UNIVERSIDAD AUTONOMA DE NUEVO LEON
SCHOOL OF MEDICINE
MODULE DESCRIPTION (ANALYTIC PROGRAM)

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):	General chemistry
Total number of class hours-theory and practice:	160
Class hours per week:	8 hours
Independent study:	50
Course modality:	Face-to-face instruction
Module level:	First semester
Core/elective module:	Core
Curriculum area:	ACFB
UANL credit points:	7
Create date:	May 2nd, 2017
Date of last amendment made:	July 07th, 2024
Person(s) responsible for the design and amendment of the module:	PhD. Rocío Alvarez Román, PhD. David A. Silva Mares

2. Presentation:

The general chemistry learning unit is taught during the first semester of the Clinical Biological Chemist degree. This AU is divided into two stages focusing on: i) analyzing the composition and structure of matter based on its physical and chemical properties to elucidate the formation of molecules, their geometry and their intermolecular interactions and ii) interpreting the solubility, stoichiometry and acid/base character of chemical elements and compounds based on their physical and chemical properties to predict their chemical reactivity and select separation techniques.

To achieve this, during the first stage, basic chemical concepts and safety in the laboratory will be exposed, the different types of inorganic chemical compounds will be classified for their nomenclature. Then, different atomic theories will be covered, distinguishing the modern atomic theory to establish the electronic configuration of the chemical elements of the periodic table, as well as their periodic properties. Subsequently, the forces involved in the formation of molecules, both inter- and intra-molecular, will be established and their molecular geometry will be predicted.

In the second stage, the concepts of solubility of a solute in a solution will be associated with the different ways of expressing it. Subsequently, we will focus on deducing the chemical reactivity of molecules based on their physical and chemical properties, which will allow us to relate the chemical structure of compounds with their acidity/basicity constants and the pH of the solution. Finally, all the acquired knowledge will be integrated in the theoretical-practical resolution of cases of integration and/or deduction of the physical, chemical and reactivity properties of diverse compounds.

3. Purpose:

The purpose of this learning unit (LU) is to develop in the student competencies that will allow him/her to identify inorganic chemical compounds of biochemical importance and to identify their physical and chemical properties. In addition, students will acquire laboratory skills for handling reagents and materials commonly used in chemical laboratories. The above will contribute to develop in the graduate of the QCB degree, the abilities and skills to apply the scientific method and support the generation and application of knowledge in their work field.

It contributes to the development of **general competencies** in that the student will be able to use logical and mathematical language to understand and interpret stoichiometric calculations, preparation and analysis of solutions. Likewise, the student will be committed to respect the working conditions and regulations in classrooms and laboratories to consolidate his own and his classmates' general wellbeing. In addition, through the analysis of the parts and functioning of chemical systems, they will be able to construct innovative proposals to overcome challenges of their interdependent global environment.

During the LU, the student will also develop **specific competencies** in the classroom and laboratory by solving problems applying knowledge of the chemical composition and properties of the main elements and inorganic compounds of biochemical interest, which will be useful for their determination in different matrices. Likewise, by complying with the safety regulations of the department, observing the safety sheets of the reagents and the Official Mexican Standards, the student will develop the competence to handle chemical and biological materials following the official Mexican and/or international standards that guarantee their correct use and disposal to preserve health and the environment.

The learning unit of **General Chemistry** is located in the first semester of the Clinical Chemistry academic program and is linked through the topics taught, with other learning units such as Physicochemistry and Fundamentals of Analytical Chemistry. The knowledge of properties of radiation and matter, as well as the handling of solutions, will help to understand the thermodynamic properties of solutions and the basics of spectroscopy, which are taught in the Physicochemistry learning unit. Likewise, the LU of Fundamentals of Analytical Chemistry, retakes the knowledge of nomenclature, chemical reactions and stoichiometry acquired in this learning unit, in order to perform the calculations of optimal proportions of reagents and yield of reactions that will be seen in the learning unit of Fundamentals of Analytical Chemistry.

4. Competences of the graduate profile

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

Instrumental skills:

2. To use logical, formal, mathematical, iconic, verbal and non-verbal languages according to their stage of life, to understand, interpret and express ideas, feelings, theories and currents of thought with an ecumenical approach.

Personal and social interaction skills:

10. To intervene in the face of the challenges of contemporary society at the local and global level with a critical attitude and human, academic and professional commitment to contribute to consolidating general well-being and sustainable development.

Integrative skills:

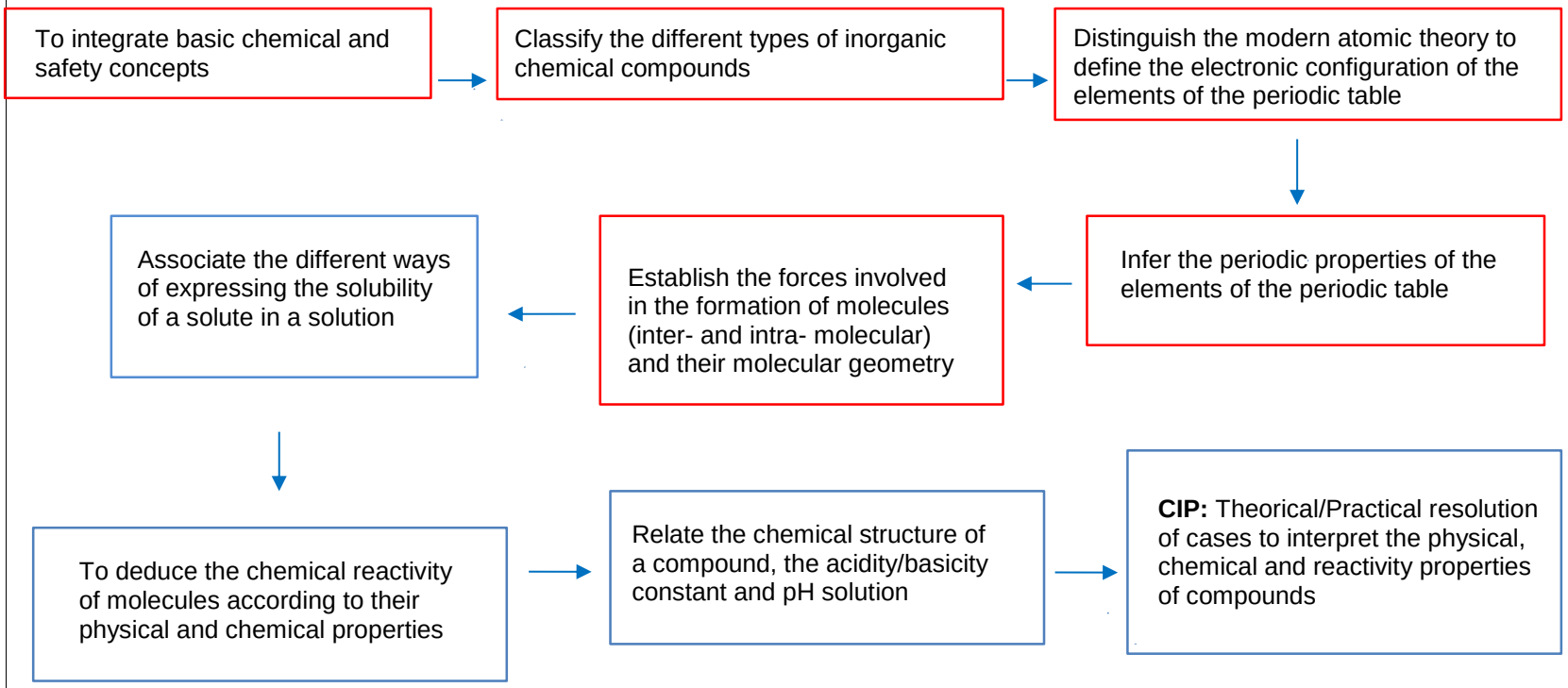
12. To make innovative proposals based on a holistic understanding of reality to help overcome the challenges of the interdependent global environment.

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

1. 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.

3. To handle chemical and biological materials following official Mexican and/or international standards that guarantee their correct use and disposal to preserve health and the environment.

5. Course roadmap:



6. Structuring into stages or phases:

Stage 1: Physical and chemical properties of elements and molecules.

Component(s) of the competence: Analyze the composition and structure of matter based on its physical and chemical properties to elucidate the formation of molecules, their geometry and their intermolecular interactions.

Evidence of student learning	Performance criteria	Learning activities	Content	Resources
Challenge1: A classroom-based theory assessment of composition and structure of matter, nomenclature and atomic structure of the elements.	Individual face-to-face evaluation. Answer in a clear way. Include the calculations performed.	The teacher conducts in the classroom the framing of the topic. The student individually and prior to the session, performs the reading on matter and mixtures. The student participates in a collaborative way, in classroom discussion forum guided by the P on the composition and structure of matter and nomenclature rules of the IUPAC, traditional and Stock. The teacher reviews in face-to-face session, basic terms. In a discussion forum, each group of inorganic compounds is exemplified with exercises. The student individually and prior to the session applies mnemonic techniques to memorize ions, valences and rules of traditional, Stock and IUPAC nomenclature. The student individually	-Matter, pure substance Pure substance and mixture and ions. -Compounds Inorganic compounds: salts, acids, bases, oxides and hydrides. -IUPAC, traditional and Stock nomenclature rules.	Computer equipment and Internet connection. Lesson plan of the session for students Power point presentation. Microsoft teams platform, Modle, youtube. Brown, Chapiter: Introduction: Matter and measurement. Brown, Chapiter: Atoms, molecules and ions. Guide for activity 1a. Rubric activity 1a. Lesson plan of the session Power point presentation.

		solves the comparative table of the five groups of inorganic compounds (**Accredited activity 1a**). The teacher conducts in the classroom the framing of the topic. The student individually and prior to the session, reads the related chapters of the book. The student participates collaboratively in a discussion forum guided by the teacher on modern atomic theory. The student individually reviews the periodic properties videos. The teacher reviews basic terms. In a discussion forum, the student exemplifies with exercises of electronic configuration. The student collaboratively solves in non-school mode the problems of electronic configuration of elements, periodic table and periodic properties. (**Accredited activity 1b**).	- Electronic configuration of the chemical elements: quantum numbers (n, l, s, m), Heisenberg's principle, Pauli's exclusion principle and Hund's rule. -Electronic configuration of the elements in the periodic table. -Periodic properties of the elements.	Microsoft teams platform, Modle, youtube. Brown, Chapiter: Electronic structure of atoms. Brown, Chapiter: Properties Periodic properties of the elements. Guide for activity 1b. Rubric for activity 1b.

Challenge 2: A theoretical evaluation of molecule formation, geometry, intermolecular interactions and physical properties of matter and their application.	Individual face-to-face evaluation. Answer in a clear way. Include the calculations performed.	The student, individually and prior to the session, reads the related chapters of the book. The teacher carries out the framing of the topic. The student participates collaboratively in a discussion forum guided by the teacher on the topic. The teacher reviews basic terms. In a forum, the student exemplifies Lewis symbol bonding, intra- and inter-molecular forces and molecular geometry with sample exercises. The student individually reviews the videos of chemical bonds and geometry. The student individually and prior to the session, performs the reading of physical properties and their application in the separation of mixtures. The student individually reviews in digital format the videos of separation	-Chemical bonds: electro-negativity and bond types. -Representation with Lewis symbols. -Classification based on the number of electrons involved. Bond polarity and partial charges. Bond strength and bond length. -The octet rule and its exceptions. -Intermolecular interactions: london, dipole-dipole, hydrogen bridges, ion-dipole. -Solvation process. -Interactions and physical properties: viscosity and surface tension. -Molecular geometry of covalent compounds: RPENV and hybrid orbital theories. -Bond and molecule polarity. -Properties of ionic and covalent compounds.	Session lesson plan. Brown, Chapiter: Basic concepts of chemical bonding. Brown, Chapiter: Molecular geometry and bond theories. Chemical bonds, Intermolecular forces, liquids and solids Videos Power point presentation. Molecular geometry videos: Microsoft teams platform, Modle, youtube. Brown, Chapiter: Aqueous reactions and stoichiometry of solutions. Brown, 2009 Infographics on solutions Brown, Chapiter: Properties of solutions. Guide for activity 1c. Rubric for activity 1c.

		techniques. The teacher performs in session, the framing of the topic. The student participates collaboratively in a discussion forum guided by the teacher on solubility and type of solutions in classroom and/or survey in educaplay. The teacher reviews in session, basic terms, in forum is exemplified with mol type exercises, conversions ways of expressing the concentration of solutions. The student collaboratively solves in non-school mode, the problems of formation of molecules, intermolecular interactions, geometry and concentration of solutions. (**Accredited activity 1c**).		
Challenge 3: Scholarly laboratory reporting manual. Experimental development	-Respect the attendance schedule. The handbook must contain:	The student individually and prior to the session, performs the digital reading of the Manual and related basic concepts. In addition, he/she	-Review of safety regulations -Introduction and protective devices in the laboratory.	Lesson plan of the session for students. Internship Report Manual.

	-Student's name -All spaces filled with data and observations. -At least two references in APA 7th edition format. -Calculations made by hand or in Excel and attach them to the manual if necessary. -It must be done in electronic format and delivered in pdf format on the Moodle platform.	completes in his/her logbook and by hand, a previous questionnaire and a flow chart of the experimental development of the practice. In the laboratory session, the student individually answers a questionnaire of theoretical (ions, nomenclature, periodic table) and experimental fundamentals (**Accredited activity 1d**). The teacher carries out in session, the framing of the practice. The student performs the experimental development individually and/or collaboratively, complying with the Safety Regulations and checklists. (**Accredited activity 1e**). The student individually answers the Manual (activity EXTRAULA). The teacher advises the student for the resolution of the report. The student solves five practical cases in the laboratory (**Accredited activity 1f**).	-Frequently used materials in the laboratory. -Chemical nomenclature applied to the laboratory. -Frequently used techniques in the laboratory: volume measurement. -Techniques frequently used in the laboratory: mass measurement and use of the burner. -Atomic structure. -Chemical bonds.	Genially infographics: Acids and bases quiz. MindMeister and Canva mind map Practice Report instructional guide. Practice report rubric. Activity 1d checklist. Activity 1e checklist. Activity 1f checklist.

Stage 2: Chemical reactivity of elements and compounds
Component(s) of the competence:
Interpret the stoichiometry and acid/base character of chemical elements and compounds based on their physical and chemical properties to predict their chemical reactivity and select separation techniques.

Evidence of student learning	Performance criteria	Learning activities	Content	Resources
Challenge 4: A theoretical evaluation of chemical reactions, balancing, stoichiometry, and physical and chemical properties of metallic and nonmetallic elements.	Individual face-to-face evaluation. Respect the submission schedule. Answer in a clear way. Include the calculations performed.	The student individually and prior to the session performs the reading on chemical reactivity and its balance. The teacher makes the framing of the topic. The student participates collaboratively in a discussion forum guided by the teacher on chemical reactivity and type of reactions, balancing and stoichiometry with infographics. The teacher reviews in session, basic terms. In a discussion forum, it is exemplified with exercises such as reactions, law of conservation of matter, balancing and stoichiometry.	-Reactivity, chemical reaction equation and reaction coefficients. -Reactions: Combination (synthesis), decomposition, single displacement (cationic and anionic), double displacement (metathesis, including hydrolysis and neutralization) and oxide-reduction. -Law of conservation of matter in balancing reactions. -Oxidation and reduction processes and standard reduction potentials. -Stoichiometry in a chemical reaction: limiting reagent, in excess, theoretical and	Computer equipment and Internet connection. Lesson plan of the session for students of the UA of QG. Power point presentation. Microsoft teams platform, Modle, youtube. Brown, Chapiter: Chemistry of nonmetals. Infographic genially: Guide for activity 2a. Rubric for activity 2a.

Challenge 5: A theoretical evaluation of compounds with acid/base character, radioactive and coordination compounds and seminar presentation.	Individual face-to-face evaluation. Respect the timetable. Answer in a clear way. Include the calculations performed.	The student, individually and prior to the session, reads about the chemical and physical properties of metallic compounds. The student collaboratively solves exercises of reactions and balancing of reactions, stoichiometry and metallic elements (**Accredited activity 2a**). The student, individually and prior to the session, does the reading on pH. The teacher performs, in session, the framing of the topic. The student participates collaboratively in a discussion forum guided by the teacher on pH, radioactive elements and coordination compounds. The teacher reviews in session, basic terms. In a discussion forum, the student exemplifies with exercises such as calculations for acidity/basicity, transmutation and nomenclature of coordination compounds. The student collaboratively solves exercises for pH,	practical yield. Metallic elements and their ions. Non-metallic elements: molecular interaction. -Concept of pH according to Arrhenius, Bronsted-Lowry and Lewis, strong and weak electrolyte and weak electrolyte, proton, hydroxyl. -Calculations for acidity or basicity of a solution based on pH and pOH formula. -Radioactive elements: formation, chemical properties, quantification, transmutation phenomena, Quantification, transmutation, fusion and nuclear fission phenomena. -Coordination compounds: general structure, classification, nomenclature, geometry, chelating	Lesson plan of the session for students. Power point presentation. Microsoft teams platform, Modle, youtube. Brown, Chapiter: Acid-base equilibrium. Brown, Chapiter: Nuclear chemistry Brown, Chapiter: Chemistry of coordination compounds. Guide for activity 2b. Rubric for activity 2b.

		radioactive and coordination compounds (**Accredited activity 2b**). In teams, students conduct a digital bibliographic search of the assigned topic, prepare a summary and a PowerPoint presentation (extra-classroom activity). The teacher verifies at least twice, in a face-to-face forum with the team for feedback (extra-classroom activity). Collaboratively, the team makes the seminar presentation (**Accredited activity 2c**). The teacher moderates the forum to answer questions or comments. The students collaboratively carry out a playful activity (**Accredited activity 2d**).	properties and application in biomedical chemistry. Assigned topics: group IA elements (Li, Na, K) group IIA elements (Ca and Mg), group IVA elements (CO, CO_2 Glucose, Pb poisoning), group VA elements (N, P, proteins, As poisoning), group VIA elements (O, S), group VII A elements (Cl and I), pH and its determination and biological importance, Importance of radioactive elements in the area of health, Importance of coordination elements in the area of health.	Guide for activity 2c. Rubric for activity 2c. Guide for activity 2d. Rubric for activity 2d.
Challenge 6: Scholarly laboratory reporting manual. Experimental development: Molecule formation, geometry and	Respect the attendance schedule. The handbook must contain: -Student's name	-The student, individually and prior to the session, reads the Manual and related basic concepts. In addition, he/she completes by hand in his/her logbook, a previous questionnaire and a flow chart of the	-Separation techniques -Preparation of percentage and molar solutions.	Session lesson plan for students. Teacher's laboratory support guide.

intermolecular interactions, stoichiometric reactions and pH.	-All spaces filled with data and observations. -At least two references in APA 7th edition format. -Calculations made by hand or in Excel and attach them to the manual if necessary. It must be done and uploaded in Moodle platform.	experimental development of the practice. In the laboratory session, the student individually answers a questionnaire of theoretical fundamentals (ions, nomenclature, periodic table, stoichiometry, concentration units, geometry) and experimental (**Accredited activity 2e**). The professor carries out the practice in session, the framing of the practice. The student performs the experimental development individually and/or collaboratively, complying with the Safety Regulations and checklists (**Accredited activity 2f**). The student individually answers the Manual (activity EXTRAULA). The teacher advises the E for the resolution of the report. The student solves five practical cases in the laboratory (**Accredited activity 2g**).	-Chemical reactions - redox -Stoichiometry. -Acids and bases.	Infographic Gallery Internship Report Manual. Laboratory Regulations Power point presentation. Practice Report instructional guide. Practice report rubric. Checklist for activity 2e. Checklist for activity 2f. Checklist for activity 2g.

7. Summative evaluation:

Phase	Evidence	Weighing
Phase 1	**Written evaluation about Challenge 1:** composition and structure of matter, nomenclature and atomic structure of the elements.	**7%**
	Accredited activity 1a. Comparative table of the five groups of inorganic compounds.	**1%**
	Accredited activity 1b. Problems of electronic configuration and periodic properties.	**1.5%**
	Written evaluation about Challenge 2: molecule formation, geometry, intermolecular interactions and physical properties of matter.	**7%**
	Accredited activity 1c. Problems of formation of molecules, intermolecular interactions, geometry and concentration of solutions.	**2%**
	Reporting Manual about Challenge 3: Practice 1-7.	**5%**
	Accredited activity 1d. Written quiz about experimental fundamentals (1-7).	**5%**
	Accredited activity 1e. Experimental development complying with the Safety Regulations and checklists (1-7).	**1%**
	Accredited activity 1f. Practical evaluation (1-7).	**4%**
Phase 2	**Written evaluation about Challenge 4:** chemical reactions, balancing, stoichiometry, and physical and chemical properties of metallic and nonmetallic elements.	**7%**
	Accredited activity 2a. exercises about reactions and balancing of reactions, stoichiometry and metallic elements.	**2%**
	Written evaluation about Challenge 5: compounds with acid/base character, radioactive and coordination compounds.	**7%**
	Accredited activity 2b. exercises about compounds with acid/base character, radioactive and coordination compounds.	**1.5%**

	Accredited activity 2c. seminar presentation**.**	**3%**
	Accredited activity 2d. playful activity.	**1%**
	Reporting Manual about Challenge 6: Practice 8-14.	**5%**
	Accredited activity 2e. Written quiz about experimental fundamentals (8-14).	**5%**
	Accredited activity 2f. Experimental development complying with the Safety Regulations and checklists (8-14).	**1%**
	Accredited activity 2g Practical evaluation (8-14).	**4%**
CIP	Written evaluation about Challenger 1, 2, 4 and 5.	**30%**
		100%

8. Course integrative project/product:
Proposal of written-practical resolution of cases to interpret and/or predict the physical, chemical and chemical reactivity properties of compounds.

9. References:

- Álvarez-Román, R. (2017) *Guías de clase*. México: UANL.
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- **Brown, T. L.; Lemay E. H. (2013). *Química la Ciencia Central*. México: Ed. Pearson.**
- Chang, R., (2011) *Química*. México: Ed. McGraw Hill.
- Petrucci, R. H., Harwood W. S. (2007) *Química General*. México: Ed. Pearson Prentice Hall.
- Yamil Cordoba . (2017). Enlaces Químicos, clases de enlaces y propiedades periódicas. 01 agosto 2020, de La Química de Yamil Sitio web: https://youtu.be/C4mZpTEgdio
- Alberto Balvin. (14 mayo 2015). Estructura de Lewis: definición y ejemplos.. 01 agosto 2020, de 8CIFRAS Sitio web: https://youtu.be/sXaR91Ve2rg
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- KhanAcademy Español. (5 enero 2015). Fuerzas intermoleculares. 01 agosto 2020, de KhanAcademy Sitio web: https://youtu.be/Rmcm51dcEl4