



جامعة الأزهر
كلية العلوم
قسم الكيمياء

Course Specification

Course Title: Physical Chemistry

Code: Chem.101,131

Program (s) on which the course is given: Chemistry

Major or minor element of Program : Single Double

Department offering the program : Chemistry

Department offering the Course : Chemistry

Academic: Year 1st Level 1,2



1-Course data		
Code: CH 101,131	Course Title: General and physical chemistry (A,B)	Academic year/ Level: 1 st , 2 nd
Credit/ Taught Hours:3 Theoretical: 3 Practical:3		Department/program: Chemistry

2- Course Aims:

Aims of the chemistry course	This course aims to: <ol style="list-style-type: none">1. Introduce some basic concepts of physical chemistry.2. Introduce the fundamental information about the gaseous state its laws.3. Study the essential conceptions of thermochemistry , the first law thermochemical equations.4. Study the principles of chemical equilibrium.5. Provide students with basic concepts of chemical kinetics.6. Enable the students to have an idea about the types of solutions and their properties.7. Introduce the basic principles of general chemistry, chemistry calculations, atomic structure and electronic configuration.8. Introduce the basic principles of atomic spectra, geometric. Shape of molecule, bonding, ionic equilibrium and their application.
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3-Intended learning outcomes (ILOs) for chemistry program:

A-Knowledge and Understanding	<p>By the end of this course, students should be able to:</p> <ul style="list-style-type: none">a1. Explain the important chemical concepts, principles, techniques and theories across a wide range of physical chemistry.a2. Illustrate the essential knowledge of the principles of the shape of the molecule, chemical equilibrium.a3. Define the major types of chemical reactions, their characteristics and mechanisms as well as their kinetics including catalysis.a4. Explain the theories on which practice and measurements in chemistry are based and methods to solve of chemical kinetics.applied for interpreting and analyzing data.a5. Illustrate the principles of thermodynamics and quantum mechanics including their applications in chemistry.a6. Describethe main characteristics of the different states of the matter and elements, including trends within the periodic table and the related theories.
B-Intellectual Skills:	<p>By the end of the course, students should be able to:</p> <ul style="list-style-type: none">b1. Differentiate between the essential facts, concepts, principles and theories chemistry and related subjects of basic science.b2. Differentiate between the different states of the matter, elements and compounds based on the recognition and quantification of the properties.b3. Predict the type of chemical reaction and its mechanism.b4. Predict the efficiency of chemical systems by applying mathematical expressions.
C-Professional and Practical Skills:	<p>By the end of the course, students should be able to:</p> <ul style="list-style-type: none">c1. Report on the investigated data, using appropriate techniques and considering scientific guidance.c2. Use computational packages and tools in chemical investigations.c3. Solve problems using a range of formats and approaches in the area of specialization.c4. Assess risk in laboratory work taking into consideration the specific hazards associated with the use of chemical materials as well as the safe and proper operation of the laboratory techniques.



	<p>c5. Assess by observation and measurements the chemical properties or changes, including systematic recording and technical reporting.</p>
<p>D-General and Transferable Skills</p>	<p>By the end of the course, students should be able to:</p> <ul style="list-style-type: none">d1. Use information technology and search data base to help present clearly and effectively a scientific topic.d2. Think independently to solving problem, relating to quantitative information.d3. Work in a team effectively and communicate with others positively.d4 Manage time and organize skills, as evidenced by the ability to plan and implement efficient and effective modes of working.d5. Identify roles and responsibilities, and their performing manner.



4. Course content:(theoretical and then practical):

4.1 Theoretical part content

Week	Topic	No. of Lecture	Practical	No. of Hour
1-6	-Atomic structure (theories) -Principle of quantum mechanics and the wave – like properties of the matter. -Quantum numbers – shape of atomic orbitals – Electronic configuration of elements – Resonance	6	3	6
7-12	-Chemistry: An Overview - Units of Measurement - Uncertainty in Measurement - Significant Figures and Calculations - Dimensional Analysis -Types of Chemical Reactions and Solution Stiochiometry - Naming various types of compounds - Atomic Symbol (atomic #, mass#, isotopes) Atomic mass. - Avogadro's number and the molar mass of an element. - Percent composition of compounds. - Chemical reactions and chemical equations. - Limiting reagents. - Reaction yield	6	3	6
13-18	- Gaseous state: - General ideal gas equation - Kinetic theory of gases - Applicability of the ideal gas laws - Liquefaction of gases.	6	3	6
19-24	- Thermodynamics: First law of thermodynamics Application of the first law -Thermochemistry- Thermochemical equations - Hess's law of heat summation. - Chemical equilibrium: Law of mass action- equilibrium constants – Le Chatelier principle -Equilibrium in homogeneous and heterogeneous gas and liquid systems.	6	3	6



4.2 Practical part content

Topic	Week	No. of Lecture	Hour of Practical
Introduction	1	1	3
Identification of acidic radical	2	1	3
Scheme of acidic radical	3,4	2	6
Revision + Mid exam (1)	5	1	3
Identification of basic radical	6	1	3
Scheme of basic radical	7	2	6
Revision + Mid exam (2)	8	1	3
General scheme of simple salts	9	1	3
final exam of first term	10	1	3
Neutralization reaction HCl + Na ₂ CO ₃ , Hcl + NaOH, NaOH + Oxalic Neutralization curves	11	2	6
Buffer solution	12	1	3
Det. of M.Wt of volatile liquid steam	13	1	3
Estimation of % of purity of BaCl ₂ sample Det. of Ba as BaCrO ₄	14	1	3
Oxidation reaction KMnO ₄ + Oxalic, Na ₂ S ₂ O ₃ + K ₂ Cr ₂ O ₇	15.16	2	6
Internal and external indicators	17	1	1
Final practical exam of second term	18	1	3



5. Teaching and learning methods

Teaching and learning methods	5.1. Lectures. 5. 2. Research group. 5. 3. Lab. 5. 4. Internet and the available books on the library.
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6- Student assessment

6.1. Methods	6.1.1 .Witten exam. 6.1.2. Oral exam. 6.1.3. Practical exam. 6.1.4. Semester work.
6.2.Assessment schedule	6.2.1. Final exam at the end of term. 6.2.2. Oral exam at the end of term. 6.2.3. Final Practical exam at the end of term. 6.2.4. Semester work during the term.
6.3. Weighting of assessments	6.3.1. Final examination (60%) 6.3.2. Oral examination (6%) 6.3.3. Practical examination (20%) 6.3.4. Semester term work. (14%)

7- List of references

7.1. Course note.
7.2. Wolfgang Schärftl (2014). Basic Physical Chemistry, 1 st edition, Bookboon.



9. Chemistry program ILOs Matrix:

Course content	Week (s) No.	A knowledge and Understanding Skills	Intellectual Skills	Professional skills	General skills
Atomic structure (theories): Principle of quantum mechanics and the wave - like properties of the matter. Quantum numbers – shape of atomic orbitals – Electronic configuration of elements – Resonance	1-6	a1,a2,a4	b1,b3	c1,c2,c4	d1,d4,d5
- Units of Measurement - Uncertainty in Measurement - Significant Figures and Calculations - Dimensional Analysis -Types of Chemical Reactions and Solution Stiochiometry - Naming various types of compounds - Avogadro's number and the molar mass of an element. - Percent composition of compounds. - Chemical reactions and chemical equations. - Limiting reagents. - Reaction yield	7-12	a1,a3,a5	b1,b4	c1,c3,c4	d1,d3
- Gaseous state: - General ideal gas equation - Kinetic theory of gases - Applicability of the ideal gas laws - Liquefaction of gases.	13-18	a1,a6	b2,b3	c1,c4,c5	d1,d3
- Thermodynamics: First law of thermodynamics Application of the first law -Thermochemistry- Thermochemical equations - Hess's law of heat summation. - Chemical equilibrium: Law of mass action- equilibrium constants – Le Chatelier principle -Equilibrium in homogeneous and heterogeneous gas and liquid systems.	19-24	a1,a3,a6	b1,b3,b4	c1,c5	d2,d3,d4



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Topic	Week(s) No.	Professional and Practical Skills
Introduction	1	
Identification of acidic radical	2	c1,c2.c3
Scheme of acidic radical	3,4	c1,c2.c4
Revision + Mid exam (1)	5	c1,c2.c4
Identification of basic radical	6	c1,c2.c5
Scheme of basic radical	7	c1,c4.c5
Revision + Mid exam (2)	8	c1,c4.c5
General scheme of simple salts	9	c1,c3.c4
final exam of first term	10	c1
Neutralization reaction HCl + Na₂CO₃ , Hcl + NaOH, NaOH + Oxalic Neutralization curves	11	c1,c2.c5
Buffer solution	12	c1,c4.c5
Det. of M.Wt of volatile liquid steam	13	c1,c4.c5
Estimation of % of purity of BaCl₂ sample Det. of Ba as BaCrO₄	14	c1,c4.c5
Oxidation reaction KMnO₄ + Oxalic, Na₂S₂O₃ + K₂Cr₂O₇	15.16	c1,c4.c5
Internal and external indicators	17	c1,c3.c5
final exam of second term	18	c1



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8. Matrix between chemistry program specification ILOs and ILOs of Course:

Knowledge & understanding		Intellectual skills		Professional practical skills		General & transferable skills	
ILOs of Course	ILOs of Program	ILOs of Course	ILOs of Program	ILOs of Course	ILOs of Program	ILOs of Course	ILOs of Program
a1	A1	b1	B1	c1	C1	d1	D1
a2	A3	b2	B2	c2	C4	d2	D2
a3	A4	b3	B3	c3	C5	d3	D3
a4	A6	b4	B9	c4	C6	d4	D4
a5	A7			c5	C9	d5	D5
a6	A8						

Course coordinator :

Head of Department