



UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Exactas e Ingenierías
Secretaría Académica / Coordinación de la Licenciatura en Química
Comité de Innovación Curricular de la Licenciatura en Química

1. GENERAL INFORMATION

Learning unit Physical Chemistry III		Department Chemistry		Format Lecture
Prerequisites(P) Physical Chemistry II	Corequisites (CO) None	Ascribed Academy Physical Chemistry	Module M2: Synthesis, purification and chemical transformation.	
Type Basic particular mandatory	Lecture hours 68	Practice hours None	Total hours 68 hrs.	Credits 9

2.- GENERIC COMPETENCIES

Students...

- ... are able to adapt the knowledge of this and previous courses to solve chemistry related problems such as reaction kinetics, enzyme and heterogeneous catalysis, surface chemistry, and colloidal systems.
- ...use basic terminology of advanced physical chemistry.
- ... express scientific ideas accurately.
- ... are able to establish relationships among concepts and knowledge.
- ... are able to search and select advanced physicochemical information as they please.

3.- SPECIFIC CHARACTERISTICS OF THE COMPETENCY

Knowledge	<p>Students...</p> <ul style="list-style-type: none">• Study and apply the basic concepts of chemical kinetics, to the study of the influence of the variables that affect the behavior of a reactive system.• Distinguish the terms of surface, interface adsorption, and absorption.• Describe in physical and chemical terms the concept of superficial tension.• Define the nature of the colloidal systems and explain their behavior depending on their structural characteristics and their kinetic, superficial and optical properties.• Explain the physicochemical principles applied to the study of colloidal system stability such as emulsions and dispersions.
Skills	<ul style="list-style-type: none">• Analyze the acquired theoretical information.• Understand some applications of advanced physical chemistry.• Solve physical chemistry-related problems.• Learn autonomously.• Practice critical thinking.• Use digital resources



UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Exactas e Ingenierías
Secretaría Académica / Coordinación de la Licenciatura en Química
Comité de Innovación Curricular de la Licenciatura en Química

	<ul style="list-style-type: none">• Search for bibliographic information.
Aptitudes	<ul style="list-style-type: none">• Interrelate the use of mathematical models with physicochemical systems.• Identify problems state questions and hypotheses to solve them.• Enunciate knowledge from different fields and establish relationships among them and their daily life.• Develop efficient and continuous study habits.• Self-learning.
Values	Consistency, perseverance, ethics, honesty, tidiness, responsibility, respect, tolerance.

4.- TRANSVERSAL COMPETENCIES

<input checked="" type="checkbox"/>	Foreign Language (English)
<input checked="" type="checkbox"/>	Critical, analytical and synthetic thinking.
<input checked="" type="checkbox"/>	Oral and written expression
<input checked="" type="checkbox"/>	Professional ethics
<input checked="" type="checkbox"/>	Administration of human and material resources
<input type="checkbox"/>	Leadership and sustainability
<input type="checkbox"/>	Creativity, innovation and entrepreneurship
<input checked="" type="checkbox"/>	Others: algebra, and differential and integral calculus.

5.- COURSE CONTENT OF THE LEARNING UNIT

UNIT 1 CHEMICAL KINETICS

- 1.1 Introduction
- 1.2 Reaction rate models.
- 1.3 Methods of determining reaction order.
- 1.4 Reaction mechanisms
- 1.5 The effect of temperature
- 1.6 Catalysis
- 1.7 Photochemistry

UNIT 2 SURFACE PHENOMENA

- 2.1 Foundations
- 2.2 Surface thermodynamics
- 2.3 Liquid- gas interface and liquid-liquid
- 2.4 Superficial films.



UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Exactas e Ingenierías
Secretaría Académica / Coordinación de la Licenciatura en Química
Comité de Innovación Curricular de la Licenciatura en Química

2.5 Solid-liquid and solid-gas

2.6 Adsorption

UNIT 3 COLLOID CHEMISTRY

3.1 Classification of colloidal systems

3.2 Kinetic properties of the colloidal systems.

3.3 Electric and electro kinetic properties of colloidal systems.

3.4 Stability of colloidal systems.

3.5 Emulsions and foams.

6.- ASSESSMENT

☒ Numeric grade.



7.- GRADING CRITERIA OF THE LEARNING UNIT

Indicator of Evaluation	Percentage
Departmental exams	30
Partial exam	40
Homework	15
Research activities	10
Practice reports	0
Class participation	5
Other: attendance	0

8.- REQUIRED MATERIAL (for students)

☒ Calculator

☒ Periodic table

☐ Lab coat

☒ Text book

☐ Workbook





UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Exactas e Ingenierías
Secretaría Académica / Coordinación de la Licenciatura en Química
Comité de Innovación Curricular de la Licenciatura en Química



UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Exactas e Ingenierías
Secretaría Académica / Coordinación de la Licenciatura en Química
Comité de Innovación Curricular de la Licenciatura en Química

9.-SPECIFIC CONTENT BY LEARNING UNITS

Content unit	Generic competency of the content unit	Topics	Class hours	Professor activities	Student activities	Bibliography
UNIT I CHEMICAL KINETICS	Students... -Apply kinetic equations to calculate the time and convert an irreversible reaction onto a complex reversible one. Study the effect of temperature in such equations -Explain the concept of catalyst: types characteristic,	1.1 Introduction	2	Lecture: Professor explains the contents of the program, using pedagogical material as a resource to support the lecture. Classwork: Professor assigns the exercises to solve problems about specific topics.	Students... DURING: • Carry out the activities the professor assigns during the unit. AFTER: • Answer homework exercises. Related to this unit. • Search and discuss current scientific articles about kinetics.	Basic. G. W. Castellan. (1995). <i>Fisicoquímica</i> Addison Wesley Longman Pearson, Mexico Mark W. Zemansky. (1985). <i>Calor y termodinámica</i> McGraw-Hill, Mexico Complementary. P. W. Atkins. (1986). <i>Fisicoquímica</i> . Fondo Educativo Interamericano, Mexico. F. W. Sears, G. L. Salinger, (1980). <i>Termodinámica, teoría cinética y</i>
		1.2 Reaction rate models.	2			
		1.3 Methods of determining reaction order.	2			
		1.4 Reaction mechanisms	4			
		1.5 The effect of temperature	2			
		1.6 Catalysis	5			
		1.7 Photochemistry	5			



UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Exactas e Ingenierías
Secretaría Académica / Coordinación de la Licenciatura en Química
Comité de Innovación Curricular de la Licenciatura en Química

	<p>uses, and their pollution.</p> <p>-Explain the general mechanism of a heterogeneous catalytic reaction.</p> <p>-Apply the kinetic equations to calculate time and the conversion of catalytic reactions.</p>					<p><i>termodinámica estadística.</i> Editorial Reverté, Spain</p> <p>I. N. Levine <i>Fisicoquímica</i>, (1978).. Editorial Mc Graw Hill</p> <p>D. Myers. (1991). <i>Surfaces, interfaces and colloids. Principles and applications.</i> VCH Publishers, Inc.</p>
UNIT II SURFACE PHENOMENA	Students...	2.1 Foundations	2	Lecture: Professor explains the contents of the program, using pedagogical material as a	Students...	Basic. G. W. Castellan. (1995). <i>Fisicoquímica</i> Addison Wesley Longman Pearson, Mexico
		2.2 Surface thermodynamics	5			
		2.3 Liquid- gas interface and liquid-liquid	4			
		2.4 Superficial films.	4			
	-Establish the importance of studying interfaces and apply the principles of				<p>DURING:</p> <ul style="list-style-type: none"> • Carry out the activities the professor assigns during the unit. 	<p>Mark W. Zemansky. (1985). <i>Calor y</i></p>



UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Exactas e Ingenierías
Secretaría Académica / Coordinación de la Licenciatura en Química
Comité de Innovación Curricular de la Licenciatura en Química

	thermodynamics to these systems. - Describe the experimental methods to portray interfaces. - Describe the substances that can affect interface properties. - Solve problems related to interface properties.	2.5 Solid-liquid and solid-gas	4	resource to support the lecture. Classwork: Professor assigns the exercises to solve problems about specific topics.	AFTER: <ul style="list-style-type: none"> • Answer homework exercises. Related to this unit. • Search and discuss current scientific articles about surface phenomena. 	<i>termodinámica</i> McGraw-Hill, Mexico Complementary. P. W. Atkins. (1986). <i>Fisicoquímica</i> . Fondo Educativo Interamericano, Mexico. F. W. Sears, G. L. Salinger, (1980). <i>Termodinámica, teoría cinética y termodinámica estadística</i> . Editorial Reverté, Spain I. N. Levine <i>Fisicoquímica</i> , (1978).. Editorial Mc Graw Hill D. Myers. (1991). <i>Surfaces, interfaces and colloids. Principles and applications</i> . VCH Publishers, Inc.
		2.6 Adsorption	5			



UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Exactas e Ingenierías
Secretaría Académica / Coordinación de la Licenciatura en Química
Comité de Innovación Curricular de la Licenciatura en Química

UNIT III COLLOID CHEMISTRY	<p>Students...</p> <ul style="list-style-type: none"> -Know the importance of colloidal systems and the suspensions in daily life. - Analyze the properties and characteristics of both systems in order to exemplify and know their applications. - Evaluate the stability of a disperse system from a ternary phase diagram. (Continuous phase, disperse phase, and tensoactive system). 	3.1 Classification of colloidal systems	3	<p>Lecture:</p> <p>Professor explains the contents of the program, using pedagogical material as a resource to support the lecture.</p> <p>Classwork:</p> <p>Professor assigns the exercises to solve problems about specific topics.</p>	<p>Students...</p> <p>DURING:</p> <ul style="list-style-type: none"> • Carry out the activities the professor assigns during the unit. <p>AFTER:</p> <ul style="list-style-type: none"> • Answer homework exercises. Related to this unit. • Search and discuss current scientific articles about colloidal systems and disperse systems. 	<p>Basic.</p> <p>G. W. Castellan. (1995). <i>Fisicoquímica</i> Addison Wesley Longman Pearson, Mexico</p> <p>Mark W. Zemansky. (1985). <i>Calor y termodinámica</i> McGraw-Hill, Mexico</p> <p>Complementary.</p> <p>P. W. Atkins. (1986). <i>Fisicoquímica</i>. Fondo Educativo Interamericano, Mexico.</p> <p>F. W. Sears, G. L. Salinger, (1980). <i>Termodinámica, teoría cinética y termodinámica estadística</i>. Editorial Reverté, Spain.</p> <p>I. N. Levine (1978). <i>Fisicoquímica</i>, Editorial Mc Graw Hill</p>
		3.2 Kinetic properties of the colloidal systems.	4			
		3.3 Electric and electro kinetic properties of colloidal systems.	5			
		3.4 Stability of colloidal systems.	5			
		3.5 Emulsions and foams	5			



UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Exactas e Ingenierías
Secretaría Académica / Coordinación de la Licenciatura en Química
Comité de Innovación Curricular de la Licenciatura en Química

	- Solve problems related to the properties of colloids and disperse systems.					D. Myers. (1991). <i>Surfaces, interfaces and colloids. Principles and applications.</i> VCH Publishers, Inc.
<div>COURSE EVIDENCE (Deliverables)</div> <div>1) Summaries or data sheets of the investigations of each learning unit. 2) Diagrams and questionnaires of different learning units. 3) Homework exercises of each unit. 4) Exams.</div>						

Professors who were part of the revision of this course content and the creation of the extensive program:

Saira Lizette Hernandez Olmos

Víctor Manuel Soto García

Signatures