 4% respectively. How long will it take to dry the materials to 6% moisture under the same conditions? All moisture contents are on wet basis.
10905024 10905025 10905027 10905028	ARADHANA MISHRA ARCHANA JEEVA S ASHWIN RATHNAM S AYYAM PERUMAL KARTHIK M	1.Give the principle of Leaching 2. What are the factors which affect a leaching operation ?. 1. a) Describe any one type of commercial Extraction tower with a neat sketch. b) Enumerate the desirable characteristics of solvent used in Liquid-Liquid Extraction
10905029 10905030 10905031 10905032	BARATH BALACHANDRAN R BHARGAVI MURTHY CHAKRADHAR C CHAVA ABHISHIKTA	3. Explain the term extraction and leaching. 4. What is extraction ?. Explain with example. 2. Describe the Bollmann Extractor used in leaching operation with a suitable sketch.
10905033 10905034 10905035 10905036	CHINMAYANANDA PATRA CHINTHALA SAHITHI CHITHRA GOMATHI .A DEBASMITA CHAKRABORTY	5. Give the principle of Solid-Liquid Extraction 6. Discuss about the effect of temperature on leaching. 3. Describe the Equipments used for Leaching operations with neat diagram.

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10905040</td><td>DEEPA SEKHAR
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8. Write the properties of a good solvent for extraction.
4. a) Explain briefly the various types of contacting devices available for liquid-liquid extraction operation.
b) Explain the difference between constant and variable underflow operation in leaching.</td></tr>
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10905044</td><td>DEEPIKALAL K E
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DIPTI RANJAN SAHOO
DIVYA NIVEDITHA E</td><td>9. Explain percolation method of leaching.
10. Define distribution coefficient and state its importance.
5. A 25% (Weight %) solution of dioxane in water is to be continuously extracted in counter current fashion with Benzene to remove 94% of the dioxane in the feed. If the feed rate is 1000Kg/hr.Estimate the
(i) Minimum solvent required
(ii) Theoretical stages needed if 900Kg/hr of solvent is used.
<table><tr><td>Wt% Dioxane in water</td><td>5.1</td><td>18.9</td><td>25.2</td></tr><tr><td>Wt% Dioxane in benzene</td><td>5.2</td><td>22.5</td><td>32.0</td></tr></table></td></tr>
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GANGULA NAGASAHITHI
GAYATHRI RAJA
GAYATRI S</td><td>11. Define extraction factor.
12. Differentiate between leaching and decoction.
6. Nicotine in water containing 1% Nicotine is to be extracted with kerosene at 20°C.Water and kerosene are insoluble
a) Determine the percentage extraction of nicotine if 100Kg of feed solution is extracted with 150Kg of solvent.
b) Repeat for 3 theoretical extraction using 50kg of solvent in each stage.
Equilibrium Data:
<table><tr><td>X</td><td>0</td><td>0.001</td><td>0.00246</td><td>0.005</td><td>0.0075</td><td>0.01</td><td>0.02</td></tr><tr><td>Y</td><td>0</td><td>0.0008</td><td>0.002</td><td>0.0046</td><td>0.007</td><td>0.009</td><td>0.019</td></tr></table></td></tr>
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10905055</td><td>GOPI KRISHNA REDDY
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HARSH H DHAGAMWAR
HARSHA VARDHAN SAGI</td><td>13.What is selectivity of solvent for extraction?.
14.State the properties of good solvent for Extraction
7. If 1000kg/hr of Nicotine –Water solution containing 1% nicotine is to be counter currently extracted with kerosene at 20°C to reduce the nicotine content to 0.1%.Detremine the (a) the minimum kerosene rate and b) the number of theoretical stages required if 1150kg of kerosene is used per hour.
<table><tr><td>X</td><td>0</td><td>0.001</td><td>0.00246</td><td>0.005</td><td>0.0075</td><td>0.01</td><td>0.02</td></tr><tr><td>Y</td><td>0</td><td>0.0008</td><td>0.002</td><td>0.0046</td><td>0.007</td><td>0.009</td><td>0.019</td></tr></table></td></tr>
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10905060 10905061 10905074	JAYAKISHORE PREIKALA JAYANTWIN KUNDANA KANCHERLA	17.Write short notes on Heap Leaching 18.What is Binodal Solubility curve? 1. Explain in detail the working of Swenson-Walker Continuous crystallizer with a neat diagram.