



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE**  
**EXPRESS WAY,**  
**JABI - ABUJA.**  
**FACULTY OF SCIENCES**  
**DEPARTMENT OF CHEMISTRY**  
**2024 1 EXAMINATION**

**COURSE CODE:** CHM 316  
**COURSE TITLE:** INDUSTRIAL CHEMICAL TECHNOLOGY I  
**COURSE UNIT:** 2  
**TIME:** 2 HOURS  
**INSTRUCTION:** Answer question one and any other two questions.

**QUESTION ONE**

- 1(a) Explain the following terms: (i) Mass transfer by diffusion (ii) Mass transfer by convection (iii) mass transfer by change of phase
- 1(aii) Name and explain the three modes of heat transfer.
- 1(bi) Define mass concentration and molar concentration.
- 1(bii) Discuss the second law of thermodynamics and its implications for heat flow
- 1(c) State Fick's first law of diffusion and include an equation
- 1 (cii) Explain diffusion velocity.
- 1(di) Give four examples of industrial processes that involve mass transfer operations.
- 1(dii) Define an exothermic reaction and give one example to explain.

**QUESTION TWO**

- 2(a) Describe the process of crystallization and its applications. (5 marks)
- (2b) Discuss velocity in a multi-component system (6 marks)
- (2c) Define a unit process and provide examples. (5 marks)
- (2d) Explain eddy diffusion with an example (4 marks)

**QUESTION THREE**

- (3a) Explain the tubular heat exchanger and its process (6 marks)
- (3b) Define chemical technology and explain its role in the chemical industry. (4 marks)
- (3c) Define molar concentration and mass concentration and include equations (5 marks)
- (3d) Provide five examples of industrial processes involving mass transfer. (5 marks)

#### QUESTION FOUR

- (4a) Describe the structure, dimensions and two applications of typical industrial distillation towers. (6 marks)
- (4b) Give four examples of everyday experiences of mass transfer process (4 marks)
- (4c) Highlight the six components of an oil and gas separator. (6 marks)
- (4d) Describe the characteristics and operating states of transient reactors. (4 marks)

#### QUESTION FIVE

- (5a) Describe the structure and functioning of a typical industrial distillation tower. (5 marks)
- (5b) Define chemical reactors and their role in chemical engineering. (4 marks)
- (5c) Name and explain two types of equipment used in chemical technology. (6 marks)
- (5d) Discuss the importance of data such as fugacity data and vapour pressures in distillation modelling (5 marks)

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