

نموذج توصيف مقرر
Course Description Form

Name of College\Faculty : Science

Name of Department: Chemistry

اسم الكلية:

اسم القسم العلمي:

Course Name	Physical Chemistry II	اسم المقرر
Course No.	0420215	رقم المقرر
No. of Credits	4	عدد الوحدات
Theoretical Hours	3	عدد الساعات النظرية
Practical Hours	3	عدد الساعات المحلّية
Course topics		مواضيع المقرر
1. Kinetics theory of gases 2. Chemical and Electrochemical equilibrium. 3. Rates of chemical reactions 4. Reaction dynamics 5. Process at solid Surfaces		
Text book: (Name, Author , Year , Publisher)		عنوان الكتاب : (الاسم ، المؤلف ، سنة الطبع ، دار النشر)
Peter Atkins, Physical Chemistry, Oxford University Press, Oxford, <u>Latest Edition</u> .		
References: (Name , Author , Year . Publisher)		عنوان المرجع : (الاسم ، المؤلف ، سنة الطبع ، دار النشر)
1. Physical chemistry by R.A. Alberty and R. J. Silbey, latest edition, J. Wiley & Sons., Chichester, <u>Latest Edition</u> . 2. Physical Chemistry by I. N. Levine, latest edition, McGraw-Hill, New York, <u>Latest Edition</u> . 3. Experiments in Physical Chemistry by D. P. Shoemaker, C. W. Garland, and J. W. Nibler, latest edition, McGraw-Hill, London, <u>Latest Edition</u> . 4. Laboratory Manual for Chem. 215, prepared by the departments.		

Prerequisites				متطلبات المقرر		
Grading	Exams	30	%		الاختبارات	آلية رصد المقرر
	Quizzes	5	%		امتحانات قصيرة	
	Lab	25	%		واجبات	
	Final	40	%		الاختبار النهائي	
	100%					

Chapters included:

Chapter	Topic	page
CH.1	Kinetics theory of gases	11-18
CH.2	Chemical and Electrochemical equilibrium.	203-228
CH.3	Rates of chemical reactions	723-736
CH.4	Reaction dynamics	779-809
CH.5	Process at solid Surfaces	823-844

Course objectives					
No.	Course Objectives (Learning Outcomes)	Example(s) of relevant (Topics and activities)	Recommended Level to satisfy the objectives		
			High	Medium	Low
1	Explains the macroscopic properties of gases, such as volume, pressure, and temperature, as well as transport properties such as viscosity, thermal conductivity, and mass diffusivity.	- Use the Maxwell-Boltzmann distribution of molecular speeds to calculate root-mean-square, most probable, and average speeds of molecules in a gas. - Calculate the collision frequency, the mean free path, and the diffusion constant for gases. - Describe transport phenomena and calculate the transport coefficients in gases in the reaction mixture - Discuss the connection between activation energy and the energy distribution of molecules, and relate the forward and reverse activation energies using thermodynamics.	x		



		• Explain simple collision theory of bimolecular reactions. • Outline the theoretical calculation of rate constants using collision theory. • Describe transition state theory and its thermodynamic formulation. • Discuss femtosecond transition state spectroscopy.			
2	To introduce the laws and theories governing the rate of chemical reactions.	• Deduce rate laws and kinetics of simple and complex types of gas phase reactions. • Explain the temperature dependence of the reaction rate. • Discuss the reaction molecularity and reaction mechanism. • Use the steady state approximation to deduce rate laws. • Identify several types of catalysts and their effect on chemical reactions. • Relate the rate of enzyme-catalyzed reaction to the concentrations of substrate and enzyme	x		
3	To discuss basics of surface phenomena including adsorption and catalysis.	• Distinguish between physisorption and chemisorption. • Summarize the adsorption isotherm models (Langmuir model, the BET model). • Calculate the surface area. • Discuss the rates of surface processes. • Discuss the electron-based surface characterization. • Explain the catalytic activity at surfaces (heterogeneous catalysis).	x		
4	To study the elements of electrochemistry.	• Define conductance. • Discuss thermodynamics properties of ions in solution.	x		



		- Identify the activity and activity coefficient of electrolytic solutions. - Understand the equilibria involving potential difference. - Explain thermodynamics of electrochemical cells. - Identify the electrode potential and overpotential - Describe the kinetics of electrode processes.			
5	To demonstrate experimentally the topics covered in the theoretical part.	- Know how to deal with the safety problem. - Record the experimental results and able to draw conclusions based on these results. - Communicate the results critically and knowledgeably. - Study conductometry of base-catalyzed hydrolysis of ethyl ethanoate. - Study gasometry of homogeneously and heterogeneously catalyzed decomposition of hydrogen peroxide solutions. - Measure polarimetry of inversion of sucrose. - Study titrimetry of reversible hydrolysis of methyl ethanoate. - Measure surface tension of liquids. - Determine relative viscosities of gases. - Measure viscosity of liquids. - Determine adsorption isotherms of organic acid on charcoal. - Measure transport numbers by moving boundary methods. - Determine the activity coefficient of silver or zinc ions using a concentration cell. - Measure overpotential from decomposition potential.	x		

		• Measure conductance of electrolyte in aqueous solution. • Study polarographic analysis.			
Fields	Physical Chemistry				
Skills					
Coordinator (Name and Rank) :	Physical Chemistry Coordinator				
Signature and stamp :					
Date:	10/11/2025				