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25CHP103/22CHP103N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2025
(First Semester)

Branch- **CHEMISTRY**

THERMODYNAMICS, ELECTROCHEMISTRY AND PHASE EQUILIBRIUM

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Which equation relates partial molar properties in a system at constant temperature and pressure? (a) Gibbs-Duhem equation (b) Van't Hoff equation (c) Nernst equation (d) Onsager equation	K1	CO1
	2	For an ideal gas, fugacity is equal to its: (a) Volume (b) Temperature (c) Pressure (d) Activity	K2	CO1
2	3	The Van't Hoff equation relates the equilibrium constant to: (a) Pressure (b) Temperature (c) Concentration (d) Volume	K1	CO2
	4	According to Le Chatelier's principle, increasing the temperature of an exothermic reaction will: (a) Shift the equilibrium to the right (b) Shift the equilibrium to the left (c) Have no effect on equilibrium (d) Increase the rate of reaction	K2	CO2
3	5	Identify the unit for specific conductance? (a) ohm (b) ohm^{-1} (c) $ohm^{-1}\ cm^{-1}$ (d) $ohm^{-1}\ cm^2\ eq^{-1}$	K1	CO3
	6	Which of the following is an example of a reference electrode? (a) Glass electrode (b) Hydrogen electrode (c) Calomel electrode (d) Quinhydrone electrode	K2	CO3
4	7	The Butler-Volmer equation is fundamental to the field of: (a) Thermodynamics (b) Phase equilibria (c) Electrode kinetics (d) Spectroscopy	K1	CO4
	8	A lead-acid battery is an example of a(n): (a) Primary cell (b) Fuel cell (c) Secondary cell (accumulator) (d) Dry cell	K2	CO4
5	9	What is a system with two components called? (a) Unary (b) Binary (c) Ternary (d) Quaternary	K1	CO5
	10	A solid that melts to form a liquid of the same composition has a: (a) Eutectic point (b) Congruent melting point (c) Incongruent melting point (d) Triple point	K2	CO5

Cont...

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.	Discuss the freezing point method for the determination of activity.	K2	CO1
		(OR)		
	11.b.	Explain the variation of chemical potential with temperature.		
2	12.a.	State the Third Law of Thermodynamics and explain its significance.	K3	CO2
		(OR)		
	12.b.	Briefly explain the Nernst Heat Theorem for calculation of entropy.		
3	13.a.	Explain the conductivity method for the determination of equivalent conductance for strong Electrolytes.	K3	CO3
		(OR)		
	13.b.	What are potentiometric titrations? Describe the procedure for the acid -base titrations.		
4	14.a.	Explain decomposition potential and overvoltage.	K3	CO4
		(OR)		
	14.b.	Explain the principle of electrophoresis with a simple, labeled diagram.		
5	15.a.	State Gibbs Phase Rule and derive the rule.	K4	CO5
		(OR)		
	15.b.	With a neat sketch explain the phase diagram of the water system.		

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	What is fugacity? How the fugacity of a gas is determined using the graphical method?	K3	CO1
2	17	State Le Chatelier's principle. Discuss its application to a physical equilibrium and a chemical equilibrium.	K3	CO2
3	18	Explain Debye – Huckel Theory.	K4	CO3
4	19	What are storage batteries? Explain the charging and discharging processes in a lead-acid battery.	K4	CO4
5	20	Explain the term "eutectic system". With a neat diagram discuss the Lead-Silver (Pb-Ag) system.	K5	CO5

Z-Z-Z END