PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2023
(First Semester)

Branch - **CHEMISTRY**

THERMODYNAMICS, ELECTROCHEMISTRY AND PHASE EQUILIBRIUM

Maximum: 75 Marks

Time: Three Hours

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks

$(10 \times 1 = 10)$

Module No.	Question No.	Question	K Level	CO
1	1	Choose Fugacity is most helpful in------. a) Representing actual behaviour of real gases b) Representing actual behaviour of ideal gases c) The study of chemical equilibria involving gases at atmospheric pressure d) None of these	K1	CO1
	2	Find in the following that Activity co-efficient is a measure of the-----. a) Departure from ideal solution behaviour b) Departure of gas phase from ideal gas law c) Vapour pressure of liquid d) None of these	K2	CO1
2	3	Select that the equilibrium $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$, is an example of _____. a) homogeneous chemical equilibrium b) heterogeneous chemical equilibrium c) neither homogeneous nor heterogeneous d) both homogeneous and heterogeneous	K2	CO2
	4	Find that Le Chatelier's principle is applicable to---------. a) only homogeneous chemical reversible reactions b) only heterogeneous chemical reversible reactions c) only physical equilibria d) all systems, chemical or physical in equilibrium.	K1	CO2
3	5	What is the reciprocal of resistivity of a conductor? a) conductance b) capacitance c) conductivity d) none of these	K1	CO3
	6	What is the Debye-Huckel limiting law correlates to? a) activity of electrolyte with ionic strength b) mean ionic activity coefficient of electrolyte with ionic strength c) molality of electrolyte with ionic strength d) mean molality of electrolyte with ionic strength	K2	CO3
4	7	What is the electrical double layer model among the following that consists of both fixed and diffuse layers? a) Helmoltz b) Gouy c) Stern d) Debye-Huckel	K1	CO4
	8	The combination of two layers of opposite charges around the colloidal particle is called Helmholtz electrical double layer. Name the potential difference between the fixed layer and the diffused layer of opposite charge. a) Electrode potential b) Zeta potential c) Adsorption potential d) Diffused potential	K2	CO4
5	9	Outline the number of phase lines observed for the phase diagram of sulphur? a) 3 b) 4 c) 5 d) 6	K2	CO5
	10	What is the point at which all the three phases of a system exist? a) Vapor point b) Sublimation point c) Triple point d) Eutectic point	K1	CO5

SECTION - B (35 Marks)
Answer ALL questions
ALL questions carry EQUAL Marks
(5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Explain the partial molar properties of the system.	K5	CO1
		(OR)		
	11.b.	Discuss the activity and activity coefficient.		
2	12.a.	Derive a general expression for equilibrium constant thermodynamically.	K4	CO2
		(OR)		
	12.b.	Explain the third law of thermodynamics.		
3	13.a.	Describe Debye–Hückel Onsagar law of the strong electrolyte.	K4	CO3
		(OR)		
	13.b.	How do you find the equivalent conductance of a strong electrolyte?		
4	14.a.	Discuss the factors affecting over voltage.	K6	CO4
		(OR)		
	14.b.	Describe streaming potential.		
5	15.a.	Derive Gibbs phase rule.	K5	CO5
		(OR)		
	15.b.	Draw and explain one component system with the phase diagram.		

SECTION -C (30 Marks)
Answer ANY THREE questions
ALL questions carry EQUAL Marks
(3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Derive chemical potential. Explain the variation of chemical potential with pressure and temperature.	K6	CO1
2	17	State and explain Le-Chalier's principle.	K5	CO2
3	18	Discuss on Potentiometric titrations.	K4	CO3
4	19	Explain the followings: (5+5) i) Butler-Volmer equation ii) Tafel equation.	K5	CO4
5	20	Examine the phase diagram for two component system with suitable example.	K4	CO5

Z-Z-Z   END