

School: School of Science
Program: B.Sc. in Chemistry
Year: 3rd Semester: V

Examination: End Semester Examination

Examination year: December - 2021

Course Code: CH302

Course Name: Phase Equilibria, Chemical Kinetics & Catalysis

Date: 06/12/2021 Total Marks: 40

Time: 11:30 am to 13:30 pm

Total Pages: 3

Instructions:

→ Write each answer on a new page.

→ Use of a calculator is prequired.

→ * COs=Course Outcome mapping. # BTL=Bloom's Taxonomy Level mapping

Q. No.	Details	Marks	COs*	BTL#
Q.1	Answer the following (Any two) 1) A skater can skate easily on the surface of ice rink and cooking is more efficient in a pressure cooker. Justify. 2) Unwanted moisture can be removed from the drug/protein/enzyme sample. Justify. 3) Define the terms adsorption and absorption. Distinguish between chemical	6	CO1, CO2, CO5	BT1, BT2, BT3, BT4,
Q.2	adsorption and physical adsorption. Discuss the various applications of adsorption in industry and in everyday life. Chose the most appropriate answer from the options provided A. What is the name of the phase transition that occurs when a solid is converted			
	directly into a gas (without going through the liquid phase)? a) Melting b) Boiling c) Sublimation d) Condensation B. On a two component solid-liquid phase diagram, an isopleth indicates which of the following? a) A region where the temperature is constant b) An area below which only the solid phase exists c) An area above which only the liquid phase exists d) A region where the composition of the system is constant	8	CO1, CO2, CO3, CO4	BT1 BT2 BT3 BT4 BT5
	C. A mixture of two immiscible liquids, water and benzene constitutes a system having number of phases equal to			

	a) three b) one c) two			
	D. For a two component system, the condensed Gibbs phase rule is defined as, a) F' = C - P + 1 b) F' = C - P + 2 c) F' = C - P E. The promoters added to the iron catalyst used in Haber process for synthesis of ammonia are K2O, Al2O3 and CaO b) K2O, Al2O3 and CeO2 c) SiO2, Al2O3 and CaO d) K2O, Al2O3 and BaO			
	F. Which of the following statements is NOT true in relation to a system that has reached the critical temperature? a) The system must a closed system b) The system can be described as a homogenous fluid c) Substances can have more than one critical temperature. d) A surface between the liquid and vapour phases is no longer present.			
	G. What is the order of reaction for which rate equation, rate = $k [A]^2 [B]^{1/2}$			
	a) 3/2 b) 1/2 c) 5/2 d) 7/2			
	H. A saturated solution of sodium chloride is a			
	a) one phase system b) two phase system			
	c) three phase system d) none of these			
Q.3	 Answer the following in detail (Any four) A. What do you understand by a first order reaction? Cite a chemical reaction that follows first order reaction kinetics. Derive the integrated rate law expression for a first order reaction and express the units of rate constant. Discuss characteristics of a first order reaction. B. State Gibbs Phase Rule. Define the terms involved in Gibbs Phase Rule. Draw the phase diagram of one-component system involving a vapour phase (water system) and label the regions accordingly. Discuss the phase transitions involved. State and explain applications of water phase diagram. C. What do you understand by a second order reaction? Cite a chemical reaction that follows second order reaction kinetics. Derive the integrated rate law expression for a second-order reaction when both the reactants are same and express the units of rate constant. Derive expression for the half life of a second-order reaction. D. Draw a detailed energy profile diagram for an exothermic reaction. Define activation energy on the basis of this diagram. Illustrate the reaction involving use of catalyst and its effect on activation energy. 	20	CO1, CO2, CO3, CO4	BT1, BT2 BT3, BT4, BT5

Answer the following. 1) The rate of reaction is doubled when the temperature is changed from 298 K to 308 K. Calculate the energy of activation of the reaction. 2) 5 ml of Methyl acetate was added to a flask containing 100 ml of 0.1M HCl placed in a thermostat water bath maintained at 303 K. 5 ml of the reaction mixture was withdrawn at different time intervals and after chilling, titrated against a standard solution of sodium hydroxide. The following data were obtained: 6 CO3, BT3 CO4 BT4						ethyl acetate i		1	
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		system) and label the regions. Define: Eutectic Point, Eutectic Composition and Eutectic Temperature. Explain the significance of this diagram in							
가는 마다와 마다 그 바로에 다른 사람들이 되었다. 그 생활에서 하는 사람들이 모든 사람들이 되었다면 그 사람들이 하는 사람들이 가장 하는 사람들이 나를 하는 것이다.	1						component	J 447 34	

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