Code: **QG191**

Name: **Química**

Name in English: **Chemistry**

Name in Spanish: **Química**

Subject type: **Weekly**

Approval Type: **Grade and Attendance**

Characteristic: **Regular**

Frequency: **75%**

Period Type / Offering period: **Semester / Yearly at the first semester**

Requires Final Exam: **Yes**

Vectors

T	L	P	O	PE	OE	SL	WEEKS	CREDITS
4	**-**	**2**	**-**	**-**	**-**	**6**	**15**	**6**

Occurrence on curriculum:

Pre requirements: **None**

Summary: **The course focuses on learning techniques for the preparation, isolation, purification, and characterization of organic and inorganic substances, handling toxic and flammable substances, and setting up the necessary apparatus for various purposes. It covers various strategies on syntheses including using an inert atmosphere and organometallic reagents.**

Program:

1. International System of Units.
2. Definition of units commonly used in general chemistry for energy, mass, time, space, volume, pressure, temperature, density, and velocity.
3. Stoichiometry and Chemical Arithmetic: The mole, molecular and formula weight. Chemical formulas. Molecular formulas. Balancing equations. Calculations based on chemical equations. Calculations with limiting reagents.
4. Atomic Structure and Periodic Table: The electric nature of matter, the charge of the electron, the nucleus of the atom, the periodic law and the Periodic Table, electron spin and the Pauli exclusion principle, electronic configurations of elements, the periodic table and electronic configurations, and the spatial distribution of electrons.
5. Chemical Bonding: Lewis symbols, covalent bonding, polar molecules and electronegativity, oxidation and reduction, oxidation number, nomenclature and chemical compounds, other bonding forces, crystalline solids, types of crystals, band theory of solids, defects in crystals, ionic bonding, factors influencing the formation of ionic compounds, and atomic molecular orbital theory.
6. Metals, Nonmetals, and Metalloids: Trends in metallic behavior: chemical properties and typical products.
7. Metalloids and Nonmetals: Free elements, oxygen compounds of nonmetals, oxoacids and oxoanions, and polymeric oxoacids and oxoanions.
8. Chemical Reactions in Aqueous Solution: Terminology in solutions, electrolytes, chemical equilibrium, ionic reactions, acids and bases in aqueous solutions, preparation of inorganic salts by double displacement reactions, redox reactions, and balancing redox reactions. Quantitative aspects of solutions: molarity, equivalent weights, and normality.
9. Solution Properties: Types of solutions, concentration units, the dissolution process, the heat of dissolution, the effect of temperature in the solubility, and fractional crystallization.
10. Chemical Equilibrium: The law of mass action, the equilibrium constant, and the kinetics and equilibrium. Thermodynamics and equilibrium. Relationship between Kp and Kc.

Heterogeneous equilibrium. Le Chatelier's principle. Equilibrium calculations.

11. Acids and Bases in Water: Definitions. Strengths of acids and bases. Water ionization and pH. Dissociation of weak electrolytes. Buffers. Hydrolysis. Indicators.
12. Solubility - Solubility product. Common ion effect and solubility.
13. Thermochemistry: ΔH, specific heat. The first Law of Thermodynamics. Spontaneity of reactions, ΔG, ΔS, The second Law of Thermodynamics.
14. Reaction Rates: Catalysis.
15. Relationships between structure and properties.
16. Oxidation and reduction.
17. Polymers.

Basic Bibliography

1) ATKINS, P.; JONES, L. **Chemical Principles: The quest for insight**, 2ª ed., W.H. Freeman, 2002.

2) KOTZ, J.C.; TREICHEL JR., P. **Chemistry & Chemical Reactivity,** Saunders College Publishing, 4ª ed., 1999.