R09

Code No: 54047

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, December - 2018
MASS TRANSFER OPERATIONS
(Biotechnology)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) Write the procedure for estimation of diffusivity estimation by Stefan's experiment.
b) Explain the procedure for distribution of gas and liquid components through solid diffusion of biological solutes in the liquids. [7+8]

2.a) What is oxygen mass transfer? Explain.
b) What are the parameters are takes place to effecting the oxygen mass transfer? Explain.
c) Write the significance of below dimension less groups.
i) Sherwood number ii) Stanton number iii) Schmidt number. [5+5+5]

3.a) Explain VLE with a suitable diagram and discuss its equation.
b) Discuss about the solubilities of gases in liquids of:
i) Two components systems
ii) Multi component systems
iii) Ideal Liquid solutions. [7+8]

4. Describe the various extraction equipments used in a process industry. Compare and contrast the stage columns versus differential columns used in liquid extraction and highlight their merits. [15]

5. An aqueous solution containing a valuable solute is colored by small amounts of an impurity. Before crystallization is to be removed by absorption on a decolorizing carbon which adsorbs only insignificant amounts of the principal solute. A series of laboratory tests was made by stirring various amounts of the adsorbent into batches of the original solution until equilibrium was established, yielding the following data at constant temperature.

Kg carbon/kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium color	9.6	8.6	6.3	4.3	1.7	0.7

The color intensity was measured on an arbitrary scale, proportional to the concentration of the colored substance. It is desired to reduce the color to 10% of its original value, 9.6. Determine the quantity of fresh carbon required per 1000 kg of solution for a single stage operation for a two stage cross current process using the minimum total amount of carbon, and for a two stage counter current operation. [15]

6.a) Discuss about the direct dryers and indirect dryers.

b) An insoluble crystalline solid wet with water is placed in a rectangular pan 0.7 m by 0.7 m and 25 mm deep, made of 0.8 mm thick galvanized iron. The pan is placed in an airstream at 65^0C, humidity 0.01 kg water/kg dry air, flowing parallel to the upper and lower surface at a velocity of 3 m/s. The top surface of the solid is in direct sight of steam- heated pipes whose surface temperature is 120^0C, at a distance from the top surface of 100 mm:

i) Estimate the rate of drying at constant rate

ii) Reestimate the rate if the pan is thoroughly heat-insulated and there is no radiation from the steam pipes. [7+8]

7.a) Explain with the help of neat diagram about ultra filtration and reverse osmosis for separation of impurities from waste water.

b) Explain about the micro filtration.

c) Write the differences between dialysis and electro dialysis. [5+5+5]

8.a) Discuss about Drying of baker's yeast.

b) Explain about Extraction of penciline using butyl acetate.

c) Write about Crystallization of citric acid. [5+5+5]

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