

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: MSc/IMSc  
BRANCH: CHEMISTRY

SEMESTER : I/VII  
SESSION : MO/2025

SUBJECT: CH402 CHEMICAL KINETICS AND SURFACE CHEMISTRY

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a)	Derive an expression of the rate equation for Conventional transition state theory assuming only translational motion for the concerned species.	[5] 1	2
Q.1(b)	Derive an expression of the rate equation for Rice-Ramsperger-Kassel theory for unimolecular reactions.	[5] 1	3
Q.2(a)	Utilizing appropriate diagrams, explain how molecules exhibit fluorescence and phosphorescence. In which case would the intensity of the signal be more and why?	[5] 2	2
Q.2(b)	Taking H <sub>2</sub> and Br <sub>2</sub> as reactants, explain the mechanism of formation of product (HBr) under the influence of external (photon) perturbation.	[5] 2	3
Q.3(a)	Derive the mathematical expression of Debye-Huckel-Onsager theory of ion-ion interaction. Extrapolate the expression to the empirical equation of molar conductivity-concentration relationship for strong electrolytes.	[5] 3	3
Q.3(b)	Elaborate the concept of electrical double layer of a sol. What is Gouy-Chapman layer?	[5] 3	2
Q.4(a)	Elaborate the BET theory of multilayer adsorption. How BET equation can be used to determine if a particular adsorption process is single layered or multilayered.	[5] 4	3
Q.4(b)	Draw and discuss the five types of adsorption isotherms.	[5] 4	2
Q.5(a)	Outline with clear diagram the Electrophoretic method of determining the charge of a sol. What do you mean by electrophoretic mobility of colloidal particles?	[5] 5	2
Q.5(b)	How will you make gold sol by (a) condensation method (b) dispersion method. Elaborate with appropriate chemical equation and schematic diagram. What is Hydrophile-Lipophile balance (HLB) of a surfactant? Elaborate.	[5] 5	3

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