



**C20-CHPP-CHPC-CHOT-406**

**7475**

**BOARD DIPLOMA EXAMINATION, (C-20)**

**OCTOBER/NOVEMBER—2023**

**DCHPP – FOURTH SEMESTER EXAMINATION**

**UNIT OPERATIONS—II**

*Time : 3 Hours ]*

*[ Total Marks : 80*

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**PART—A**

**3×10=30**

- Instructions :** (1) Answer **all** questions.  
(2) Each question carries **three** marks.  
(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. Distinguish between molecular diffusion and eddy diffusion.
2. What is the mass transfer coefficient? Give the relation between mass transfer coefficient and diffusivity.
3. Define distillation. Give an example.
4. What is an azeotrope?
5. Mention three industrial applications of gas absorption.
6. List the important properties of a solvent which is used for absorption.
7. Define the terms (a) absolute humidity and (b) percentage humidity.
8. Discuss the theory of wet bulb temperature.
9. Give three examples for leaching operation.
10. State the methods of attaining supersaturation in crystallization.

- Instructions :** (1) Answer **all** questions.  
(2) Each question carries **eight** marks.  
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

- 11.** Derive an equation for flux for steady state diffusion of A through non-diffusing B in gases.

**(OR)**

Oxygen (A) is diffusing through carbon monoxide (B) under steady-state conditions, with the carbon monoxide non-diffusing. The total pressure is  $1 \times 10^5 \text{ N/m}^2$  and the temperature is  $0^\circ\text{C}$ . The partial pressures of oxygen at two planes 2.0 mm apart are respectively 13000 and  $6500 \text{ N/m}^2$ . The diffusivity for the mixture is  $1.87 \times 10^{-5} \text{ m}^2/\text{s}$ . Calculate the rate of diffusion of oxygen in kmol/s through each square meter of the two planes.

- 12.** Mention the assumptions made in McCabe-Thiele method to determine theoretical stages.

**(OR)**

Explain entrainment, foaming, coning and limiting vapour velocity in distillation operation.

- 13.** Explain the construction and working of rotary dryer with sketch.

**(OR)**

Briefly explain about functioning of cooling towers.

- 14.** Explain the principle and working of Bollman extractor with a sketch.

**(OR)**

How does the solids are leached in rotocell extractors? Explain.

- 15.** Draw a sketch of vacuum crystallizer and explain its working and construction.

**(OR)**

Explain about physical adsorption and chemisorption.

**PART—C**

10×1=10

- Instructions :** (1) Answer the following question.  
(2) The question carries **ten** marks.  
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

**16.** A mixture of benzene and toluene containing 60 mole% benzene is to be separated to give a product of 95 mole % benzene and a bottom product containing 10 mole % benzene. The feed enters the column at its bubble point. It is proposed to operate the column with reflux ratio of 2.5. Find the number of theoretical plates needed and the position of feed plate for the given separation.

**Equilibrium data :**

<i>x</i>	0	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
<i>y</i>	0	0.13	0.21	0.375	0.5	0.6	0.7	0.77	0.83	0.9	0.95	1.0

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