1.	School	Science
2.	Department	Chemistry
3.	Program title (Arabic)	ماجستير كيمياء
4.	Program title (English)	Master in Chemistry
5.	Track	Non-Thesis

	Specialization #	Degree	Dep #	Faculty #	Year	Track
Plan Number					2011	Non-Thesis

First: General Rules & Conditions:

1. This plan conforms to the valid regulations of the programs of graduate studies.
2. Specialties of Admission:
- Bachelor's degree in Chemistry

Second: Special Conditions: None.

Third: Study Plan: Studying (33) Credit Hours as follows:

1. Obligatory Courses (**21**) Credit Hours:

Course No.	Course Title	Credit Hrs	Theory	Practical.	Pre/Co-requisite
0353711	Modern Methods of Chemical Analysis	3			-
0333721	Chemical Applications of Group Theory	3			-
0333731	Molecular Structure and Mechanisms of Organic Reactions	3			-
0333741	Quantum Chemistry	3			-
0333791	Research Methods in Chemistry	3			-
0303733	Spectroscopy of Organic Compounds	3			
0333751	Applied Chemistry	3			

2. Elective Courses: Studying (**12**) Credit hours from the following:

Course No.	Course Title	Credit Hrs	Theory	Practical.	Pre/Co-requisite
0333715	Advanced Environmental Chemistry	3			
0353722	Crystallography and X-Ray Diffraction	3			0333721
0333725	Advanced Bioinorganic Chemistry	3			
0343734	Chemistry of Heterocyclic Compounds	3			
0343735	Advanced Bioorganic Chemistry	3			0333731
0303737	Organic Electrochemistry	3			
0333743	Materials Science	3			
0303745	Surface Chemistry and Colloids	3			
1201710	Medicinal Chemistry	3			
1201908	Medicinal Natural Products	3			

3. Pass the comprehensive examination (0333798) after successful completion of all courses.

Course Description
(Non-Thesis Track)

0353711 **Modern Methods of Chemical Analysis** **(3 Credit Hrs)**

Prerequisite: (None)

Recent developments in chemical analysis methodologies and instrumentation in fields of spectrophotometric and chromatographic techniques such as ICP-MS, GC-MS, HPLC-MS and FT-IR.

0333715 **Advanced Environmental Chemistry** **(3 Credit Hrs)**

Prerequisite: (None)

The role and importance of environmental chemistry, basic properties of chemical pollutants, transformation and degradation of chemical pollutants in the environment, toxicity of environmental pollutants, chemistry of water pollutants, chemistry of atmosphere pollutants.

0333721 **Chemical Applications of Group Theory** **(3 Credit Hrs)**

Prerequisite: (None)

Basic principles of group theory and its main applications; theorems of group theory; molecular symmetry and symmetry groups; representation of groups; group theory and quantum mechanics; symmetry adapted linear combinations; symmetry aspects of molecular orbital theory; hybrid and molecular orbitals; ligand field theory; molecular vibrations.

0353722 **Crystallography and X-Ray Diffraction** **(3 Credit Hrs)**

Prerequisite: (0333721)

X-ray diffraction by crystals and elucidation of structure. Crystal lattices systems, space groups and derivation of equivalent positions; the reciprocal lattice concept; collection of diffraction data and their reduction; calculated structure factors and Fourier transform; the phase

problem; Paterson function and the heavy atom method; other methods; structure refinement.

The laboratory work involves data collection by the Weissenberg technique as well as unit cell measurements and space group determination for a compound. Solving one crystal structure using a suitable program.

0333725 Advanced Bioinorganic Chemistry (3 Credit Hrs)

Prerequisite: (None)

Advanced studies in biological activity of inorganic compounds. The course includes revision of basic principles of biochemistry and coordination chemistry; and then study of the role of metals in biological systems and biologically important complexes and enzymes containing metals such as iron, cobalt, copper, zinc… etc. This course includes as well the study of toxicity effect of metals, especially heavy metals, like lead, mercury, and chemical therapy of metal poisoning.

0333731 Molecular Structure and Mechanisms of Organic Reactions (3 Credit Hrs)

Prerequisite: (None)

An advanced study of the structures of organic compounds and organic reactions mechanisms, chemical bonds on the basis of molecular orbital theory, aromaticity, methods of study of organic mechanisms, mechanisms of selected reactions, concerted reactions, photochemical reactions, reactions of reactive intermediates, charge transfer reactions.

0303733 Spectroscopy of organic compounds (3 Credit Hrs)

Prerequisite: (None)

The application of spectroscopic methods in structural elucidation of organic compounds: mass spectrometry, ^{1}H and ^{13}C-NMR spectroscopy, IR spectroscopy, and UV/visible spectroscopy.

0343734 Chemistry of Heterocyclic Compounds (3 Credit Hrs)

Prerequisite: (None)

An extensive study of the chemistry of three-, four-, five-, and six- membered rings containing one heteroatom or more including their reaction mechanisms and examples of their biological applications. General topics in heterocyclic chemistry which include: methods of synthesis, aromaticity, chemical reactivity, symmetry, stability and others.

0343735 Advanced Bioorganic Chemistry (3 Credit Hrs)

Prerequisite: (0333731)

This course covers topics related to the essential role of enzymes such as: biological importance, reaction mechanisms, related spectroscopic techniques, and their application in drug discovery.

0303737 Organic Electrochemistry (3 Credit Hrs)

Prerequisite: (None)

Electrochemical principles; techniques used for investigation of electrode reactions; electrochemical reduction of some organic compounds, such as alkyl halides, aryl halides, acyl halides, halogenated heterocyclic compounds, carbonyls, nitro groups, and others; oxidation processes including oxidation of carboxylic acids and aromatic compounds; indirect electrolysis and electrocatalysis with emphasis on the catalytic reduction of the carbon-halogen bond.

0333741 Quantum Chemistry (3 Credit Hrs)

Prerequisite: (None)

The fundamentals of quantum chemistry and its applications. Survey of fundamentals of quantum theory. Physical and mathematical foundations of quantum theory, quantum theory of some simple systems, approximate methods, the electronic structure of many- electron atoms and molecules, fundamentals of molecular

orbital theory and applications to diatomic and polyatomic molecules, quantum chemical aspects of molecular spectroscopy.

0333743 Materials Science (3 Credit Hrs)

Prerequisite: (None)

Coordination and self assembly, constructing and study the properties of ordered molecules on surfaces, adsorption and sorption. Surface alloys, catalysts and their application in surface chemistry, theoretical aspects of study of structure and properties of materials on the atomic scale.

0303745 Surface Chemistry and Colloids (3 Credit Hrs)

Prerequisite: (None)

Nature of colloidal dispersions; thermodynamics of surfaces, clean surfaces, adsorption and desorption, surface reactions and surface reactivity, transport properties of suspensions, particle size and shape, electrified interfaces: the electrical double layer, the electrokinetics and zeta potential, the theory of van der Waals forces, colloidal structure in association system, emulsions, microemulsions and their applications.

0333751 Applied Chemistry (3 Credit Hrs)

Prerequisite: (None)

Application of chemical thermodynamics and kinetics to industrial chemical processes, catalytic reactions and catalysts in the chemical industry, industrial separation methods.

0333791 **Research Methods in Chemistry** **(3 Credit Hrs)**

Prerequisite: (None)

The scientific method and the general principles of scientific research in chemistry represented by examples of major achievements in chemical research, treatment of chemical data and experiment design, information retrieval and scientific and technical report writing, intellectual property protection of chemical inventions, the students will be required to prepare and present seminars on selected topics which will form part in their assessment.

1201710 **Medicinal Chemistry** **(3 Credit Hrs)**

Prerequisite: (None)

This course is designed to impart the knowledge in computational methods and drug design approaches. It aims to build students' knowledge in theoretical chemistry and its application in drug design. It is proposed to provide students with an understanding of hit discovery, lead identification, lead optimization, target selection, and molecular recognition employing computer-aided drug design software. And, it will shed the light on computer-based methods, combinatorial chemistry, high-throughput screening, and database mining. Additionally, different drug classes will be discussed regarding structure-activity relationship (SAR), synthesis, and metabolism.

1201908 **Medicinal Natural Products** **(3 Credit Hrs)**

Prerequisite: (None)

Selected plants which form bases for some medicinal product discovery, or synthetic. Some families and species from different natural sources as a lead for drug discovery. Further elaboration will deal with the biosynthesis of these natural agents and the stress mechanism that leads to their existence such as environment, chemical treatment, and climate. Marine animals and plants as new and rich sources for medical agents will be covered.