1. Module identification code.	
Name of the institution:	Universidad Autónoma de Nuevo León
Name of the school:	School of Medicine
Name of the degree program:	Clinical Chemistry
Name of the course (learning unit):	Physics
Total number of class hours-theory and practice:	100
Class hours per week:	5
Independent study:	20
Course modality:	Face-to-face instruction
Module level:	Second semester
Core/elective module:	Core
Curriculum area:	ACFB
UANL credit points:	4
Create date:	January 30th, 2017
Date of last amendment made:	January 16th, 2023
Person(s) responsible for the design and amendment of the module:	Design: Dr. en C. Judith Rocha Gámez, Q.C.B. Olga Catalina Rodríguez Martínez. Amendment: Dr. en C. Omar Jassiel Portillo Castillo.

2. Presentation:

This learning unit consists of 4 stages; in which the student in the first stage of Mechanics the student states Newton's Laws on speed, acceleration, work, energy, etc.; in the second stage of Fluids the student recognizes the properties of fluids such as surface tension, flow rate, viscosity, pressure; in the third stage Electromagnetic Radiation and Optics, the student explains the interactions that light can have with matter, such as reflection, refraction, diffraction, dispersion, polarization, absorption, etc. In the fourth stage Electricity and Magnetism, the student experiences the basic terms of electricity and electronics, such as direct and alternating current, resistance, voltage, capacitive and inductive reactance, etc., and mathematically solves questions that involve the basic laws of electromagnetism, through continuous and collaborative learning, making conceptual maps before each topic, solving problems and capturing the main concepts of each stage through a manuscript glossary.

To complete the Course Integrative Project/Product (CIP), the student verifies Newton's laws with energy and thermodynamics, fluids with the properties of plasma, optics, electricity, and electronics to be able to use both the instruments and the mathematical analytical methods in written form with a global evaluation instrument.

The methodology used focuses on learning and the development of skills. It is adapted to a constructivist perspective of teaching, where collaborative work and autonomous and critical learning are encouraged, favoring learning based on problem-solving.

3. Purpose:

This learning unit (LU) aims to help students develop the skills necessary to use the fundamentals and physical techniques that will be applied during their academic and professional performance.

Regarding general skills, in this learning unit, the student uses information technologies to support the resolution of tasks and the completion and presentation of work and uses the software's advanced features to prepare electronic documents that comply with international standards for formatting, style, and citing bibliographical references. During the practices carried out in the laboratory, he takes care to protect the environment and the well-being of himself and his colleagues, thus practicing values of solidarity, and respect for life and nature, promoted by the UANL. During group work, students express their ideas clearly and calmly to convey their position during a conflict, respect those of their classmates and teachers, reach agreements that allow for appropriate decision-making, and act with integrity in the development of their academic activities. As for the specific competencies of the degree, most of the physical techniques studied at this LU will help the student solve problems related to the physicochemical properties of matter.

This LU is in the second semester of the degree, for its development it uses knowledge acquired in Higher Mathematics, such as the management of fundamental mathematical operations, scientific notation, logarithms, and algebraic equations, as well as the resolution of Physics exercises; from the LU General Chemistry it takes the concepts of electromagnetic radiation to relate them to its optical properties and applications, and in turn these topics reviewed in this LU of Physics contribute to the LU of Instrumental Analysis in the topics of electromagnetic radiation and spectrophotometry. Basic terms described in Physics, such as speed, energy, fluid properties, radiation, etc., are used in the Physical Chemistry LU to describe the thermodynamic, spectroscopic, and kinetic properties of matter. It also provides the theoretical basis for understanding the different homeostatic processes seen in the Physiology LU.

4. Competences of the graduate profile:

General competences to which this module (learning unit) contributes:

- *Instrumental skills:*
  3. To manage Digital Information, Communication, Knowledge and Learning Technologies (TICCAD), in academic, personal and professional environments with cutting-edge techniques that allow their constructive and collaborative participation in society.

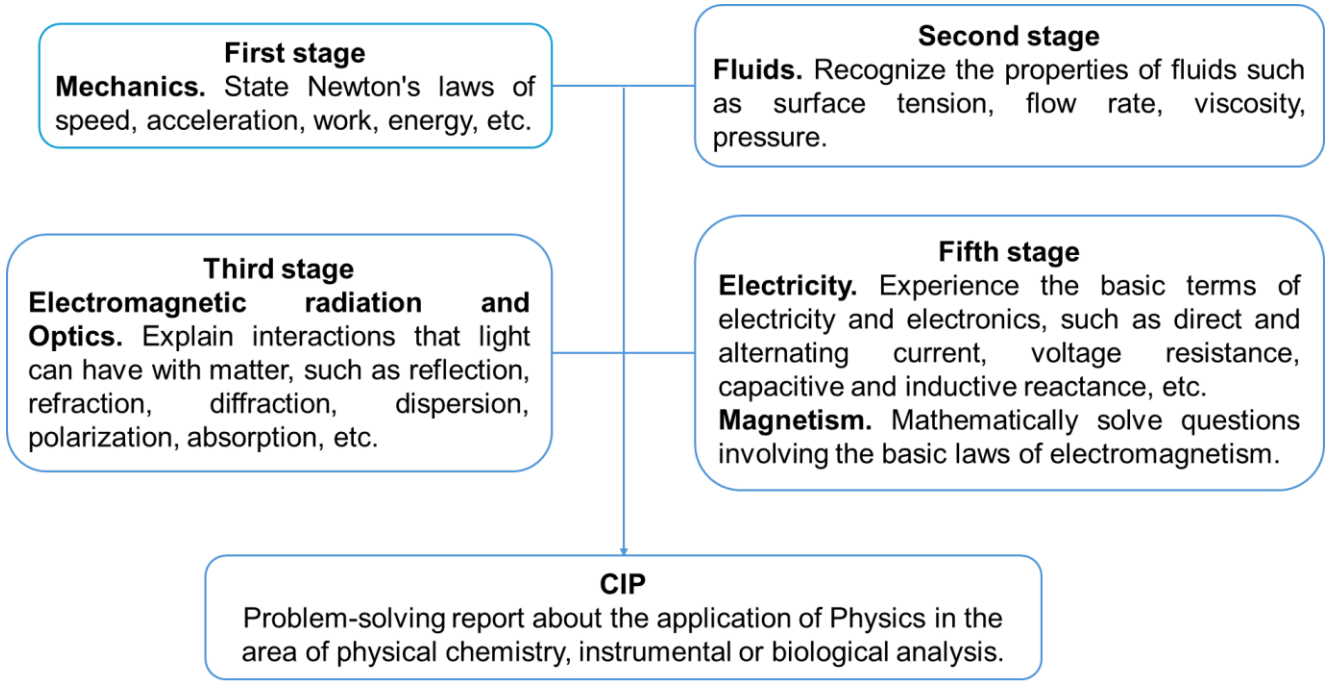
- *Personal and social interaction skills:*
  11. To practice the values promoted by the UANL: truth, equity, honesty, freedom, solidarity, respect for life and others, peace, respect for nature, integrity, ethical behavior and justice, in their personal and professional environment to contribute to building a sustainable society

- *Integrative skills:*
  14. To resolve personal and social conflicts, in accordance with specific techniques in the academic field and in their profession for appropriate decision-making.

Specific competences of the graduate profile to which this module (learning unit) contributes:

To solve problems by applying knowledge of the chemical composition of matter as well as its physicochemical properties to determine analytes in biological, environmental and food matrices.

5. Course roadmap:



6. Structuring into stages or phases:

Stages of the learning unit:

1. Mechanics.
2. Fluids.
3. Electromagnetic radiation and Optics.
4. Electricity and Magnetism.

Stage: 1
Component(s) of the competence:
To state the terms and principles of Newton's Laws in mechanics and relate them to laboratory instruments that apply said force.

Evidence of student learning	Performance criteria	Learning activities	Content	Resources
Evidence 1 Written evaluation about mechanics.	To be eligible for evaluation, the student must submit the learning activities: problem set, conceptual map, glossary, and laboratory reports. • Identify the type of problem to be solved. • Decide the appropriate operation or algorithm to use. • Make the systematic planning of the solution to the problem. • Develop the operation or algorithm selected for the orderly resolution of the problem. • Solve problems individually or in work team • Complete the submission of tasks or exercises through the corresponding platform.	• The teacher presents the course and program of the Learning Unit. • The teacher explains the methodology of the activities required for each stage and mentions the use of the corresponding platform to deliver said activities. • In addition, it explains the scoring of the weighted activities, the dates of the written evaluations on problem-solving at each stage, and the requirement(s) to be eligible to submit said evaluations. • In the same way, it mentions when the practical laboratory sessions will be held.	• The student analyzes the inclusion of Physics in the curriculum of the degree of Clinical Biologist Chemist, and the relationship with other learning units and with professional practice. • Extensive and intensive properties of matter. • Systems of units and transformation of units. • Dimensional analysis: scalar and vector magnitudes. • Kinematics: uniform and uniformly accelerated rectilinear motion. • Circular motion.	• Computer equipment with Microsoft Office. • MS Teams and Moodle platforms. • Textbooks: Giancoli-Douglas, 1999 y F.J., 1991. • PhET simulators on Nearpod on the web related to the topic, the Internet, and academic search engines. • Web tools for creating conceptual maps. • Web tool: Nearpood and Microsoft Forms. • Laboratory L14 of the Department of

	• Submit individual evidence in writing on the date and time indicated.	**Before class:** • Before the session, the student reads the bibliography recommended by the professor. **In the classroom:** For each of the contents, the following teaching sequence will be carried out: • The teacher presents the theoretical concepts of the phase. • The students participate by answering questions interspersed by the teacher during the session, these can be orally or through the use of digital applications. • The students are organized into teams and make a conceptual map of the content of stage 1.	• Relationship between angular and tangential quantities. • Dynamics: Newton's laws. • Work, potential energy, gravitational energy, kinetic energy, mechanical energy, conservative force and power. • Theorems of work and kinetic energy, conservation of mechanical energy. • The general principle of conservation of energy.	Analytical Chemistry of the School of Medicine of the UANL. • Teaching material for the laboratory practices described in the Physics laboratory practices manual and/or videos made by the practice teachers.

		• The conceptual map includes the systems of units, the different types of movements, Newton's Laws, and the basic concepts of Mechanics. • This activity will be sent through the electronic platform indicated by the teacher. **(accredited activity 1.1)** • With the teacher's guidance, students solve exercises on the basic principles of Mechanics. • The student identifies and copies the relevant information into his notebook. • The students solve the classroom exercises, individually or in work teams. • The student solves the problem set individually		

		and hands it in on the indicated date. **(accredited activity 1.2)** **In the laboratory:** The students do the practices: 1. Introduction to Physics. 2. Weights and measures. 3. Centrifugation. • Before the laboratory session, the student reads the corresponding practices in the laboratory manual outside class. • Outside of class, the student prepares the flow chart for the practice that will be carried out. • The student attends the corresponding session punctually, fulfilling the entry criteria for the		

		laboratory practice session. • The teacher leads a group discussion on the practice to be carried out. • The student performs the practices according to the LU laboratory manual (individually or by work team). • The student prepares the laboratory practice reports by sending them through the electronic platform indicated by the professor. **(accredited activity 1.3)** • The students makes a glossary with concepts on the topics reviewed in stage 1, sending it in electronic format to the teacher through the corresponding platform. **(accredited activity 1.4)**		

Stage: 2
Component(s) of the competence:
To recognize the properties of fluids to relate them to the characteristics of various solutions used in the laboratory and the properties of biological fluids.

Evidence of student learning	Performance criteria	Learning activities	Content	Resources
Evidence 2 Written evaluation of the properties of fluids.	To be eligible for evaluation, the student must submit the learning activities: problem set, conceptual map, glossary, and laboratory reports. • Identify the type of problem to be solved. • Decide the appropriate operation or algorithm to use. • Make the systematic planning of the solution to the problem. • Develop the operation or algorithm selected for the orderly resolution of the problem. • Solve problems individually or in work team • Complete the submission of tasks or exercises through the	**Before class:** • Before the session, the student reads the bibliography recommended by the professor. **In the classroom:** For each of the contents, the following teaching sequence will be carried out: • The teacher presents the theoretical concepts of the phase. • The students participate by answering questions interspersed by the teacher during the session, these can be orally or through the use of digital applications.	• Density, relative density, pressure, hydrostatic pressure, flow rate, or flow volume. • Pascal's and Archimedes' principles. • Continuity and Bernoulli equations. • Viscosity. • Poiseuille's and Stokes' laws. • Reynolds number. • Diffusion, osmosis, surface tension and capillarity. • Fick's law of diffusion and osmotic pressure equation.	• Computer equipment with Microsoft Office. • MS Teams and Moodle platforms. • Textbooks: Giancoli-Douglas, 1999 y F.J., 1991. • PhET simulators on Nearpod on the web related to the topic, the Internet, and academic search engines. • Web tools for creating conceptual maps. • Web tool: Nearpood and Microsoft Forms. • Laboratory L14 of the Department of

	corresponding platform. • Submit individual evidence in writing on the date and time indicated.	• The students are organized into teams and make a conceptual map of the content of stage 2. • The conceptual map should include the different types of fluid properties, the basic concepts of fluid mechanics. • This activity will be sent through the electronic platform indicated by the teacher. **(accredited activity 2.1)** • With the teacher's guidance, students solve exercises on the basic principles and concepts of Fluids. • The student identifies and copies the relevant information into his notebook. • The students solve the classroom exercises, individually or in work teams.		Analytical Chemistry of the School of Medicine of the UANL. • Teaching material for the laboratory practices described in the Physics laboratory practices manual and/or videos made by the practice teachers.

		• The student solves the problem set individually and hands it in on the indicated date. **(accredited activity 2.2)** **In the laboratory:** The students do the practices: 4. Density. 5. Pressure and pressure differences 6. Viscosity • Before the laboratory session, the student reads the corresponding practices in the laboratory manual outside class. • Outside of class, the student prepares the flow chart for the practice that will be carried out. • The student attends the corresponding session punctually,		

		fulfilling the entry criteria for the laboratory practice session. • The teacher leads a group discussion on the practice to be carried out. • The student performs the practices according to the LU laboratory manual (individually or by work team). • The student prepares the laboratory practice reports by sending them through the electronic platform indicated by the professor. **(accredited activity 2.3)** • The students makes a glossary with concepts on the topics reviewed in stage 2, sending it in electronic format to the teacher through the corresponding platform. **(accredited activity 2.4)**		

Stage: 3
Component(s) of the competence:
To explain the phenomenon of electromagnetic radiation and its correlation with optics to relate it to the components of the instruments commonly used in the laboratory by solving mathematical problems.

Evidence of student learning	Performance criteria	Learning activities	Content	Resources
Evidence 3 Written evaluation about Electromagnetic Radiation and Optics.	To be eligible for evaluation, the student must submit the learning activities: problem set, conceptual map, glossary, and laboratory reports. • Identify the type of problem to be solved. • Decide the appropriate operation or algorithm to use. • Make the systematic planning of the solution to the problem. • Develop the operation or algorithm selected for the orderly resolution of the problem. • Solve problems individually or in work team. • Complete the submission of tasks or exercises through the	**Before class:** • Before the session, the student reads the bibliography recommended by the professor. **In the classroom:** For each of the contents, the following teaching sequence will be carried out: • The teacher presents the theoretical concepts of the phase. • The students participate by answering questions interspersed by the teacher during the session, these can be orally or through the use of digital applications.	• Models or theories about the nature of light. • Historical review. • Transverse and longitudinal waves. • Light energy as a function of wavelength, frequency, period, or wavenumber. • Reflexión and refraction of light. • Real and virtual image. • Analysis of images in plane and spherical mirrors, whether concave or convex, and in thin lenses, whether convergent or divergent. • Combination of two or more elements.	• Computer equipment with Microsoft Office. • MS Teams and Moodle platforms. • Textbooks: Giancoli-Douglas, 1999 y F.J., 1991. • PhET simulators on Nearpod on the web related to the topic, the Internet, and academic search engines. • Web tools for creating conceptual maps. • Web tool: Nearpood and Microsoft Forms.

	corresponding platform. • Submit individual evidence in writing on the date and time indicated.	• The students are organized into teams and make a conceptual map of the content of stage 3. • The conceptual map must include the different types of radiant energy, the laws of radiation and their interactions with matter. • This activity will be sent through the electronic platform indicated by the teacher. **(accredited activity 3.1)** • With the teacher's guidance, students solve exercises on the basic principles of electromagnetic and optical radiation. • The student takes notes of synoptic tables and questions interspersed in the presentation on the topic.	• Power of a lens • Application in microscopes and in defects of the human eye. • Aberration in image formation. • Light diffraction. • Huygens' principle. • Coherent light. • Application in Young's double slit experiment. • Diffraction grating and its usefulness in spectroscopic instruments. • Diffraction in a circular aperture. • Resolution power. • Rayleigh criterion. • Polarization, birefringence and dichroism. • Application of polarimeters in calculating the concentration of an optically active substance. • Absorption and light scattering.	• Laboratory L14 of the Department of Analytical Chemistry of the School of Medicine of the UANL. • Teaching material for the laboratory practices described in the Physics laboratory practices manual and/or videos made by the practice teachers.

		• The student identifies and copies the relevant information into his notebook. • The students solve the classroom exercises, individually or in work teams. • The student solves the problem set individually and hands it in on the indicated date. **(accredited activity 3.2)** **In the laboratory:** The students do the practices: 7. Reflexión and refraction of light. 8. Thin lens. • Before the laboratory session, the student reads the corresponding practices in the laboratory manual outside class. • Outside of class, the student prepares the	• Tyndall and Rayleigh effects.	

		flow chart for the practice that will be carried out. • The student attends the corresponding session punctually, fulfilling the entry criteria for the laboratory practice session. • The teacher leads a group discussion on the practice to be carried out. • The student performs the practices according to the LU laboratory manual (individually or by work team). • The student prepares the laboratory practice reports by sending them through the electronic platform indicated by the professor. **(accredited activity 3.3)** • The students makes a glossary with concepts on the topics reviewed		

		in stage 3, sending it in electronic format to the teacher through the corresponding platform. **(accredited activity 3.4)**		

Stage: 4
Component(s) of the competence:
To manipulate the parts of the electronic circuit and locate them in the electronic devices of daily use in the laboratory using theoretical diagrams.

Evidence of student learning	**Performance criteria**	**Learning activities**	**Content**	**Resources**
Evidence 4 Written evaluation about Electricity and Magnetism.	To be eligible for evaluation, the student must submit the learning activities: problem set, conceptual map, glossary, and laboratory reports. • Identify the type of problem to be solved. • Decide the appropriate operation or algorithm to use. • Make the systematic planning of the solution to the problem. • Develop the operation or algorithm selected for the orderly resolution of the problem.	**Before class:** • Students read the topics covered in textbooks and reference books beforehand. **In the classroom:** For each of the contents, the following teaching sequence will be carried out: • The teacher presents the theoretical concepts of the phase. • The students participate by answering questions	• Analytical methods. Chemical analysis instruments. • Electrical charge, direct and alternating current. • Resistance, voltage or potential difference. • MaterialConductive, insulating, and semiconductor materials. • Work and electrical power. • Different units of measurement. • Resistencia equivalente para	•Computer equipment with Microsoft Office. •MS Teams and Moodle platforms. •Textbooks: Giancoli-Douglas, 1999 y F.J., 1991. •PhET simulators on Nearpod on the web related to the topic, the Internet, and academic search engines.

	• Solve problems individually or in work team. • Complete the submission of tasks or exercises through the corresponding platform. • Submit individual evidence in writing on the date and time indicated.	interspersed by the teacher during the session, these can be orally or through the use of digital applications. • The students are organized into teams and make a conceptual map of the content of stage 4. • The conceptual map must include the electronic circuit parts, the concepts of electric current, voltage and resistance. • This activity will be sent through the electronic platform indicated by the teacher. **(accredited activity 4.1)** • With the teacher's guidance, students solve exercises on the basic principles of eletricity and magnetism.	configuraciones en serie, paralelo y delta. • Ohm's and Kirchhoff's laws. • Wheatstone bridge circuit. • Effective values of voltage and current, for an alternating current signal. • Capacitors and inductors. • Combinations and calculation of the resulting capacitive and inductive reactances. • Impedance. • Resonant filters. • Calculation of the resonance frequency. • Linear and non-linear elements. • “p” type and “n” type semiconductor materials. • Diodes (common and Zener), transistors (bipolar and field effect). • Transformers.	• Web tools for creating conceptual maps. • Web tool: Nearpood and Microsoft Forms. • Laboratory L14 of the Department of Analytical Chemistry of the School of Medicine of the UANL. Teaching material for the laboratory practices described in the Physics laboratory practices manual and/or videos made by the practice teachers.

		• The student takes notes of the information presented by the teacher and answers questions interspersed in the presentation on the topic. • The student highlights and copies the relevant information into his notebook. • Students solve exercises in the classroom, both individually and in work teams. • Students solve the problem set individually and hand it in on the indicated date. **(accredited activity 4.2)** **In the laboratory**: The students do the practices: 9. Introduction to electronic circuits.	• Power or voltage sources. • Operational amplifiers and electronic gates (design, operation, application, etc.). • Digital circuits. • Design and simplification using Boolean algebra. • Application of electronics in the area of biological chemistry. • Magnetic field. • Force on a charged particle or conductor passing through a magnetic field. • Right hand rule one to determine the direction of force. • Right-hand rules 2 and 3, to determine the direction of the magnetic field in a conductor or a current coil or coil. • Electromagnetic induction. • Faraday equation.	

		10. Ohmmeter, resistors, and color code. 11. Determination of conductivity. • Before the laboratory session, the student reads the corresponding practices in the laboratory manual outside class. • Outside of class, the student prepares the flow chart for the practice that will be carried out. • The student attends the corresponding session punctually, fulfilling the entry criteria for the laboratory practice session. • The teacher leads a group discussion on the practice to be carried out. • The student performs the practices according to the LU	• Lenz to calculate the FEM in coils in which the magnetic flux is varied.	

		laboratory manual (individually or by work team). • The student prepares the laboratory practice reports by sending them through the electronic platform indicated by the professor. **(accredited activity 4.3)** • The students makes a glossary with concepts on the topics reviewed in stage 4, sending it in electronic format to the teacher through the corresponding platform **(accredited activity 4.4)**		

7. Summative evaluation:			
Stage 1	**Evidence 1.** Written problem-solving assessment about mechanics.	8%	20%
	1.1 The conceptual map indicated by the teacher about stage 1.	2%	
	1.2 Resolution of the problem set about the topics of stage 1.	4%	
	1.3 Laboratory Practice Reports of Stage 1.	4%	
	1.4 Glossary of the concept of mechanics.	2%	
Stage 2	**Evidence 2**. Written problem-solving assessment about fluids.	8%	20%
	2.1 The conceptual map indicated by the teacher about stage 2.	2%	
	2.2 Resolution of the problem set about the topics of stage 2.	4%	
	2.3 Laboratory Practice Reports of Stage 2.	4%	
	2.4 Glossary of the concept of fluids.	2%	
Stage 3	**Evidence 3.** Written problem-solving assessment about Electromagnetic radiation and Optics.	8%	20%
	3.1 The conceptual map indicated by the teacher about stage 3.	2%	
	3.2 Resolution of the problem set about the topics of stage 3.	4%	
	3.3 Laboratory Practice Reports of Stage 3.	4%	
	3.5 Glossary of the concept of Electromagnetic radiation and Optics.	2%	
Stage 4	**Evidence 4.** Written problem-solving assessment about Electricity and Magnetism.	8%	20%
	4.1 The conceptual map indicated by the teacher about stage 4.	2%	
	4.2 Resolution of the problem set about the topics of stage 4.	4%	
	4.3 Laboratory Practice Reports of Stage 4.	4%	
	4.4 Glossary of the concept of Electricity and Magnetism.	2%	
CIP		20%	20%
TOTAL			100%

8. Course integrative project/product:
Problem-solving report on the application of Physics in explaining different laboratory and environmental phenomena.

9. References:
Giancoli-Douglas, C. (1999). Física principios con aplicaciones, 2a edición. México: editorial Prentice Hall Hispanoamericana, S.A. Blatt, F. J. (1991) Fundamentos de Física. México: editorial Prentice Hall Hispanoamericana. Skoog, D. A. (2009) Análisis Instrumental. México: editorial Cengage Learning. Strother G.K. (1988) Física aplicada a las Ciencias de la Salud. Colombia: editorial McGraw Hill. Gómez González, Raúl 1984. La segunda ley de Newton. Ciencias 6, octubre-diciembre, 14-15. Jou D., Llebot J. y Pérez C. (1994) Física para Ciencias de la Vida. México: editorial McGraw Hill.