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**END SEMESTER REGULAR / RETEST  
EXAMINATION, JULY - 2023**

Branch : Chemical

Semester : 4th (New/Old)

Subject Code : Ch-405

**PRINCIPLES OF UNIT OPERATION - II**

Full Marks - 70

Time - Three hours

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

**Instructions :**

- (i) All questions of PART-A are compulsory.
- (ii) Answer any five questions from PART-B.

**PART - A**

Marks - 25

1. Choose the correct answers :  $1 \times 5 = 5$ 
  - (a) For NH<sub>3</sub>-air separation, solvent used is
    - (i) water
    - (ii) alkanol amine
    - (iii) alcohol
    - (iv) ester

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(b) Raoult's law is applicable to

- (i) Non-ideal solution
- (ii) Ideal solution
- (iii) Saturated solution
- (iv) Unsaturated solution

(c) For easy separation of component of a mixture, relative volatility should be

- (i) equal to zero
- (ii) equal to 1
- (iii) greater than 1
- (iv) less than 1

(d) In liquid-liquid extraction two phases must be brought into

- (i) good contact
- (ii) same density
- (iii) different density
- (iv) None of these

(e) Potato chips, papad are dried by

- (i) tray dryer
- (ii) rotary dryer
- (iii) spray dryer
- (iv) vacuum dryer.

2. Fill in the blanks :

$1 \times 10 = 10$

(a) Transport of molecules from higher concentration to lower concentration in a stagnant medium occurs by a mechanism called \_\_\_\_\_.

(b) Absorption of gas is done at \_\_\_\_\_ temperature.

(c) Bubble cap tray has \_\_\_\_\_ pressure drop.

(d) \_\_\_\_\_ heat is obtained from a reboiler.

(e) Azeotropic distillation creates to \_\_\_\_\_ layer.

(f) Minimum reflux ratio requires \_\_\_\_\_ number of plates.

(g) Moisture that are not retained or absorbed by the aggregates are called \_\_\_\_\_.

(h) Total moisture content is equal to \_\_\_\_\_ + \_\_\_\_\_.

(i) Liquid-liquid extraction is done to avoid \_\_\_\_\_.

(j) The residual liquid which the solute has been removed from it is called \_\_\_\_\_.

3. State True or False :  $1 \times 10 = 10$

(a) An azeotrope is a mixture of two or more liquid whose properties cannot be altered by simple distillation.

- (b) Upper curve in the boiling point diagram is called bubble point curve.
- (c) In total reflux, number of plates is minimum.
- (d) Reflux ratio is the ratio of the amount of top product to amount of reflux given.
- (e) Temperature read by a thermometer covered in water soaked cloth over which air is passed is called dry bulb temperature.
- (f) Spray dryer is used to make milk powder.
- (g) Extraction solvent must be immiscible with the solution to be extracted.
- (h) Leaching is not used in pharmaceutical industry.
- (i) Physical symptom of flooding is the sharp rise in pressure drop.
- (j) The packing material should trap fine solid particle that may be present in liquid.

## PART - B

### Marks - 45

4. (a) What are the advantages of double cap tray ? 3

(b) Explain vacuum distillation. 3

(c) What is tray and what are its major function ? 3

5. (a) Define absolute and relative humidity of air. 2

(b) Describe construction and operation of rotary dryer. 7

6. (a) What are the advantages of packed bed absorption tower ? 3

(b) Describe the working of mixer settler with suitable diagram. 6

7. Describe construction and operation of sieve plate distillation column with diagram. 9

8. (a) Distinguish between drying and evaporation. 3

(b) What is fractional distillation ? 3

(c) State and explain Henry's Law. 3

9. (a) Name the different types of towers packing with diagram. 4

(b) Explain the packed bed absorption tower with diagram. 5

10. (a) What is the mechanism of solvent extraction ? 3

(b) State and explain Fick's Law. 3

(c) What are the objectives of drying ? 3