NATIONAL OPEN UNIVERSITY OF NIGERIA
UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESS WAY,
JABI - ABUJA.
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2025_2 EXAMINATIONS

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) Heat (ii) Heat transfer (iii) Thermodynamics

(6 Marks)

1(aii) Name and define the three modes of heat transfer. (6 marks).

(1bi) Explain Newton's law of cooling and its application in convection (4 marks)

(1bii) Discuss the second law of thermodynamics and its implications for heat flow (3 marks)

1(ci) State Fourier's law of heat conduction and include an equation (3 marks)
1 (cii) Differentiate between adsorption and absorption. (2 marks)
1(di) Describe three properties of radiant heat and its similarity to light. (4 Marks)

1(dii) Define an exothermic reaction and give one example to explain. (3 Marks)

QUESTION TWO

2(a) Explain the principle of distillation and its role in the chemical industry (5 marks)
(2b) Explain distillation and identify four other terms for the word "distillate" (6 marks)
(2c) State the ideal gas law and its equation. (5 marks)
(2d) Explain eddy diffusion with an example (4 marks)

QUESTION THREE

(3a) Give three examples of everyday experiences of mass transfer process (6 marks)
(3b) Explain mass transfer by diffusion and use an example for illustration. (4 marks)
(3c) Define molar concentration, mass concentration and differentiate between the two (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) Provide two examples each of physical processes in sugar, pharmaceutical, and salt industries. (6 marks)
(4c) Differentiate between continuous and batch process reactors. (4 marks)
(4d) Explain the plug flow reactor (PFR) model and its applications. (4 marks)

QUESTION FIVE

(5a) Discuss the continuous stirred-tank reactor (CSTR) model and highlight two differences between it and a plug flow reactor (PFR). (5 marks)
(5b) Define chemical reactors and their role in chemical engineering. (4 marks)
(5c) Provide four examples of industrial processes that utilize different types of chemical reactors. (6 marks)
(5d) Highlight two types of chemical reactors and three key process variables of a chemical reactor. (5 marks)