1. Identification data:

Name of the learning unit:	**Integral chemistry laboratory**
Guided time (theory and practice):	**80 hours**
Guided time per week:	**4 hours**
Total autonomous time:	**10 hours**
Modality:	**Scholarized**
Number and type of academic period:	**2° Semester**
Type of learning unit:	**Mandatory**
Cycle:	**First**
Curricular area:	**Introductory to the profession initial training (ACFI-IP)**
UANL credits:	**3**
Elaboration date:	**16/03/2021**
Responsible for elaboration:	**Dr. David Mizael Ortiz Martinez** **Dra. Martha Patricia Rodríguez Magaña**
Date of last actualization:	**Does not apply**
Responsible for actualization:	**Does not apply**

2. presentation:

This UA focuses on the application of the knowledge of chemistry in the practical work of a laboratory, In a first phase, the student will develop the basic skills necessary in a laboratory applying skills of the use of physical magnitudes and their units, in addition, to learn about the fundamental physicochemical properties with social responsibility , handling waste substances appropriately. In the second phase the physicochemical properties of matter will be applied for analysis, the development of various methods of separation and chemical reactions and their uses. For the third phase the student will evaluate the properties of organic compounds, their reactions, physicochemical properties and uses in the production of products in various areas. To finish the student will be able to develop a synthesis of an organic or inorganic compound by reaction or chemical reactions.

3. purpose:

This learning unit (UA) aims for the student to experiment in the chemistry laboratory using their knowledge of chemistry, forming criteria to identify common problems in the work of the laboratory. This is relevant as it will allow you to assess the situation; relate

and classify the information to apply it in the resolution of problems that arise in the work areas.

This UA has as antecedent the knowledge acquired in the UA of Inorganic Chemistry where it acquires the bases of the properties of the matter, in parallel it relates with the UA of Organic Chemistry to check and build basic knowledge for the understanding of the organic chemistry, and finally, it is related later with the UA of Structural Biochemistry which provides the competences to understand structural aspects required for the study of the molecules organic and inorganic in biological systems.

The Integral Chemistry Laboratory promotes in the student the correct structure of the information according to the communicative purpose and type of writing when preparing the reports of the laboratory practices in order to correctly communicate the information to his teammates (4.2.1), always seeking the environmental and social well-being during his performance in the laboratory by finding information about local and global events that occur in his environment (10.1.2) , to recognize the elements and their interaction that allow you to contribute timely ideas in the face of a need or challenge (12.1.2).

At the end of the UA, the student will be able to investigate the mechanisms involved in the evolution of biodiversity in relation to the environmental risks that affect the populations in their ecosystem and ensure their persistence in a self-sustaining environment. (E2-B).

It contributes to the development of the specific competences of the educational program of Bachelor of Food Sciences since it makes use of physicochemical and microbiological techniques to visualize the composition and changes that food undergoes during its handling and storage to ensure its quality and safety (E1-LCA), working in a multidisciplinary way to improve the productivity of companies in the food industry and be aware of the care for the environment (E2-LCA).

In the same way, it contributes to the development of the specific competences of the educational program of Chemistry, Bacteriology and Parasitology since the student will be able to design protocols that apply to the study of chemical reactions and phenomena (E1-QBP) studied through analytical methods and apply them to the solution of problems in the area of chemistry, microbiology or biotechnology (E2-QBP) as well as, contribute to the diagnosis of metabolic diseases (E3-QBP) by obtaining results applying methodologies established and validated under regulations in order that they are relevant for said diagnosis always performing under standards of continuous improvement, applying the regulations to meet the requirements that are established (E4-QBP).

In the same way, it contributes to the development of the specific competences of the educational program of Degree in Genomic Biotechnology since the student will be able to design protocols that apply to the study of chemical reactions and phenomena (E1-LBG) through analytical methods and innovative tools applied to the solution of problems in the area of chemistry or biotechnology

(E2-LBG) as well as , contribute to the diagnosis and design of genome detection by finding a locus that identifies heritable diseases (E3-LBG) that allow it to develop products and processes in the prevention of diseases, designing treatments tailored to each patient according to mutations identified in their genes (E4-LBG).

4. Competencies of the graduation profile:

1. General competences to which this learning unit contributes:

Instrumental competences:
4. Master your mother tongue in oral and written form with correctness, relevance, opportunity and ethics adapting your message to the situation or context, for the transmission of ideas and scientific findings.

Personal and social interaction skills:
10.- Intervene in the face of the challenges of contemporary society locally and globally with a critical attitude and human, academic and professional commitment to contribute to consolidating general well-being and sustainable development.

Integrative competences:
12.- Build innovative proposals based on the holistic understanding of reality to contribute to overcoming the challenges of the interdependent global environment.

2. Specific competences to which the learning unit contributes:

Biology
2. To estimate the ecological impact of ecosystems at the local, regional and national levels through the investigation of the biological mechanisms involved in the evolution of species and populations in relation to the environmental risk factors that affect the dynamic populations within ecosystems in order to ensure that conservation programs lead to their persistence as viable and self-sustaining populations in nature.

Food Science

1. Manage the conservation of food proactively, through the use of physicochemical and microbiological techniques of food analysis with a comprehensive view of its composition and the modifications that these present as a result of the handling and storage

conditions to guarantee its quality and safety.

2. Optimize processes involved in food processing, by monitoring and evaluating the effect of process conditions on the physical, chemical and biological characteristics of raw materials and products, working in a multidisciplinary way, with respect for the environment to contribute to the improvement of the productivity of companies in the food industry.

Genomic Biotechnology

1. Design experimental protocols related to biological chemistry, using the theoretical, methodological and instrumental knowledge, traditional and cutting-edge, of the exact sciences, biology and chemistry, which are applied in the study of natural phenomena and biodiversity, in a logical, creative and purposeful way, in order to conserve biotic resources and the environment for the benefit of society.

2. Develop molecular diagnostics through the identification of pathogenic organisms, applying traditional and cutting-edge techniques effectively, as well as the use of innovative tools in their detection, which allow the study and treatment of genetic diseases in the health, economic and social fields.

3. Design strategies for the detection, modification and selection of genomes, through the identification of genes, proteins or cellular metabolic components, following the current regulations on biosafety of Genetically Modified Organisms (GMOs) and evaluating their competitive advantage when compared to what is traditionally used, in order to develop biotechnological products, processes and services in the health sectors , agricultural, livestock, industrial and environmental.

4. Design drugs and clinical treatments, through the selection of microorganisms with productive metabolic pathways in the market of prebiotics, probiotics and additives, as well as viral genomes of biotechnological application in the agricultural, livestock, industrial and environmental sectors that allow it to develop products and processes in the prevention of diseases.

Chemistry, Bacteriology and Parasitology

1. Design experimental protocols related to biological chemistry, using the theoretical, methodological and instrumental knowledge, traditional and cutting-edge, of the exact sciences, biology and chemistry, which are applied in the study of natural phenomena and biodiversity, in a logical, creative and purposeful way, in order to conserve biotic resources and the environment for the benefit of society.

2. Implement analytical methodologies in chemical-biological, microbiological and biotechnological laboratories that are applied to biomedical, agricultural, industrial and/or environmental problems, to provide results supported by the validation of the processes used, for the benefit of the health and economy of the community.

3. Contribute to the diagnosis of autoimmune, metabolic and infectious diseases through the biochemical study of the cellular response in living beings, to contribute to the treatment that guarantees an optimal state of health.

4. Develop systems of continuous improvement and quality assurance of chemical-biological, microbiological and biotechnological processes, applying current national and international regulations through compliance with the established requirements, to determine in a rigorous and objective way the properties of the products obtained, for the good of society.

5. Phase structure:

Phase 1. Physicochemical properties of matter: its measurement and correct interpretation.

Element of competence: Identify the physicochemical properties of the material to make measurements, interpret results and apply knowledge in the basic work of the laboratory.

Evidence	Performance criteria	Learning activities	Content	Resources
Evidence 1. account on practices of laboratory of basic laboratory operations and physicochemical properties of matter	By team develops the different practices laboratory following the Methodologies described in the manual. Organizes, writes and analyzes the results obtained and organizes them in your manual of laboratory practices in the assigned section,	The professor performs the framing of the UA presenting the analytical program The teacher makes an exhibition of the frame of the learning unit exposing with the support of a presentation. The student reads and knows the rules of the laboratory with the support of an explanation from the teacher.	The basic operations of the laboratory. Laboratory safety: basic laboratory safety standards. Good practices in the laboratory: work rules, classification, labelling, storage and disposal of reagents and waste. Dangerousness characteristics. Water quality. Use and characteristics of mass and volume measuring instruments	laboratory Computer equipment Laboratory equipment and instrumentation. Digital chemistry applications that

	always taking care of the use of the correct units in each case Includes information about the processes for measuring properties physicochemical of matter Handles concepts such as mass, volume, density and concentration Write the discussion of your results in the correct section, comparing them with background, considering the purposes of each practice Make the corresponding bibliographic citations in APA format Presents your conclusion of the practice considering the purposes of the same Solves the problem/questionnaire of each laboratory practice, writes all the literature consulted in APA format and appends the	In each laboratory practice of phase 1, the student understands the theory on the /the base topics on which the laboratory practice is based, with the explanation of the professor and reading of the manual of practices of the UA. The student, in each session and individually, reviews the material and / or reagents necessary to perform the practice. The student prepares, as a team, the reagents necessary for the practice. The teacher exposes to the student, the procedures to be performed in practice. The student performs the corresponding laboratory practice as a team, with supervision by the teacher and following the instructions in the laboratory manual. The student presents the first theoretical exam(Weighed activity 1.1)	Solubility and melting point of organic and inorganic compounds. Preparation of solutions (mass, volume and density) Mass Measurement Calculations Volume measurement Density Significant figures, accuracy and precision Reproducibility and coefficients of variation Preparation of buffer solutions.	facilitate learning. projector Internet PowerPoint presentations Pintaro Safety equipment (lab coat, safety glasses at least) Periodic Table updated to the current year. Reagents Laboratory instruments Laboratory Practice Manual Brown, T.; LeMay, H.;

	documents or information requested in the laboratory manual, this in the assigned section of the manual. Hand-write what is requested in each section of the report in legible print. Deliver the laboratory report in your laboratory manual duly identified and on the date indicated by the professor			Burnsten, B.; Murphy, C.; Woodward, P.; Stoltzfus, M. (2017), Química. La ciencia central. Chang, R.; Goldsby K. (2017), Química Petrucci, R.; Herring, F.; Madura, J.; Bisssonnette C. (2017) Hill, R.; Finster, D. (2016), Laboratory Safety for Chemistry Students IUPAC. (2020). International union of pure and applied chemistry. Normas APA Talavera Bustamante, I., & Menéndez Cabezas, A. (2020). Una

				explicación desde la química: ¿por qué son efectivos el agua y jabón, el hipoclorito de sodio y el alcohol para prevenir el contagio con la COVID-19?. Anales De La Academia De Ciencias De Cuba

Phase 2. Physicochemical properties of matter: application in chemical reactions and separation methods.
Element of competence: Interpret the physicochemical properties of matter for analysis and the development of chemical reactions and predict a separation method to obtain the products of the reaction.

Evidence	Performance criteria	Learning activities	Content	Resources
Evidencia 2. Ejercicios de aplicación del conocimiento	It carries out individually and in the manual of practices, the laboratory reports for practices 5, 6 and 7.	In each laboratory practice of phase 2, the student understands the theory on the /the base topics on which the laboratory practice is based, with the explanation of the professor and reading of the manual of practices of	Formation of acetyl salicylic acid: Use of catalysts Formation of an inorganic salt:	laboratory Computer equipment

	Organizes, writes and analyzes the results obtained and organizes them in your manual of laboratory practices in the assigned section, always taking care of the use of the correct units in each case Write the discussion of your results in the correct section, comparing them with background, considering the purposes of each practice and making the corresponding bibliographic citations in APA format Presents your conclusion of the practice considering the purposes of the same Solves the problem/questionnaire of each laboratory practice, writes all the literature consulted in APA format and appends the documents or information requested in the laboratory manual, this in the assigned section of the manual.	the UA. The student, in each session and individually, reviews the material and / or reagents necessary to perform the practice. The student prepares, as a team, the reagents necessary for the practice. The teacher exposes to the student, the procedures to be performed in practice. The student performs the corresponding laboratory practice as a team, with supervision by the teacher and following the instructions in the laboratory manual. The student presents the second theoretical exam (Weighted Activity 2.1).	Chemical equations (rolling, stochiometric calculations and properties of reagents) Formation of a dye:	Laboratory equipment and instrumentation. Digital chemistry applications that facilitate learning. projector Internet PowerPoint presentations Pintaro Safety equipment (lab coat, safety glasses at least) Periodic Table updated to the current year. Reagents

	Hand-write what is requested in each section of the report in legible print. Deliver the laboratory report in your laboratory manual duly identified and on the date indicated by the professor			Laboratory instruments Laboratory Practice Manual Brown, T.; LeMay, H.; Burnsten, B.; Murphy, C.; Woodward, P.; Stoltzfus, M. (2017), Química. La ciencia central. Chang, R.; Goldsby K. (2017), Química Petrucci, R.; Herring, F.; Madura, J.; Bisssonnette C. (2017) Hill, R.; Finster, D. (2016), Laboratory Safety for Chemistry Students IUPAC. (2020). International union of pure

				and applied chemistry. Normas APA Talavera Bustamante, I., & Menéndez Cabezas, A. (2020). Una explicación desde la química: ¿por qué son efectivos el agua y jabón, el hipoclorito de sodio y el alcohol para prevenir el contagio con la COVID-19?. Anales De La Academia De Ciencias De Cuba

Phase 3. Properties of organic compounds
Competitive element: To examine the properties of organic compounds in order to apply separation methods to the products of a reaction and thus infer their industrial applications.

Evidence	Performance criteria	Learning activities	Content	Resources

Evidencia 3. Informe de prácticas de laboratorio	Realiza de forma individual y en el manual de prácticas, los reportes de laboratorio para las prácticas 8, 9 y 10 Organiza, escribe y analiza los resultados obtenidos y los organiza en su manual de prácticas de laboratorio en la sección asignada, cuidando siempre el uso de las unidades correctas en cada caso Redacta la discusión de sus resultados en la sección correcta, comparándolos con antecedentes, tomando en cuenta los propósitos de cada practica Realiza las citas bibliográficas correspondientes en formato APA Presenta su conclusión de la practica tomando en cuenta los propósitos de la misma; Resuelve el problemario/cuestionario de cada practica de laboratorio, redacta toda la literatura	In each laboratory practice of phase 3, the student understands the theory on the /the base topics on which the laboratory practice is based, with the explanation of the professor and reading of the manual of practices of the UA. The student, in each session and individually, reviews the material and / or reagents necessary to perform the practice. The student prepares, as a team, the reagents necessary for the practice. The teacher exposes to the student, the procedures to be performed in practice. The student performs the corresponding laboratory practice as a team, with supervision by the teacher and following the instructions in the laboratory manual. The student presents the third theoretical exam(Weighed activity 3.1).	Obtaining the products of a reaction: separation methods according to the physicochemical properties of the compounds Isolation and partial identification of natural products: Extraction methods Qualitative tests for detection of some compounds and functional groups. Purity tests and applications of the products of a reaction.	laboratory Computer equipment Laboratory equipment and instrumentation. Digital chemistry applications that facilitate learning. projector Internet PowerPoint presentations Pintaro Safety equipment (lab coat, safety glasses at least)

	consultada en formato APA y anexa los documentos o información solicitada en el manual de laboratorio, esto en la sección del manual asignada. Redacta a mano lo solicitado en cada sección del reporte con letra legible. Entrega el reporte de laboratorio en su manual de laboratorio debidamente identificado y en la fecha indicada por el profesor			Periodic Table updated to the current year. Reagents Laboratory instruments Laboratory Practice Manual Brown, T.; LeMay, H.; Burnsten, B.; Murphy, C.; Woodward, P.; Stoltzfus, M. (2017), Química. La ciencia central. Chang, R.; Goldsby K. (2017), Química Petrucci, R.; Herring, F.; Madura, J.; Bisssonnette C. (2017) Hill, R.; Finster, D. (2016), Laboratory

				Safety for Chemistry Students IUPAC. (2020). International union of pure and applied chemistry. Normas APA Talavera Bustamante, I., & Menéndez Cabezas, A. (2020). Una explicación desde la química: ¿por qué son efectivos el agua y jabón, el hipoclorito de sodio y el alcohol para prevenir el contagio con la COVID-19?. Anales De La Academia De Ciencias De Cuba

6. Evaluation of learning:

Phase	Field	Weight (%)
1	Evidence 1. Report on laboratory practices of basic laboratory operations and physicochemical properties of matter	16 points
	Weighed activity 1.1. Exam	10 points
2	Evidence 2. Knowledge application exercises	17 points
	Weighed activity 2.1: Exam	10 points
3	Evidence 3. Classification matrix	17 points
	Weighed activity 3.1. Exam	10 points
	PIA	20 points
	Total:	100 points

7. Integrative learning product (PIA):
Resolution Report (Case-Based Learning): Experiments for obtaining and analyzing a chemical compound.

8. Literature:

Brown, T.; LeMay, H.; Burnsten, B.; Murphy, C.; Woodward, P.; Stoltzfus, M. (2017), Química. La ciencia central, México, Pearson Educación.

Chang, R.; Goldsby K. (2017), Química, Mexico, Editorial McGraw-Hill.

Petrucci, R.; Herring, F.; Madura, J.; Bisssonnette C. (2017), Química General, México, Editorial Pearson Educación.

Hill, R.; Finster, D. (2016), Laboratory Safety for Chemistry Students, Estados Unidos de América, Editorial Wiley.

IUPAC. (2020). International union of pure and applied chemistry. Normas APA de http://www.iupac.org/

Talavera Bustamante, I., & Menéndez Cabezas, A. (2020). Una explicación desde la química: ¿por qué son efectivos el agua y jabón, el hipoclorito de sodio y el alcohol para prevenir el contagio con la COVID-19?. Anales De La Academia De Ciencias De Cuba, 10(2), e781. Recuperado de http://revistaccuba.sld.cu/index.php/revacc/article/view/781/818

Annex1

Resolution Report (Case-Based Learning): Experiments for obtaining and analyzing a chemical compound

instructions:	The final laboratory report should include: 1. Identification data: Institutional cover, name of the UA, title of the work, name of students, name of the professor. 2. Introduction: Detail the basis of the reaction (type of reaction, reaction mechanism, etc.), the characteristics and physical and chemical properties of the reagents and products focusing on the product of interest; in addition, the balanced chemical equation or equations, limiting reagent and excess reagent. 3. Material and methods: Each of the methods used will be detailed; from the preparation of work solutions to obtaining the product of interest (including the handling, storage and proper disposal of chemical substances and waste generated). 4. Results: The quantities of products obtained, the coefficients of variation, the reproducibility and the physical characteristics of the product (based on the use of tables and figures) will be presented. 5. Conclusion: The student will conclude about the importance of the knowledge acquired in the UA. 6. Literature consulted: The bibliography will be added in APA format. 7. Annexes: It must contain the safety sheets and technical sheets of the substances used, as well as a list of the Official Mexican Standards for the handling, classification and disposal of waste.
Value:	**Total: 20%**

Evaluation criteria:	• punctuality • Complies with laboratory regulations • Choice and correct handling of laboratory instruments and equipment • Correct use and disposal of hazardous materials • Perform your calculations and working solutions correctly • Delivery in a timely manner of the requested writings • Presents a general scheme of work, prior to its activities in the laboratory
Mode:	Team