PRN:		Course Code :	PCH102

First Year **M. Sc.** End Semester Examination Winter 2023

Chemical Kinetics and Thermodynamics

Day and Date: Tuesday 19/12/2023 Max Marks: **100**

Time : 10·30 am to 1·30 pm Duration: **03** hrs

Instructions:

i) All questions are compulsory.

ii) Use of log table and scientific calculator is allowed

iii) Draw neat and systematic diagrams where ever necessary.

		Marks	Bloom's Level	CO
Q.1	**Attempt the following**			
a)	Discuss the following thermodynamic terms. i)Closed system ii)Open system iii)Isolated system iv)state function	8	L2	CO-1
b)	Derive relations for the change in entropy at constant pressure and constant temperature. Find the molar increase in entropy in calories when an ideal gas expands reversibly and isothermally at 25^{O}C from an initial volume from 1 liter to 100 liters.	8	L3	CO-2
c)	Derive Maxwell relations for Helmholtz free energy and enthalpy.	9	L3	CO-2
	Or			
d)	State and explain first law of thermodynamics. Derive following relations with usual notations, dE = TdS – PdV and dG = -SdT+ VdP	9	L3	CO-3
Q.2	**Attempt the following**			
a)	What is zero order reaction? Discuss characteristics of zero order reactions.	8	L3	CO-4
b)	Show that half-life of second order reaction is inversely related to initial concentration of reactant.	8	L3	CO-4
c)	Derive kinetic equation of second order reaction with equal concentrations of reactants. In a second order reaction when concentrations of both reactants are equal, the reaction is 20% completed in 500 seconds. How long will it take the reaction to go to 60% completion?	9	L2	CO-4

ESE

Or

	d)	What is homogeneous and heterogeneous catalysis? Discuss acid catalyzed reaction with examples.	9	L2 CO-4
Q.3		**Attempt the following**		
	a)	What is enzyme catalysis? Derive Michaelis-Menten kinetic equation.	8	L3 CO-3
	b)	Describe primary and secondary structure of proteins.	8	L2 CO-3
	c)	Discuss the terms number average molar mass(Mn) and weight average molar mass(Mw) of the biopolymers. Equal number of molecules with M1 =100000 and M2 = 10000 are mixed. Calculate Mn and Mw.	9	L2 CO-3
		Or		
	d)	Explain the following terms. i)Isoelectric points of proteins ii) Promoters and inhibitors and co-activators in enzyme catalysis.	9	L2 CO-3
Q.4		**Attempt the following**		
	a)	What are partial molar properties? Derive Gibbs-Duhem equation with usual notations.	8	L2 CO-1
	b)	What is chemistry of phospholipid? Describe formation of cell membrane of biological cell by lipids.	8	L2 CO-3
	c)	Derive equation for half-life of first order reactions. The half-life of a first order reaction is 30 minutes. Calculate the velocity constant of the reaction and time required for the 70% completion of the reaction.	9	L3 CO-4
		Or		
	d)	Discuss the terms molecularity and order of the reaction. Derive an equation for velocity constant of a first order reaction.	9	L2 CO-4

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