

Roll No.....

Jamia Hamdard
Department of Chemistry
School of Chemical & Life Sciences
BSc. Hons. Chemistry (FYUP), Chemistry/Semester-I
Paper Title: Phase Equilibria & Chemical Kinetics
Paper Code: BCH-DSC402TH

Time: 2 ½ hours

Maximum Marks: 60

Abbreviations Used: CLO- Course Outcome, PLO- Program Outcome, BTL- Bloom Taxonomy Level:
 BT level 1-Remember; BT level 2-Understand; BT level 3-Apply; BT level 4-Analyse; BT level 5-Evaluate, BT level 6-Create.

Q. No.		BTL	CLO	PLO
SECTION A				
Very Short Type Questions (Attempt all):		(1.5x10=15 marks)		
A1	Differentiate between components and phases with the help of the $\text{CaCO}_3 \rightleftharpoons \text{CaO} + \text{CO}_2$ system.	2	2	1-2
A2	Explain how degrees of freedom change during phase transitions.	2	2	1-2
A3	What kind of behavior is shown by the KI-H ₂ O system: eutectic or peritectic?	1	2	2
A4	Give reason: First ionization enthalpy of boron is less than that of beryllium.	2	2	3
A5	What is meant by congruent melting? Illustrate using the Mg-Zn system.	1	1-2	1-2
A6	Define solid solution.	2	3	3
A7	What is meant by partial miscibility of liquids? Give examples.	1	2	2
A8	What are the conditions under which the distribution law holds true?	1	2	3
A9	Define consecutive reactions	1	1-2	1-2
A10	Define opposing reactions in the context of chemical kinetics.	2	1	3
SECTION B				
Long Type Questions (Attempt any two out of four):		(10x2=20 marks)		
B1	Derive the Clausius-Clapeyron equation from thermodynamic principles.	3	1-3	1-3
B2	Explain why some liquid pairs are completely miscible and others are not.	4-6	2-6	4-6
B3	Explain the concept of the transition state in the activated complex theory and how it determines the rate of reaction.	3-4	3-5	3-5
B4	What is the Lindemann mechanism for unimolecular reactions? Explain the steps involved in this mechanism and the significance of the rate constant k_1 , k_{-1} and k_2 , k_{-2}	4-5	3-6	3-6

SECTION C				
Short Type Questions (Attempt all Questions):		(5x5=25 marks)		
C1	Identify the eutectic point in the NaCl-H ₂ O system. OR Draw and explain the phase diagram of the NaCl-H ₂ O system.	3-5	4-5	4-5
C2	Contrast congruent and incongruent melting using phase diagrams. OR Explain the application of the NaCl-H ₂ O system in de-icing roads.	3	4	3-4
C3	Derive the Gibbs-Duhem equation and explain its significance in thermodynamics of solutions. OR Discuss the limitations of the Margules equation for highly non-ideal systems.	4-6	4	4-5
C4	Explain the qualitative treatment of the theory of absolute reaction rates. How does it relate to the concept of activation energy and temperature dependence? OR Explain the activated complex theory (also known as the transition-state theory). How does it differ from the collision theory?	3-4	2-3	3-5
C5	What role does spectrophotometry play in measuring reaction rates? OR Suggest an experimental setup to determine the rate law for the decomposition of hydrogen peroxide.	5-6	3-6	4-6