1.- GENERAL INFORMATION

Learning unit	Department	Format
General Chemistry Lab II	Chemistry	Lab

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

Type	Lecture hours	Practice hours	Total hours	Credits
Basic Particular Mandatory	0	51	**51**	3

2.- GENERIC COMPETENCIES

Students…
… relate the theoretical knowledge seen in class with the topics of solutions redox and non-redox reactions, solution and crystallization processes, colligative properties, chemical kinetics, and chemical equilibrium through the experimentation with reagents, analytical techniques, lab material and equipment to develop motor, cognitive and scientific skills.

2.- GENERIC COMPETENCIES

Knowledge	Ability to relate the theory of General Chemistry II with the development of Experimental Chemistry. Lab material and equipment. Adequate use of computers. Search for bibliographic information.
Skills	Writing up scientific reports. Handling reagents, lab material and equipment. Team and collaborative work. Autonomous learning. Analytical and critical thinking. Use of digital resources. Ability to synthesize, analyze and evaluate. Responsibility.
Aptitudes	Personal and collective care. Care and preservation of the environment. Team and collaborative work. Saving material resources, water, and energy.
Values	Ethics Honesty Cleanliness

	Responsibility Tolerance Respect Punctuality

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

Preparation and titration of redox and non-redox solutions and their applications in analytical chemistry.
Dissolution and crystallization processes.
Determination of colligative properties.
Chemical kinetics.
Chemical equilibrium.
Ionic equilibrium. (Using the potentiometer).

6.- ASSESSMENT

☑	Numeric grade
☐	
☐	

7.- GRADING CRITERIA OF THE LEARNING UNIT

Indicator of evaluation	Percentage
Practical exams	15
Questionnaires	15
Research activities	15

Experimentation reports	40
Other: attendance	15

8.- REQUIRED MATERIAL (for students)	
☑	Calculator
☑	Periodic table
☑	Lab coat
☐	Text book
☑	Workbook
☑	Other (Work material: gloves, safety glasses, disposable material, etc.)

9.-SPECIFIC CONTENT BY LEARNING UNITS

Content unit	Generic competency of the content unit	Topics	Class hours	Professor activities	Student activities	Bibliography
Unit 1 Preparation and titration of solutions for redox and non-redox reactions: their applications in analytical chemistry.	Students… -Define and apply the concept of normality and molarity, using preparation and titration of solutions with a specific concentration to make the analytical quantitative chemical calculations. -Prepare dilutions by using a stock solution to build a chart and know the trend line equation in order to determine the concentration of test samples.	Non-redox solutions	9	Professor… -Calculates the amount of substance and explains the preparation of the normal solutions to apply in non-redox reactions. -Specifies the titration technique. -Grades the results of the experimentation.	Students… - Research before class to know about the safe handling of reagents. -Answer a questionnaire to consolidate the theoretical knowledge and relate it to the experimentations. -Prepare solutions for non-redox reactions and demonstrate their concentration by using the titration method.	Douglas A. Skoog, West, Holler and Crouch (2001) *Química Analítica,* 7th edition Mc. Graw-Hill, Mexico. Daniel C. Harris (2012) *Análisis Químico Cuantitativo 3rd* edition (6th original edition), Reverté, Spain. Whitten K. Davis R., Peek M. andStanley G.,and Contributors (Avalos T., Blanco A., Palacios G., Ríos N.) (2011) *Química*, 8th Special edition. Cengage Learning, Mexico. Whitten K. Davis R., Peek M. y Stanley G.,

					-Quantify the concentration of a test solution. -Write a report with the results of the experimentation.	(2015), *Química*, 10th Edition, Cengage Learning, Mexico. Brown, T., LeMay, H., Bursten, B., Murphy, C. (2014). *Química La Ciencia Central,* 11th edition. Mexico: Pearson.
		Redox solutions	6	Professor… -Calculates the amount of substance and explains the preparation of normal solutions to apply them in redox reactions. -Specifies the titration technique. -Grades the results of the experimentation.	Students… -Research before class to know about the safe handling of reagents. -Answer a questionnaire to consolidate the theoretical knowledge and relate it to the experimentations. -Prepare solutions for non-redox reactions and demonstrate their	

					concentration by using the titration method. -Quantify the concentration of a test solution. -Write a report with the results of the experimentation.	
		Dilutions	6	Professor… -Calculates the amount of substance and explains the preparation of solutions from a specific concentration solution (stock solution) using a visible UV spectrophotometer	Students… -Carry out some research before class to know the safe handling of reagents. -Answer a questionnaire to consolidate the theoretical knowledge and relate it to the experimentations. -Prepare solutions to obtain different	

				-Grades the results of the experimentation.	concentrations from a stock solution. -Draw a chart (calibration curve) determining the absorbance of the prepared dilutions. -Get the equation of the trend line. -Calculate the concentration of a test sample through the chart and/or the trend line. -Write a report with the results of the experimentation.	
Unit 2 Dissolution and crystallization processes.	Define the concepts of solubility and crystallization, determining experimentally the values of solubility of an anhydride salt at different temperatures, and then creating a chart with the	Solubility coefficients (saturated, unsaturated and supersaturated solutions)	3	Professor… -Explains the basic concepts of dissolution-crystallization.	Students… -Carry out some research before class to know the safe handling of the reagents used in this unit.	

	values obtained from the experimentation in order to compare them with the theoretical information.			-Specifies the analytical technique. -Grades the results of the experimentation.	-Answer a questionnaire to consolidate the theoretical knowledge and relate it to the experimentations. -Determine experimentally the coefficients of solubility at different temperatures. -Draw charts with the experimental and theoretical data and compares them. -Write a report with the results of the experimentation.	

Unit 3 Colligative properties	Determine the cryoscopic constant of water by experimentally getting the freezing point of the pure solvent and the freezing-point depression of a specific molality solution of an electrolyte to obtain the cryoscopic constant from these data.	Cryoscopic constant	3	Professor… -Explains the concept of the freezing-point depression of a solution with a strong electrolyte. -Explains the interpretation of experimental data. -Grades the results of the experimentation.	Students… -Carry out some research before class to know the safe handling of the reagents used in this unit. -Answer a questionnaire to consolidate the theoretical knowledge and relate it to the experimentations. -Experimentally obtain the freezing point of a pure solution and an electrolytic solution. -Relate the obtained data to calculate the value of the cryoscopic constant of the solvent and compare them	

					against the tables of constants. - Write a report with the results of the experimentation.	
Unit 4 Kinetic chemistry	Identify the factors that affect the reaction rate, observing through experimentation the nature of the reagents and the influence of temperature to compare the reaction rate. Interpret through experimentation the influence of the reagent concentration on the reaction rate with different concentrations to relate the data with the order of reaction.	Influence of the reagent's nature. Influence of temperature.	3	Professor… -Explains the factors that affect the reaction rate. -Describes the qualitative analytical technique to determine the influence of elements that affect the reaction rate. -Grades the results of the experimentation.	Students… -Carry out some research before class to know the safe handling of the reagents used in this unit. -Compare and record the reaction rate depending on the nature of the reagent and the influence of temperature.	

					-Make a list of the reaction rates in descendent order. -Interpret the effect of temperature in the reaction rate. -Write a report with the results of the experimentation.	
		Influence of the reagent concentration.	6	-Explains the influence of the concentration in reagents. -Describes the experimental technique and the interpretation of results. -Describes and define the models of first and second order reactions to interpret the data.	-Research before class to know about the safe handling of the reagents used in this unit. -Compare and record the reaction rate depending on the concentration of the reagent. -Create two charts with the obtained data: one of the first order model and	

				-Grades the results of the experimentation.	one for the second order model. -Compare the results of the trend line of these models in order to deduce the reaction order and calculate the constant value of the reaction rate according to the resulting model. -Write a report with the results of the experimentation.	
Unit 5 Chemical equilibrium	Determine the concentrations of the equilibrium species through spectrophotometric methods to calculate the experimental value	Expression of equilibrium constant.	6	Professor… -Explains the concept of the equilibrium constant expression.	Students… - Research before class to know about the safe handling of the reagents used in this unit.	

	of the equilibrium constant. Confirm the Le´Châtelier principle through the perturbation of a system in equilibrium (changing the concentration of an equilibrium species) to interpret the course where the equilibrium will be displaced.	Value of equilibrium constant.		-Describes the spectrophotometric technique. -Grades the results of the experimentation.	-Draw a calibration curve with specific concentrations of the equilibrium species. -Determine through spectrophotometry and a calibration curve the concentration in the equilibrium of the reaction product. -Calculate the concentration of the other species that influence the equilibrium. -Calculate the constant value of an average equilibrium. -Write a report with the results of the experimentation.	

		Le Châtelier's principle	3	Professor… -Explains the Le Châtelier's principle. -Describes the experimental qualitative technique and the interpretation of results. -Grades the results of the experimentation.	Students… -Research before class to know about the safe handling of the reagents used in this unit. -Prove through experimentation the course of displacement due to the change of concentration of a species in the equilibrium. -Observe the effect of temperature over the equilibrium. -Write a report with the results of the experimentation.	

Unit 6 Ionic equilibrium (using the potentiometer)	Carry out a potentiometric titration, obtaining a chart with the experimental data to determine the equivalence point.	Acid-base equilibrium.	6	Professor… -Explains the concept of acid-base equilibrium. -Compares the method of volumetric titration with the method of potentiometric titration. -Describes the technical use of the potentiometer. -Grades the results of the experimentation.	Students… -Record the data from the potentiometer. -Draw a chart of the pH based on the added volume. -Determine the equivalence point. -Write a report with the results of the experimentation.	
COURSE EVIDENCE (Deliverables) 1) Workbook or logbook with the activities and experimentations. 2) Experimentation reports.						

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