

QP Code: D143665	Total Pages: 2	Name:
		Register No.
<b>FOURTH SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2026</b>		
<b>CHEMISTRY</b>		
<b>CHE4CJ205: Physical Chemistry – II:</b>		
<b>Chemical Thermodynamics, Kinetics &amp; Surface Chemistry</b>		
<b>2024 Admission onwards</b>		
<b>Maximum Time: 2 Hours</b>	<b>Maximum Marks: 70</b>	
<b>Section A</b>		
<b>All Questions can be answered. Each Question carries 3 marks (Ceiling: 24 Marks)</b>		
1.	Define i) closed system ii) thermal equilibrium iii) isothermal process.	
2.	Explain the terms : heat capacity at constant pressure and heat capacity at constant volume. How are they related?	
3.	Explain inversion temperature.	
4.	Discuss the Carnot's theorem.	
5.	Give the Gibbs-Duhem equation and explain the terms.	
6.	Describe the various factors which affect the rate of a reaction.	
7.	Explain i) zeroth law of thermodynamics ii) zero order reaction.	
8.	Enlist the applications of adsorption.	
9.	Explain the following with example: i) negative catalyst ii) promoters iii) catalytic poison.	
10.	Calculate the free energy change ( $\Delta G$ ) which occurs when 1 mole of an ideal gas expands reversibly and isothermally at $37^\circ\text{C}$ from an initial volume of $55\text{ dm}^3$ to $1000\text{ dm}^3$ .	
<b>Section B</b>		
<b>All Questions can be answered. Each Question carries 6 marks (Ceiling: 36 Marks)</b>		
11.	Explain Euler reciprocal relation.	
12.	Discuss Helmholtz energy and explain its variation with temperature.	
13.	What is meant by the energy of activation? Explain how energy of activation is determined with the help of the Arrhenius equation.	
14.	Describe any two methods for the determination of order of a reaction.	
15.	Write notes on i) SEM ii) TEM	
16.	One mole of an ideal gas (mono-atomic) at $27^\circ\text{C}$ expands adiabatically against a constant external pressure of 1 atm from a volume of $10\text{ dm}^3$ to a volume of $20\text{ dm}^3$ . Calculate i) q ii) w iii) $\Delta U$ and $\Delta H$ for this process. Also calculate the final temperature of the gas. Assume that $C_v = 3/2 R$ .	
17.	Calculate the entropy change involved in the following processes: i) in thermodynamic expansion of 2 moles of a gas from a volume of 5 litres to a volume of 50 litres at 303 K. ii) in isothermal expansion of 2 moles of an ideal gas at 293 K from a pressure of 10	
736652 atmosphere to a pressure of 2 atmosphere.		

18.	The rate constant for a first-order reaction is $7.40 \times 10^{-9} \text{ s}^{-1}$ at $25^\circ\text{C}$ , and the energy of activation is $112.0 \text{ kJ mol}^{-1}$ . Calculate, at $25^\circ\text{C}$ , the enthalpy of activation $\Delta H^\ddagger$ and the Gibbs energy of activation $\Delta G^\ddagger$ .
<b>Section C</b>	
<b>Answer any ONE. Each Question carries 10 marks (1×10 = 10 Marks)</b>	
19.	a) Derive Kirchoff's equation relating the variation of enthalpy of a reaction with temperature. Write down the integrated form of the equation. b) State and explain Hess's law of constant heat summation. Discuss the applications of this law.
20.	Describe the Lindemann theory of unimolecular reactions.