



جامعة المجمعة  
Majmaah University

وكالة الجامعة للشؤون التعليمية  
إدارة البرامج الدراسية والتطوير

نموذج ( 5 )

مختصر توصيف مقرر

كيمياء الكم

CHM343

(Course Syllabus)

معلومات المقرر \* (Course Information):

اسم المقرر:	كيمياء الكم
رقم المقرر:	CHM243
اسم ورقم المتطلب السابق:	MATH-201
اسم ورقم المتطلب المرافق:	لا يوجد
مستوى المقرر:	الخامس
الساعات المعتمدة:	3
Module Title:	Quantum chemistry
Module ID:	CHM 243
Prerequisite (Co-requisite) :	MATH-201
Co-requisite :	None
Course Level:	5 <sup>th</sup> level
Credit Hours:	3

Module Description

وصف المقرر :

Upon the completion of this course the student will be able to: Realizing the drawbacks of the classical mechanics and the essential need of new type of mechanics to deal with the microscopic systems. Understanding the nature and framework of quantum mechanics. Applying the quantum mechanics to solve problems in chemistry regarding atomic structure, bonding in molecules and spectroscopy.

Module Aims

أهداف المقرر :

1	By the end of this course the students will be able to: describe the fundamental principles of quantum chemistry .	1
2	state the fundamental postulates of quantum mechanics.	2
3	study the postulates of quantum mechanics to chemistry.	3
4	study the solution of Schrodinger equation for some simple systems.	4



5	develop physical intuition, mathematical reasoning, and problem solving skills	5
6	be further prepared for the necessarily rigorous sequence in chemistry courses needed the quantum chemistry.	6

**Learning Outcomes; Successful Students will be able to :**

مخرجات التعليم:

1	Illustrate, qualitatively and quantitatively, the role of photons in understanding phenomena like the photoelectric effect and Compton scattering	1
2	Mention the basic concepts and principles of quantum mechanics: The Schrödinger equation, the wave function and its physical interpretation, Eigen values and Eigen functions, expectation values and uncertainty.	2
3	Solve the Schrödinger equation for simple one-dimensional systems and conclude the probabilities, Eigen and expectation values for these systems	3
4	Compare between the different energies of the rigid rotors and harmonic oscillator models based on the solution of their Schrödinger equation	4
5	Work effectively both in a team, and independently on solving chemistry problems Use IT and web search engines for collecting information.	5

**Course Contents: المحتوى المقرر:**

ساعات التدريس (Hours)	عدد الأسابيع (Weeks)	قائمة الموضوعات (Subjects)
3	1	Introduction to the nature of quantum mechanics and chemical physics – basic concepts and definitions – limitations of the classical mechanics and historical development of the quantum theory; Planck's quantization principle and its application in solving many problems such as black body radiation, photoelectric effect, Bohr theory of Hydrogen atom, the de Broglie hypothesis, and the Heisenberg uncertainty principle
3	1	Origins of quantum theory, wave-particle duality and postulates of quantum mechanics
3	1	Schrödinger Equation, quantum mechanical operators and Eigen value Equation
6	2	Wave functions and Probability and expectation Values , Free particle and .Particle-in a one, two and three dimensional box.
6	2	Qualitative treatment of simple harmonic oscillator model of vibrational motion and Rigid rotator model of rotation of diatomic molecule
3	1	Qualitative treatment of hydrogen atom and hydrogen-like ions

صفحة 2 من 3



6	2	Schrödinger equation for many-electron atoms, The Born-Oppenheimer .approximation, Variation theorem and application to simple systems
6	2	Qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules
6	2	Simple Hückel Molecular Orbital (HMO) theory and its application to simple polyenes (ethene, butadiene)
3	1	revision

الكتاب المقرر والمراجع المساندة: Textbook and References:

ISBN	سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم الكتاب المقرر Textbook title
	, 2007	University Science Books, 2nd. Edition	Donald McQuarrie,	"Quantum Chemistry",
	سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم المرجع Reference
978-0-12-812888-6	2001	Philip Hoggan Telhat Ozdogan	John R. Sabin and Erkki J. Brändas,	Advances in Quantum Chemistry: Ratner Volume7
	2010	4 Edition, Prentice Hall PTR,	P. W. Atkins,	"Molecular Quantum Mechanics. P. W.
	2002	RSC	, David O. Hayward	Quantum Mechanics for chemists, ,
	2008	", 6th. Edition, Prentice Hall,	Ira, N. Levine	., "Quantum Chemistry

**Web Sites:**

<http://nptel.ac.in/courses/104108057/>

<http://ps.uci.edu/content/openchemistry-lectures>

<http://vergil.chemistry.gatech.edu/notes/>

[www.gaussian.com](http://www.gaussian.com) Gaussian and GaussView software's

\* يتم تعبئة معلومات المقرر فقط باللغتين العربية والانجليزية وباقي المعلومات بلغة التدريس المعتمدة ويكرر لكل مقرر في الخطة الدراسية

\* Course Information should be filled in Arabic and English. Other information should be filled using the approved teaching language at the college.

