Total No. of printed pages = 6

END SEMESTER EXAMINATION – 2022

Semester : 4th (New)

Branch : Chemical

Subject Code : Ch-405

PRINCIPLE OF UNIT OPERATION – II

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instruction :

- *All* questions of PART – A and PART – B are compulsory.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

   (a) In distillation, the constituents of liquid mixture are separated using _____ energy.

   (b) When diffusion results from the random movement / motion of the molecules, it is called as _____.

[Turn over

(c) A mixture-settler is a _____ stage extraction equipment.

(d) The temperature at which condensation will first occur is known as _____.

(e) The section above the feed plate / tray of fractionating column is called _____ section.

(f) _____ is the part of drying process during which the rate of drying remains constant.

(g) Solvent lean phases are known as _____.

(h) The formula for degree of freedom in vapour liquid equilibrium is F = _____.

(i) When a particular component is removed out with the help of a solvent is called _____.

(j) The reverse of absorption is called _____.

2. Write True or False : 1×10=10

(a) 'Weeping' problem in sieve-plate distillation column is due to high-gas rates through perforations.

(b) In gas absorption process, the mass is transferred from the liquid phase to the gas phase.

(c) The difference in vapour pressure / volatilities of different constituents at the same temperature is responsible for separation of constituents.

(d) In packed-tower absorption column, the packings are generally classified as random packings and regular packings.

(e) Rotocell extractor is a leaching equipment.

(f) In Bollman / Basket extractor there is a series of perforated baskets attached to a chain conveyor.

(g) Liquid-liquid extraction utilizes the differences in volatility of components to effect a separation.

(h) In drying process, unsaturated gas phase is known as drying medium.

(i) For reducing the transportation cost, drying operation is carried out.

(j) Area of drying surface does not affect the rate of drying.

3. Choose the correct answer : 1×5=5

(a) If relative volatility $\alpha_{AB} = 1$, then the separation by distillation is

(i) Possible (ii) Not possible

(iii) 50% possible (iv) None of these

(b) _____ gives the relationship between the concentration of gas dissolved in a liquid and the equilibrium partial pressure of the gas above the liquid surface.

(i) Raoult's law (ii) Dalton's law

(iii) Henry's law (iv) Gibb's law

(c) Impellers are used in

(i) Distillation column

(ii) Agitated vessel

(iii) Fractionation column

(iv) Packed vessel

(d) When the constituents of a liquid mixture are separated by using an insoluble liquid solvent, it is known as

(i) Solid-liquid extraction

(ii) Liquid-liquid extraction

(iii) Solid-gas extraction

(iv) Gas-liquid extraction

(e) _____ is used for drying of free-flowing granular materials on a large scale.

(i) Tunnel dryer (ii) Tray dryer

(iii) Rotary dryer (iv) All of these.

PART – B

Marks – 45

4. (a) Write a brief note on 'Selecting criterion for solvent in gas absorption'. 2

(b) Describe the process of fractional distillation. Use a simple schematic diagram. 5

(c) Give a description with diagram about bubble-cap tray of distillation column. 5

Or

Explain rotary drier with neat diagram. 5

5. (a) Define Raoult's law. 2

(b) Explain the working principles of tray drier with the proper schematic diagram. 5

Or

Explain the working of spray tower/column of liquid-liquid extraction with simple diagram. 5

(c) Write short notes on : 3+3=6

(i) Rotocell extractor

(ii) Rotating disc contractor.

6. (a) What are the factors that affect the rate of leaching ? 2

(b) State the difference between leaching and extraction process. 3

(c) Explain packed column / tower for gas absorption, with a neat schematic diagram. Mention two advantages of packed column. 5+1=6

7. (a) Define the following terms : 1×4=4

(i) Dry-bulb temperature

(ii) Wet-bulb temperature

(iii) Bound moisture content

(iv) Free moisture content.

(b) Explain gas absorption by mechanically agitated vessel with a suitable diagram. 5

Or

Describe packed column for distillation process with diagram. 5