1.- GENERAL INFORMATION

Learning unit	**Department**	**Format**
General Chemistry II	Chemistry	Lecture/workshop

Prerequisites(P)	**Corequisites (CO)**	**Ascribed academy**	**Module**
None	General Chemistry Lab II	Chemistry	M1: Structure of matter

Type	**Lecture hours**	**Practice hours**	**Total hours**	**Credits**
Basic Common Mandatory	5 hours per week	0	**90**	9

2.- GENERIC COMPETENCIES

-Problem solving
-Synthesis and analysis.
- Team work.
-General basic knowledge
-Computer skills
-Managing information
-Oral and written production
-Discerning and decision making

Specific competencies:
- Autonomous development of the acquired knowledge.
-Ability to apply the concepts learned in class to specific and complex situations.
-Autonomy and teamwork
-Ability to solve electrochemical problems.

3.- SPECIFIC CHARACTERISTICS OF THE COMPETENCY

Knowledge	Students: • Differentiate and solve different types of chemical reactions according to the type of stoichiometry balance. • Understand concepts and applications of redox reactions. • Apply the concepts about solution preparation. • Know the type of possible hydrates to be formed according to their condition. • Distinguish the type of solute in each solution depending on its colligative properties and chemical characteristics.

	• Define the basic concepts about the reaction rate and predicts the order of reaction according to the actual reaction. • Define, identify and apply the different concepts of chemical and ionic equilibrium and are able to detect the factors that affect the equilibrium.
Skills	• Solve problems that involve colligative properties, molality, molarity and/or molecular mass. • Know how to use a computer. • Solve problems that involve chemical reactions as well as calculations of reaction rates. • Apply the knowledge they learned in different areas in order to understand common problems. • Have abilities of analysis synthesis and evaluation.
Aptitudes	• Identify and solve problems by stating hypotheses and applying the necessary principles in an analytical way. • Relate knowledge from different areas and apply it in ordinary situations. • Develop study habits and manage their own learning.
Values	Students develop and reaffirm values such as responsibility, honesty, tolerance, respect, solidarity, willingness and positive attitude towards individual and group work.

4.- TRANSVERSAL COMPETENCIES

☑	Foreign Language (English)
☑	Critical, analytical and synthetic thinking.
☑	Oral and written expression
☑	Professional ethics
☐	Administration of human and material resources
☐	Leadership and sustainability
☐	Creativity, innovation and entrepreneurship
	Algebra

5.- COURSE CONTENT OF THE LEARNING UNIT

Unit 1: Oxidation-reduction reactions (Redox)
1.1 Basic concepts of oxidation-reduction reactions.
1.2 Balance of redox reactions through the oxidation number method.
1.3 Balance of redox reaction through the ion-electron or semi cell method.
1.4 Balance of the redox reactions through the algebraic or mathematical method.

1.5 Applications of stoichiometry of redox reactions in chemical processes.

Unit 2: Dissolution

2.1. Process of dissolution.
2.2 Solubility of solutes (solid, liquid and gas) in a solvent.
2.3 Expressions of the concentration on dissolutions.
2.4 Stoichiometric calculations in dissolutions.
2.5 Crystallization process in dissolutions.
2. 6 Anhydrous and hydrated salts.
2.7 Dissolutions applied to the chemical industry.

Unit 3: Colligative properties of dissolutions

3.1 Basic concepts of the colligative properties.
3.2. Colligative properties of solutions with non-electrolytic solute.
3.3. Colligative properties of solutions with electrolytic solute.
3.4. Solution of volatile liquids.
3.5. Applications of colligative properties in the chemical industry.

Unit 4: Kinetic chemistry
4.1 Speed reaction.
4.2 Elements that affect the speed reaction.
4.3 Reaction rate law.
4.4 Mathematical model for kinetic chemistry: concentration-time relationships.
4.5 Arrhenius equation: relationships with temperature.
4.6 Application of chemical kinetics in industrial processes.

Unit V. Chemical and ionic equilibrium
5.1 Concept of chemical equilibrium.
5.2 The equilibrium constant.
5.3 Homogeneous chemical equilibrium.
5.4 Heterogeneous chemical equilibrium.
5.5 Disturbance of the equilibrium state: Le Chatelier principle.
5.6 Acids and bases
5.7 Weak and strong electrolytes.
5.8 Ionization constant of acids and bases.
5.9 pH and pOH.
5.10 Buffer solutions.

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	0
Practice reports	0
Class participation	0
Quizzes	15

8.- REQUIRED MATERIAL (for students)	
☑	Calculator
☑	Periodic table
☐	Lab coat
☑	Text book
☑	Workbook
☐	Other: squared notebook

9.-SPECIFIC CONTENT BY LEARNING UNITS

Content unit	Generic competency of the content unit	Topics	Class hours	Professor activities	Student activities	Bibliography
Unit 1 Oxidation-reduction reactions (Redox)	Understand the types of reactions that may occur and distinguish when a redox reaction takes place in order to carry out its resolution by using different methods and then applying chemical processes.	1.1 Basic concepts of oxidation-reduction reactions.	2	Professor carries out the following activities: -Activity to get to know the group. -Diagnostic exam to know the previous knowledge of General Chemistry I - Brainstorming to define the concept of reactions to then analyze it and	Students… **Before:** investigate the meanings of the concepts to review in class. **During:** Solve exercises and problems after the professor's explanation, applying the knowledge learnt in class. After:	Blanco Aquino et al. *Manual del curso de Química General* II. Universidad de Guadalajara. Mexico C.H Sorum. *¿Cómo resolver problemas de química general?* Paraninfo. Whitten K. *Química* 8th edition.
		1.2 Balance of redox reactions through the oxidation number method.	4			
		1.3 Balance of redox reaction through the ion-electron	4			

		or semi cell method.		come up with one concept. - Lecture on the different redox reaction methods. - Solve problems and exercises about the concepts of the unit.	Self-evaluation and heteroevaluation	
		1.4 Balance of the redox reactions through the algebraic or mathematical method.	2			
		1.5 Applications of stoichiometry of redox reactions in chemical processes.	4			
Unit 2 Dissolution	Distinguish the phenomena that influence the dissolution process. Know the expressions of	2.1. Process of dissolution.	2	Professor… - Presents the mathematical definitions of the terms of this unit.	**Students…** **Before:** Investigate about the concepts of this unit. **During:** Solve exercises and problems	Brown T. *Química* 9th edition. Blanco Aquino et al. *Manual del curso de Química General* II. Universidad de Guadalajara. Mexico Whitten K. *Química* 8th edition.
		2.2 Solubility of solutes (solid, liquid and gas) in a solvent.	2			
		2.3 Expressions of the	2			

	the chemical concentrations in solutions, and its application in the area od analytical chemistry to determine the purity of products and standardization of different analytes.	concentration on dissolutions.		-Applies the technique of exercise solving based learning.	after the explanation of the professor, applying what was seen. **After:** Work autonomously to build up a portfolio with activities, essays and proposals indicated by the teacher. This portfolio will be turned in at the end of the semester with a self-evaluation.	John C. Kotz, *Química y Reactividad Química.* Ciencias e Ingenierías 5th edition
		2.4 Stoichiometric calculations in dissolutions.	4			
		2.5 Crystallization process in dissolutions.	4			
		2. 6 Anhydrous and hydrated salts.	4			
		2.7 Dissolutions applied to the chemical industry.	2			
Unit 3 Colligative properties of dissolutions	Know and solve problems related to colligative properties of electrolyte and non-electrolyte solutes of	3.1 Basic concepts of the colligative properties.	2	Professor… presents the mathematical definitions of the terms of this unit.	Students… **Before:** Investigate about the concepts of this unit and turn in reports.	Brown T. *Química* 9th edition. - Blanco Aquino et al. *Manual del curso de Química General* II. Universidad de Guadalajara. Mexico
		3.2. Colligative properties of solutions with	4			

	different solutions as well as its practical application in the chemical industry.	non-electrolytic solute.		-Applies the technique of exercise solving based learning. -Makes teams to solve and analyze problems collaboratively.	**During**: Students answer the orkbook during the unit. **After:** Students do homework related to this learning unit.	Whitten K. *Química* 8th edition. John C. Kotz, *Química y Reactividad Química.* Ciencias e Ingenierías 5th edition
		3.3. Colligative properties of solutions with electrolytic solute.	4			
		3.4. Solution of volatile liquids.	4			
		3.5. Applications of colligative properties in the chemical industry.	2			
Unit 4 Kinetic chemistry	Distinguish the different reaction orders that can occur in a chemical reaction and solve kinetic problems with one or more	4.1 Reaction rate.	2	Professor… - Presents the definitions of the terms of this unit. -Guides the deduction to find out the relationship	**During:** Students answer the workbook during the unit. **After:** Students do homework related	Brown T. *Química* 9th edition. Blanco Aquino et al. *Manual del curso de Química General* II. Universidad de Guadalajara. Mexico Whitten K. *Química* 8th edition.
		4.2 Elements that affect the reaction rate.	2			
		4.3 Reaction rate law.	4			
		4.4 Mathematical	6			

	reagents of temperature constant and/or variable applied to industrial processes.	model for kinetic chemistry: concentration-time relationships.		concentration-time according to the order of reaction through the integration method. -Applies the technique of exercise solving based learning.	to this learning unit.	Química de Petrucci John C. Kotz, *Química y Reactividad Química.* Ciencias e Ingenierías 5th edición
		4.5 Arrhenius equation: relationships with temperature.	4			
		4.6 Application of chemical kinetics in industrial processes.	2			
Unit 5 Chemical and ionic equilibrium	Determine the different factors that influence the equilibrium of a heterogeneous or homogeneous chemical reaction.	5.1 Concept of chemical equilibrium.	1	Professor… Presents the definitions of the terms of this unit. -Applies the technique exercise solving based learning.	**Students…** **Before:** Investigate about the concepts of this unit and turn in reports. **During:** Students answer the workbook during the unit.	Brown T. *Química* 9th edition. Blanco Aquino et al. *Manual del curso de Química General* II. Universidad de Guadalajara. Mexico Whitten K. *Química* 8th edition.
		5.2 The equilibrium constant.	1			
		5.3 Homogeneous chemical equilibrium.	4			

		5.4 Heterogeneous chemical equilibrium.	4		**After:** Students solve homework related to this learning unit. We recommend the use of electronic simulators to favor the understanding of Le Chatelier's principle.	John C. Kotz, *Química y Reactividad Química.* Ciencias e Ingenierías 5th edition Pages of simulators retrieved from: http://www.educaplus.org/play-79-Equilibrio-qu%C3%ADmico-influencia-de-la-presi%C3%B3n.html http://www.educaplus.org/play-80-Equilibrio-qu%C3%ADmico-influencia-de-la-temperatura.html
		5.5 Disturbance of the equilibrium state: Le Chatelier principle.	2			
		5.6 Acids and bases	2			
		5.7 Weak and strong electrolytes.	1			
		5.8 Ionization constant of acids and bases.	1			
		5.9 pH and pOH.	1			
		5.10 Buffer solutions.	1			

COURSE EVIDENCE (Deliverables)

1) Homework and class work
2) Exams
3) Class notebook

4) Previous activities
5) Evaluations

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