1. Identification data:

Name of the learning unit:	**Integral biology 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:	**2do. Semester**
Type of learning unit:	**Mandatory**
Cycle:	**First**
Curricular area:	**Introductory to the profession initial training (ACFI-IP)**
UANL credits:	**3**
Elaboration date:	**24/04/2021**
Responsible for elaboration:	**Dra. Alina Olalla Kerstupp,** **Dra. Susana Favela Lara,** **Dr. Gabriel Ruiz Aymá**
Date of last actualization:	**Does not apply**
Responsible for actualization:	**Does not apply**

2. Presentation:

The Learning Unit of the Integral Biology Laboratory actively involves the student in the field of scientific research, because through the application of various techniques he will be able to observe those structural, metabolic, inheritance and categorization principles of the different living beings. In this UA the student will learn to contextualize questions about facts of nature and to discover the best techniques to answer them. In any science, reading and discussion are of utmost importance, but it is in the laboratory that ideas can be tested and, where appropriate, refuted. The UA is made up of 10 laboratory practices distributed in 3 phases of knowledge. In the first and second phase, the student will use varied experimentation techniques that allow observing the basic principles of structure, metabolism and inheritance in living beings. In the third phase, it will distinguish the physical characteristics of the different taxonomic groups. Through the application of the scientific method in each of the laboratory practices and as an Integrative Learning Product, the student will be able to outline an alternate laboratory practice for any of the topics experienced.

3. Propósito:

The purpose of the Learning Unit is that the student can examine those structural and functional principles that give life to organisms and that are essential for their taxonomic classification. The UA of integral Laboratory of biology affects in the obtaining of three general competences of the UANL, because when applying the scientific method in each one of his experiments, the student will have to use reliable sources of information that allow him not only to analyze and interpret data but also to be able to compare and discuss them by means of the mastery of his mother tongue , in oral and written form in a structured form (4.2.1). In addition, by working on activities in a group way, respect is fostered among the members of the team (9.2.1) to establish agreements and present works in a consensual manner (14.1.3).

By combining theoretical, methodological and instrumental knowledge within the basic chemical-biological context, this UA pays to the acquisition of seven specific competences of the 4 educational programs(Biology, Chemistry, Bacteriology and Parasitology, Degree in Food Science and Degree in Genomic Biotechnology), because it allows the student to understand the structure and function of living beings, as well as the physical characteristics that allow their taxonomic classification; the above is of utmost importance since, through the analysis of said information, you will be able to decide the current and potential use of species, and with it, a better use of biological resources (E1-B, E2-B and E1-LBG). The UA allows the student to acquire experience in obtaining and interpreting specialized information and thereby be able to implement and design laboratory protocols that help to solve biomedical, agricultural, industrial and / or environmental problems (E1-QBP, E2-QBP and E1-LBG) as well as guarantee the quality and safety of food (E1-LCA and E2-LCA).

The UA of Integral Laboratory of Biology is directly related to the UA Structural Biology and Biological Diversity because each of the practices of laboratory of this UA examines and verifies the theoretical foundations acquired previously in said units of learning. Considering the above and considering that the student must use the scientific method for the writing of the reports of each of the laboratory practices, this UA prepares the student to directly address the UA Scientific Research(Biology),UA Basic Techniques of Microbiology (QBP), Drafting of technical and scientific documents (LCA) and Research Methodology (LBG).

4. Competencies of the graduation profile:

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:

9. Maintain an attitude of commitment and respect towards the diversity of social and cultural practices that reaffirm the principle of integration in the local, national and international context in order to promote environments of peaceful coexistence.

Integrative competences:

14. Resolve personal and social conflicts, in accordance with specific techniques in the academic field and your profession for proper decision-making.

Specific competences of the graduation profile to which the Learning Unit contributes:

Biology:

To record biological diversity, through the classification of living beings at their different levels of organization, their dynamics and interrelations in ecosystems to enrich the catalogues of species at the local, regional and national level to assess the knowledge of the state of environmental health and degree of threat in which they are.

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.

QBP:

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.

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.

LCA:

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 manner, with respect for the environment to contribute to the improvement of the productivity of companies in the food industry.

LBG:

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.

5. Phase structure:

Phase 1. Cellular structure
Element of competence: To verify that living beings are composed of cells and that these cells contain DNA in their interior to reaffirm the first postulate of cell theory.

Evidence	Performance criteria	Learning activities	Content	Resources
Evidence 1. Report on laboratory practices of cellular structure.	As a team develops the different laboratory practices following the methodologies described in the manual. It applies the basic tools of observation, experimentation and analysis used in the scientific method. Learn the correct use of the optical microscope to visualize that living beings are composed	The professor performs the framing of the UA presenting the analytical program. The professor presents a brief plenary to link the topics seen theoretically with the topic of practice. The student acquires training in the handling and use of the optical microscope by observing temporal lamellae and practices the skills to focus a	1. Components and handling of the optical microscope. 2. Simple DNA extraction. 3. Differences between plant and animal cells.	Classroom-laboratory with audiovisual system Internet access Presentation Power Point or Sway Educational platforms Manual of laboratory practices

	of cells and that within these cells is DNA. Prepares and delivers the report by team at the time, day and a half that the teacher indicates. Meets the performance criteria of the instructional guide.	sample using a virtual simulator. By experimenting with the physico-chemical properties of DNA, the student extracts this molecule from a set of cells and thus visually proves its existence. The student differentiates between plant and animal cells by observing and identifying the different cellular structures found in eukaryotic organisms. • The student presents the first multiple reagent exam (weighted activity 1.1).		Instructional guide Evaluation instrument Optical microscope Virtual simulator of optical microscope. University of Delaware (s.f.). Glassware, reagents and various laboratory consumables books: • Clark et al. (2018) • Fowler et al. (2013)

				• Karp (2011) • Kremer (2012) • Munch & Ángeles (2015) • Pendarvis & Craawley (2011) • Solomon et al. (2013) • Starr et al. (2018)

Phase 2. Cellular processes
Element of competence: Distinguish the metabolic processes that allow cells to obtain energy, divide and transmit characters (inheritance) to verify the second postulate of cell theory.

Evidence	Performance criteria	Learning activities	Content	Resources
Evidence 2. Exercises of application of the knowledge "Cellular metabolic processes".	As a team develops the different laboratory practices following the methodologies described in the manual.	• The professor presents a brief plenary to link the topics seen theoretically with the topic of practice. • The student prepares and uses onion root	• Mitosis. • Photosynthesis and Aerobic cellular respiration. • Character inheritance.	1. Classroom-laboratory with audiovisual system 2. Internet access 3. Presentation Power Point or Sway 4. Educational platform

	It applies the basic tools of observation, experimentation and analysis used in the scientific method. Distingue the metabolic processes that allow cells to obtain energy, divide and transmit characters (inheritance) to prove the second postulate of cell theory. Answer and deliver by team the exercises in the hour, day and a half that the teacher indicates.	lamellae to identify the different phases of Mitosis. • The student evidences the release of gases in the metabolic processes of photosynthesis and aerobic cellular respiration. • The student uses didactic resources, as well as the recognition of physical characteristics among their peers, to differentiate between genotype and phenotype. • Identifies common phenotypic *features.* • The student presents the second multiple reagent exam (weighted activity 2.1).		5. Manual of laboratory practices 6. Instructional guide 7. Evaluation instrument 8. Optical microscope 9. Glassware, reagents and miscellaneous laboratory consumables Books: • Clark et al. (2018) • Fowler et al. (2013) • Karp (2011) • Munch & Ángeles (2015) • Pendarvis & Craawley (2011) • Solomon et al. (2013)

	Meets the performance criteria of the instructional guide.			• Starr et al. (2018)

Phase 3. Physical characteristics of biodiversity
Element of competence: Identify the physical characteristics of different groups of living beings to facilitate their taxonomic classification.

Evidence	Performance criteria	Learning activities	Content	Resources
Evidence 3. Classification matrix on the taxonomy of different groups of organisms.	•As a team develops the different laboratory practices following the methodologies described in the manual. • It applies the basic tools of observation, experimentation and analysis used in the scientific method. •It makes a classification matrix to correctly assign the distinctive	• The student prepares and observes temporary lamellae for the identification of microorganisms. The student analyzes physical specimens from scientific collections for the identification of characteristics of different groups of plants and animals.	Observation of microorganisms (bacteria, protozoa and fungi). botany. Invertebrate animals. Vertebrate animals.	1. Classroom-laboratory with audiovisual system 2. Internet access 3. Presentation Power Point or Sway 4. Educational platforms 5. Manual of laboratory practices 6. Instructional guide

	characteristics of each group of organisms. • Elaborates and delivers by team the classification matrix in the hour, day and a half that the teacher indicates. • Meets the performance criteria of the instructional guide.	• The student presents the third multiple reagent exam (weighted activity 3.1).		7. Evaluation instrument 8. Optical microscope 9. Glassware, reagents and various laboratory consumables books: ● Clark et al. (2018) ● Fowler et al. (2013) ● Munch & Ángeles (2015) ● Pendarvis & Craawley (2011) ● Solomon et al. (2013) ● Starr et al. (2018) ● Ejemplares físicos de colecciones científicas de la FCB

6. Comprehensive evaluation of processes and products (weighting / summative evaluation).

Global scheme of evaluation of the Learning Unite:

Aspecto to evaluate	Percentage
Diagnostic Evaluation	Requisite
Learning Evidence Portfolio: -First Phase (10%) -Second Phase (10%) -Third Phase (10%)	30%
Multiple reagent test: -First Phase (12%) -Second Phase (14%) -Third Phase (14%)	40%
Learning product	30%
Final grade	100%

Schematic of evaluation of the Unit of Learning broken down by Stages and Evidence of Learning:

Phase	Learning evidence	Weight
	Diagnostic evaluation	Requirement
First Phase (22%)	Evidence 1. Report of laboratory practices of cellular structure.	10 points
	Examination of multiple reagents (weighted activity 1.1).	12 points
Phase Two (24%)	Evidence 2. Exercises of application of the knowledge "Cellular metabolic processes".	10 points
	Examination of multiple reagents (weighted activity 2.1).	14 points
Phase Two	Evidence 3. Classification matrix "Taxonomy of different groups of organisms".	10 points

(24%)	Examination of multiple reagents (weighted activity 3.1).	14 points
Integrative Learning Product		30 points
		TOTAL 100 points

7. Learning Integrator Product:

Didactic presentation of an alternative methodology to experiment theoretical principles of biology. The students by team will choose a theme of the UA of Structural Biology or Biological Diversity and will propose by applying the scientific method an alternative laboratory practice that experiences the theoretical principles of the chosen topic.

8. Literature:

- Bases de Datos UANL *(s.f.). Biblioteca Digital*. Recuperado de https://www.dgb.uanl.mx/?mod=bases_datos el 15 de Julio de 2020.
- Clark, M.A., Douglas, M., and Choi, J. (2018). *Biology 2e.* Open Stax. Recuperado de https://openstax.org/details/books/biology-2e el 14 de Septiembre de 2020.
- Fowler, S., Roush, R., & Wise, J. (2013). *Concepts of Biology*. Open Stax. Recuperado de https://openstax.org/details/books/concepts-biology el 14 de Septiembre de 2020.
- Howard Hughes Medical Institute. (s. f.). *HHMI Bionteractive*. HHMI Bionteractive. Recuperado de https://www.hhmi.org/biointeractive el 06 de Septiembre de 2020.
- Karp, G. (2011). *Biología Celular y Molecular, Conceptos y Experimentos*. McGraw-Hill Interamericana S. A de C.V.
- Khan Academy. (s. f.). *Prácticas, lecciones y cursos en línea gratuitos*. Khan Academy. Recuperado de https://es.khanacademy.org/ el 29 de Agosto de 2020.
- Kremer, B.P. (2012). *Manual de Microscopía*. Ediciones Omega.
- Miller K. R., & Levine, J. (2014). *Biology*. Pearson Education.
- Miller K. R., & Levine, J. (2010). *Evolución y Taxonomía*. Pearson Education.
- Munch, L., & Ángeles, E. (2015). *Métodos y Técnicas de Investigación.* Editorial Trillas.

- Pendarvis, M.P., & Craawley, J.L. (2011). *Exploring Biology in the Laboratory.* Morton Publishing.
- Solomon, E.P., Berg, L.R., & Martin D. W. (2013). *Biology*. Cengage Learning S.A. de C.V.
- Starr, C., Taggart, R., Evers, C., & Starr, L. (2018). *Biología. La unidad y diversidad de la vida*. Cengage Learning S.A. de C.V.
- University of Delaware. (s. f.). *Simulador de Microscopio Óptico*. Simulador de Microscopio Óptico. Recuperado de https://www1.udel.edu/biology/ketcham/microscope/scope.html el 10 de Julio de 2020.

Annex 1. Instructional Guide to the Integrative Learning Product Didactic presentation of a methodology to experiment theoretical principles of biology	
Instructions:	1. By team choose a theme of the UA of Structural Biology or Biological diversity and propose through the application of the scientific method an alternative laboratory practice that experiences the theoretical principles of the chosen topic. 2. Use power point slides that include narration and/or video of you in checkered. 3. Slides must be free of text saturation and must include images, gifs, videos, or any resource they deem relevant. 4. Convert ppt to mp4 video. 5. Uploaded the video to a drive of your choice and generate an access link. 6. In a Word document design the written document of the lab practice and include the link of the drive to observe the video. 1. Deliver the document on the date and time indicated by the teacher.

Value	30%
Evaluation criteria	*Delivery format:* • *Word or PDF.* • *Cover with data of the members of the team, the subject, teacher and date of delivery.* • *Information to be included in the document and video:* • *Theoretical framework (introduction)* • *Objective/competence* • *Materials and Methods* • *Result capture format (tables, areas for schematics, etc.)* • *Expected results* • *Questionnaire with at least 5 questions derived from the same practice and/or issues related to the chosen topic* • *Literature and sources consulted for your proposal* • *Review the evaluation rubric that is attached to this guide.*
Mode:	Team
Format:	Education platform