

Course No.	Course Name	L-T-P-Credits
CY 581	Physical Chemistry Laboratory	0-0-6: 04
Prerequisite: NIL		
Course Objectives:	The main objective of this laboratory course is to provide application oriented information of theories related to physical chemistry and biochemistry taught in the classes. The course is highly relevant for the students in terms of learning of modern sophisticated tools and their practical applications.	
Course Outcomes:	After successful completion of the course, students will be able to: <ol style="list-style-type: none"> 1. Understand basic applications of the following domains of physical chemistry: chemical kinetics, adsorption, phase rule and spectroscopy. 2. Evaluate various physical parameters related to the topics indicated. 3. Analyse the effects of salts on reaction kinetics. 4. Separate food dyes based on gel electrophoresis apparatus. 5. Learn the basic applications of spectrophotometer and spectrofluorometer. 6. Determine the pKa, acid dissociation constants of different acids using pH metry method. 7. Calculate the distance between a donor and an acceptor molecule using FRET studies. 8. Learn the error analysis of the experimental data. 	
SYLLABUS		
Module	Contents	Hours
I	<p>Chemical kinetics</p> <ol style="list-style-type: none"> 1. To determine the velocity constant, order of reaction and energy of activation for saponification of ethyl acetate by sodium hydroxide conductometrically 2. Kinetics of salt effect and ionic strength (persulfate-iodine reaction) <p>Adsorption and Viscosity</p> <ol style="list-style-type: none"> 3. To study the adsorption of oxalic acid on charcoal and test the validity of Langmuir and Freundlich adsorption isotherm 4. Determination of molecular weight of a high polymer (e.g. PEG) by viscosity measurement <p>Potentiometry and pH metry</p> <ol style="list-style-type: none"> 5. Study of an oscillatory reaction by EMF measurement 6. Determination of <i>pKa</i> of poly-basic acid with the pH meter 7. Determination of the acid and base dissociation constants of an amino acid and hence the isoelectric point of the acid 8. Determination of the valency of mercurous ions potentiometrically <p>Gel Electrophoresis Assay</p> <ol style="list-style-type: none"> 9. To analyze the given nucleic acid using Agarose Gel Electrophoresis. 10. Agarose gel electrophoresis of food dyes 11. Polyacrylamide gel electrophoresis of proteins. <p>Spectrophotometer</p>	06 hours per experiment allotted

	<p>12. Determination of stoichiometry and stability constant of inorganic (e.g. ferric- salicylic acid) complex</p> <p>13. Determination of pK_a of an indicator (e.g. methyl red) in aqueous and micellar media</p> <p>14. Effect of pH on absorption spectra of p-nitrophenol and the measurement of pK_a.</p> <p>Phase rule</p> <p>15. To construct the phase diagram for three component system (chloroform-acetic acid-water)</p> <p>16. Determination of congruent composition and temperature of a binary mixture (e.g. benzophenone-diphenylamine)</p> <p>Spectrofluorometer</p> <p>17. To study the fluorescence behaviour of tryptophan in polar and non-polar media</p> <p>18. Interaction of 8-anilino-naphthalene-1-sulfonic acid (ANS) with bovine serum albumin (BSA)</p> <p>19. FRET Studies</p> <p>20. Fluorescence Study of Critical Micellar Concentration.</p>	
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Essential Readings:

1. J. B. Yadav, Advanced Practical Physical Chemistry, Krishan Prakshan Media, 1st Edition 2016.
2. V. D. Athawale, P. Mathur, 'Experimental Physical Chemistry', New Age International (P) Limited Publishers, 1st Edition 2001.

Supplementary Readings:

1. D. P. Shoemaker, C. W. Garland and J. W. Nibler, "Experimental Physical Chemistry", McGraw-Hill, 8th Edition 2008.
2. F. A. Settle, "A Handbook of Instrumental Techniques for Analytical Chemistry", Prentice Hall, 1st Edition 1997.
3. Departmental laboratory manual.