Ministry of Higher Education and Scientific Research Scientific Supervision and Scientific Evaluation Apparatus Directorate of Quality Assurance and Academic Accreditation Accreditation Department



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Academic Program Description Form

University Name:Al– Nahrain university.. Faculty/Institute:Science.... Scientific Department:Chemistry..... Academic or Professional Program Name:Bachelor.... Final Certificate Name:Bachelor in chemistry..... Academic System: ...Semester..... Description Preparation Date: 2024/3/1 File Completion Date: 2024/3/1

Signature:

Head of Department Name:

Dr. Taghried Ali Salman

Date:/d/4/2024

Signature:

Scientific Associate Name: Manaf Adnan Saleh

Date: 14/4/ 2024

The file is checked by: Dr. Orooba Nadhim Harb.

Department of Quality Assurance and University Performance Director of the Quality Assurance and University Performance Department:

Date: 14. 4 - 2024 Signature:

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Approval of the Dean

1. Program Vision

The Chemistry Department, College of Science seeks to achieve a prominent position at the research and teaching levels, by creating a distinctive scientific environment and developing educational curricula for graduate and post graduate studies. In addition, focusing on scientific research and publication in peer–reviewed international journals. The department also aims to motivate the faculty to excel in spreading science and knowledge, and to qualify distinctive graduates who can meet the needs of society at a high level.

2. Program Mission

The mission of Chemistry Department is to achieve excellence in the field of science of chemistry through its commitment to higher education, scientific research, and service to society. The department aims to graduate a new generation of distinguished graduates, who possess the scientific knowledge and practical skills necessary to achieve excellence in multiple fields. The department seeks to develop innovative educational programs that reflect the latest developments in chemistry and encourage critical thinking and innovation. The department also seeks to conduct high–quality scientific research that contributes to expanding knowledge and its practical applications in the fields of industry, environment and medicine. In addition, the department seeks to serve the community by providing consultation, training, and awareness of the importance of chemistry in daily life and its impact on health and the environment.

3. Program Objectives

The objectives of the Chemistry Department program revolve around achieving excellence in the chemistry field by developing knowledge and skills, enhancing critical thinking, stimulating scientific research, developing practical skills, enhancing scientific communication, enhancing environmental and social awareness, and preparing students for professional life.

4. **Program Accreditation**

No

5. Other external influences

- 1- Economic, health, and social conditions that influence the academic program. For example, economic conditions can affect the availability of funding for academic programs, or a medical situation such as the Corona pandemic can affect students' performance and access to University.
- 2- The development of technology and its use in academic programs can have a significant impact. Such as the use of technology in distance education or providing educational resources online can change the student experience and affect how knowledge is presented and acquired.
- 3- International relations can influence study programs significantly, especially in areas such as student exchange and academic cooperation between Universities in different countries.

6. Program Structure													
Program Structure	Number of	Credit hours	Percentage	Reviews*									
	Courses												
Institution	14	20	12.5%	The department									
Requirements				currently adopts									
College	6	21	13.2%	the Bologna									
Requirements				curriculum for the									
Department	36	118	74.2%	first stage, the									
Requirements				program for the									
Summer Training	Yes	-	-	second stage, and									
Other	-	-	-	the basic University									
				system for the									
				remaining stages									

* This can include notes whether the course is basic or optional.

7. Program Des	scription			
Year/Level	Course Code	Course Name	Crea	dit Hours
			theoretical	practical
First year/First	CHEM1102	Atomic structure and	3	
semester		quantum theory		0
	CHEM1101	Chemistry of qualitative	5	
		analysis		2
	CREQ1101	Calculus I	4	0
	CREQ1109	General Physics 1	2	2
	URENG	English	2	0
	URCOM	Introduction to computer	2	
		science		2
First year/Second	CHEM1207	Chemistry of volumetric	5	2
semester		analysis		
	CREQ1207	Occupational safety	4	0
	CREQ1201	Calculus 2	3	0
	URDEM	Democracy and human	2	0
		rights		
	URARA	Arabic	2	0
	CHEM1208	Theories of covalent bonds	3	2
Second year/First	CHEM 211	Inorganic chemistry	2	2
semester	CHEM 221	Analytical chemistry	2	2
	CHEM 231	Organic chemistry	2	2
	CHEM 241	Physical chemistry	2	2
	CHEM 251	Biochemistry	2	_
	BIOT 281	Safety	3	_
	UREQ201	Arabic	1	_
	UREQ 210	English	1	_
	CHEM 212	Inorganic chemistry	2	2
Second year/	CHEM 222	Analytical chemistry	2	2
Second semester	CHEM 232	Organic chemistry	2	_
	CHEM 242	Physical chemistry	2	2
	CHEM 252	Biochemistry	2	2
	UREQ 245	Mathematics	3	-
	UREQ202	Arabic	1	_
	UREQ 220	English	1	_

Third year/First	CHEM 311	Inorganic chemistry	3	
somester		Analytical chamistry	3	
Semester			2	-
			2	-
	CHEM 341	Physical chemistry	2	2
	CHEM 351	Biochemistry	2	2
	CHEM 371	Radiation	2	-
	UREQ 320	Human rights	1	-
	UREQ 310	English	1	-
Third year/Second	CHEM 312	Inorganic chemistry	3	-
semester	CHEM322	Analytical chemistry	2	-
	CHEM 332	Organic chemistry	2	2
	CHEM 342	Physical chemistry	2	2
	CHEM 352	Biochemistry	2	-
	CHEM 362	Radiation	2	2
	CHEM 302	Pollution	2	-
	UREQ 320	Democracy	1	-
	UREQ 320	English	1	-
Fourth year/First	CHEM 421	Instrumental analysis	3	2
semester	CHEM 431	Identification	2	4
	CHEM 441	Physical chemistry	2	2
	CHEM 451	Biochemistry	2	2
	GEOL491	Geology	2	-
	UREQ 410	English	1	-
	CHEM 481	Research project	-	4
Fourth year/Second	CHEM422	Instrumental analysis	2	2
semester	CHEM 442	Quantum	2	-
	CHEM 412	Inorganic chemistry	2	2
	CHEM 462	Industrial chemistry	2	2
	CHEM 490-499	Elective	2	-
	UREQ 420	English	1	-
	CHEM 482	Research project	-	4

8. Expected learning outcomes of the	program
Knowledge	
-Enabling students to obtain knowledge and	- Providing students with the basics and
understanding of the intellectual framework in	topics related to knowledge and systems
chemical sciences	described in:
-Enabling students to obtain knowledge and	A - Clarification and explanation of study
understanding of the various standards in	materials by the academic staff through
chemistry	available modern capabilities
-Enabling students to obtain knowledge and	B - Providing students with knowledge
understanding of chemical analysis and	through classroom and extracurricular
examination	vocabulary assignments
-Enabling students to obtain knowledge and	C - Asking students to visit the library to
understanding of the warnings of incorrect use of	obtain academic knowledge related to
chemical materials	academic vocabulary
-Enabling students to obtain knowledge and	D - Improving students' skills by visiting
understanding of chemical systems and	websites to obtain additional knowledge of
technologies and their applications	the subjects
-Enabling students to obtain knowledge and	Scholarship
understanding of modern chemical technologies	
Skills	
1-Enabling students to think and analyze topics	Providing students with the basics and
related to the intellectual framework and standards	additional topics related to the outcomes of
of international chemical sciences	chemical thinking and analysis
	- Forming discussion groups during
	lectures to discuss topics in chemistry that
	require thinking
	And analysis
2-Enabling students to think and analyze topics	- Asking students to solve a set of thinking
related to chemistry	questions during lectures, such as what,
3- Enabling students to think and analyze topics	how, when and why
related to systems and punishment of abusers	For specific topics
using substances	
Hazardous chemicals.	

	Giving students classwork and extracurricular assignments that require self-explanation
1. Students learn the value of continued research	leach students to gain a comprehensive
and exploration in the field of chemistry, and are	understanding of basic and advanced
encouraged to have a dedication to understanding	concepts in chemistry, including atoms and
chemical phenomena and contributing to the advancement of scientific knowledge.	molecules, chemical reactions, physical states, and more.
2. Students learn to use chemical knowledge in a	Teach students the ability to critically
way that promotes public health and sustainability.	analyze chemical information and apply rationality and critical thinking to solving
3. The values of scientific integrity and ethics are promoted among students, with an emphasis on	chemical problems.
the importance of working safely and adhering to ethical standards in scientific experiments and	Teach students to gain hands–on laboratory experience by conducting
research.	hands-on experiments, analyzing data, and learning about laboratory tools and
4. Students are encouraged to collaborate with	techniques.
colleagues in scientific research and experiments,	
which enhances teamwork skills and the ability to	Teach students how to effectively express
communicate effectively.	chemical ideas and concepts, whether
	through writing or oral explanation.
5. The value of diversity and respect for others is	
promoted in the learning environment, with an	Teach students to be able to apply
emphasis on the importance of appreciating and	chemical concepts in real-life contexts
understanding diversity in scientific backgrounds,	such as industry, medicine, and
cultures and opinions.	environmental protection.

6.	Students	are	encouraged	to	strive	for	Теас	h students	the ability	to	develop new
exc	ellence in	chem	istry through	inno	ovation	and	and	creative	solutions	to	complicated
crea	ative thinkir	ng, wł	nile being mo	tivate	ed to a	pply	chem	nical proble	ems.		
che	mical conce	epts to	o solve real pi	roble	ems.						

9. Teaching and Learning Strategies

1. Cooperative Learning: Encourage students to work in small groups to solve chemical problems and conduct experiments. This strategy can contribute to enhancing communication and collaboration skills among students, in addition to stimulating critical thinking and the exchange of ideas.

2. Project-based learning: Provide comprehensive chemistry projects for students to complete, such as conducting a research experiment or developing a chemical product. This strategy encourages creative thinking and practical application of chemical concepts.

3. Problem-based learning: Present complex chemistry problems that students must solve using the concepts and skills learned. This strategy enhances skills and critical thinking in real chemistry contexts.

4. Experiential learning: Conduct practical experiments in laboratories to enhance effective interaction with chemical concepts. This strategy can be used to enhance practical skills and a deep understanding of chemical topics.

5. Active learning: Encourage students to participate in active activities such as discussions, presentations and workshops. This strategy can enhance critical thinking and scientific communication.

6. Use of technology: Adopting technology in learning, such as using interactive chemical software, computer simulations of experiments, and online educational resources. This strategy helps promote engagement and stimulate interest in the material.

10. Evaluation methods

- Daily and semester tests with multiple-choice questions and intellectual questions for the academic subject

- Setting grades for students' participation in difficult competitive questions

- Establishing grades for assigned class and extracurricular assignments.

11. Faculty												
Faculty Members												
Academic Rank	Specializatio	on	Special Requirements/Skills (if applicable)	Number of the teaching staff								
	General	Special		Staff	Lecturer							
Professor	Chemistry	Organic	Ability to communicate organic chemistry concepts in effective and appropriate ways to students	4								
Professor	Chemistry	Inorganic	Ability to communicate inorganic chemistry concepts in effective and appropriate ways to students	1								
Professor	ssor Chemistry Physical		Ability to communicate physical chemistry concepts in effective and appropriate ways to students	1								
Professor	Chemistry	Analytical	Ability to communicate analytical chemistry concepts in effective and appropriate ways to students	2								

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Professor	Chemistry	Bio	Ability to communicate	2	
			Bio chemistry concepts		
			in effective and		
			appropriate ways to		
			students		
Assistance prof	Chemistry	Organic	Ability to communicate	2	
			organic chemistry		
			concepts in effective		
			and appropriate ways		
			to students		
Assistance prof	Chemistry	Inorganic	Ability to communicate	4	
			inorganic chemistry		
			concepts in effective		
			and appropriate ways		
			to students		
Assistance prof	Chemistry	Physical	Ability to communicate	3	
		-	physical chemistry		
			concepts in effective		
			and appropriate ways		
			and appropriate ways		
			to students		
Assistance prof	Chemistry	Analytical	Ability to communicate	5	
'	,	,	analytical chemistry	-	
			concents in effective		
			and appropriate ways		
			and appropriate ways		
			to students		
Assistance prof	Chemistry	Industrial	Ability to communicate	2	
	enemieay	madellia	industrial chemistry	2	
			concepts in ellective		
			and appropriate ways		
			to students		
Assistance prof	Chemistry	Bio	Ability to communicate	2	
Assistance piùi	Chemisuy	010		<i>∠</i>	
			ыю cnemistry concepts		
			in effective and		
			appropriate ways to		
			students		

Assistance prof	Chemical	Catalysts	Ability to com	municate	1	
	engineering		Catalysts che	mistry		
			concepts in ef	ffective		
			and appropria	ite ways		
			to students			
Assistance prof	Biology	Environment	Ability to com	municate	1	
			Environment	chemistry		
			concepts in et	ffective		
			and appropria	ite ways		
			to students	-		
Lecturer	Chemistry	Organic			2	
Lecturer	Chemistry	Inorganic			3	
Lasturar	Chamiatry	Dhysical			1	
	Chemistry	FIIYSICAI			1	
Lecturer	Chemistry	Analytical			3	
Lecturer	Chemistry	Industrial			1	
Lecturer	Chemistry	Bio			1	
Assistance lecturer	Chemistry	Organic				
	Onennisary	Organic				
Assistance lecturer	Chemistry	Inorganic				
Assistance lecturer	Chemistry	Physical				
Assistance lecturer	Chemistry	Analytical				
Assistance lecturor	Chemistry	Industrial				
	Chernisuy	muusulai				

Professional Development

Mentoring new faculty members

Professional development of faculty members

Analyzed the needs of faculty members through opinion surveys, workshops, student

performance evaluations, and analysis of academic data to identify areas in need of development.

Based on specific needs, customized training programs are designed that include the use of modern teaching strategies, assessment techniques, and personal professional development. Training programs are implemented by professional trainers, whether inside or outside the university, with opportunities for workshops and group discussions to exchange experiences. – Members' application of acquired skills and concepts is monitored through periodic evaluations, including performance reviews and student evaluations, providing an opportunity to modify training programs based on actual needs.

 Faculty members are encouraged to participate in ongoing professional development activities such as attending conferences, academic publishing, and participating in advanced training programs.

12. Acceptance Criterion

(Developing regulations related to admission to the college or institute, whether central admission or others mentioned)

(Central admission - scientific)

According to the requirements of the Ministry of Higher Education and Scientific Research, so that it matches the latest admission requirements in Iraqi Universities

(Parallel acceptance - scientific)

Acceptance of evening study – scientific

Accept a scholarship

13. The most important sources of information about the program

- University requirements
- Local scientific trends
- Global scientific requirements
- Covering the specialized staff locally

14. Program Development Plan

 Defining the educational objectives of the program (such as enhancing students' understanding of basic chemical concepts, developing practical experimental skills, promoting scientific research in specific areas).

- Determine the academic subjects and concepts that students will learn.

 Identifying appropriate educational methods such as traditional lectures, applied activities, practical experiments, and interactive online lessons.

- Identifying evaluative tools to measure the achievement of educational objectives.

- Developing curricula and courses.

- Creating additional educational materials such as textbooks, practical papers, multimedia resources (such as educational videos, presentations, etc.).

- Training teachers on the new curricula and educational methods used in the program.

- Providing ongoing courses, workshops, seminars and discussions to improve and develop teaching skills.

- Periodically evaluate the program to measure its effectiveness in achieving educational objectives.

 Collect student and teacher feedback to identify strengths, weaknesses, and areas that can be improved.

 Use evaluation results to improve and adapt the program to student needs and industry aspirations.

 Updating educational materials and educational methods based on previous experiences and new directives in the field of chemical sciences.

	Program Skills Outline														
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic	Kno	wledge	•		Skill	S			Ethics			
			or optional	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
First year/First semester	CHEM1102	Atomic structure and quantum theory	Basic	V	V	V	V	V	V	V	V	V	V	V	V
	CHEM1101	Chemistry of qualitative analysis	Basic	V	V	V	V	V	V	V	V	V	V	V	V
	CREQ1101	Calculus I	Basic	\checkmark	V	V	V	V	V	V	V	V	V	V	V
	CREQ1109	General Physics 1	Basic	\checkmark	V	V	V	V	V	V	V	V	V	V	V
	URENG	English	Basic	\checkmark								\checkmark			\checkmark
	URCOM	Introduction to computer science	Basic	V	V	V	V	V	V		\checkmark	V	V	V	V
Second year/ Second semester	CHEM1207	Chemistry of volumetric analysis	Basic	V		V	V	V	V			V	\checkmark	\checkmark	V
	CREQ1207	Occupational safety	Basic	\checkmark		\checkmark				\checkmark		\checkmark			\checkmark

	CREQ1201	Calculus 2	Basic		\checkmark	V	\checkmark		V	\checkmark				\checkmark	V
	URDEM	Democracy and human rights	Basic	\checkmark	V	V	V	V	\checkmark	V	\checkmark		\checkmark	V	V
	URARA	Arabic	Basic		\checkmark		\checkmark			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	V
	CHEM1208	Theories of covalent bonds	Basic	V	V		V	V	V		\checkmark	V	\checkmark	V	\bigvee
Second year/First semester	CHEM 211	Inorganic chemistry	Basic	V	V	V	V	V	V	V	V	V	V	V	V
	CHEM 221	Analytical chemistry	Basic	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark
	CHEM 231	Organic chemistry	Basic	\checkmark	\checkmark	V	\checkmark	V	V	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	V
	CHEM 241	Physical chemistry	Basic	\checkmark	\checkmark	V	\checkmark		V	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	V
	CHEM 251	Biochemistry	Basic	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
	BIOT 281	Safety	Basic	\checkmark	V		\checkmark	\checkmark				\checkmark			\checkmark

	UREQ201	Arabic	Basic	\checkmark		V	\checkmark					V			\checkmark
	UREQ 210	English	Basic				\checkmark	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark
	CHEM 212	Inorganic chemistry	Basic	\checkmark	V	V	V	V	V	V	V	Ń	V	V	V
Second year/	CHEM 222	Analytical chemistry	Basic	\checkmark	V	V	V	V	Ń	V	V	V	V	Ń	Ń
Second semester															
	CHEM 232	Organic chemistry	Basic	V	V	V	V	V	V	V	V	V	V	V	V
	CHEM 242	Physical chemistry	Basic	V	V	V	V	V	V	V	V	V	V	V	V
	CHEM 252	Biochemistry	Basic	\checkmark			\checkmark	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark
	UREQ 245	Mathematics	Basic	V		V	\checkmark	V	V	V			\checkmark		V
	UREQ202	Arabic	Basic				\checkmark						\checkmark		\checkmark
	UREQ	English	Basic									V			
	220														
Third year/First	CHEM	Inorganic chemistry	Basic	\checkmark			\checkmark	\checkmark				V			
semester	311														

	CHEM	Analytical chemistry	Basic					\checkmark	\checkmark						
	321														
	CHEM	Organic chemistry	Basic	\checkmark			\checkmark			\checkmark		V			
	331														
	CHEM	Physical chemistry	Basic	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark
	341														
	CHEM	Biochemistry	Basic	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark
	351														
	CHEM	Radiation	Basic	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark
	371														
	UREQ	Human rights	Basic	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark	V	\checkmark		V
	320														
	UREQ	English	Basic	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark
	310														
Third year/Second	CHEM	Inorganic chemistry	Basic	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark
semester	312														
	CHEM322	Analytical chemistry	Basic	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	V	V	\checkmark			

	CHEM	Organic chemistry	Basic	\checkmark			\checkmark			\checkmark		\checkmark	\checkmark		\checkmark
	332														
	CHEM	Physical chemistry	Basic				\checkmark						\checkmark		
	342														
	CHEM	Biochemistry	Basic		V	V	V	V	V	V	V	V	V	V	V
	352														
	CHEM	Radiation	Basic		V	V	\checkmark	V	V	V	\checkmark	\checkmark	V	V	V
	362														
	CHEM	Pollution	Basic		V	V	\checkmark	V	V	V	\checkmark	\checkmark	V	V	V
	302														
	UREQ	Democracy	Basic	V	V	V	V	V	V	V	V	V	V	V	N
	320														
	UREQ	English	Basic				\checkmark			\checkmark		\checkmark	\checkmark		\checkmark
	320														
Fourth year/First	CHEM	Instrumental	Basic												
semester	421	analysis													

	CHEM	Identification	Basic		 		 		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
	431												
	CHEM	Physical chemistry	Basic		 	\checkmark	 		\checkmark		\checkmark	\checkmark	
	441												
	CHEM	Biochemistry	Basic	\checkmark	 		 	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark
	451												
	GEOL491	Geology	Basic	V	 		 \checkmark		V				
	UREQ	English	Basic		 		 			\checkmark			
	410												
	CHEM	Research project	Basic		 	\checkmark	 \checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
	481												
Fourth year/Second	CHEM422	Instrumental	Basic	\checkmark	 		 		\checkmark	\checkmark	\checkmark	\checkmark	
semester		analysis											
	CHEM	Quantum	Basic	\checkmark	 	V	 \checkmark	\checkmark		V		\checkmark	\checkmark
	442												
	CHEM	Inorganic	Basic	\checkmark	 		 						
	412	chemistry											

CHEM	Industrial	D .	\checkmark		\checkmark	\checkmark	\checkmark	 	 	\checkmark		
462	chemistry	Basic										
CHEM	Elective	Basic	\checkmark			\checkmark		 	 			
490-499												
UREQ	English	Basic	\checkmark	\checkmark	\checkmark	\checkmark		 	 		\checkmark	
420												
CHEM	Research project	Basic	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	 	 	\checkmark	\checkmark	\checkmark
482												
				V				 	 	V		

• Please tick the boxes corresponding to the individual program learning outcomes under evaluation.

- 1. Course Name: Inorganic chemistry
- 2. Course Code: Inorganic chemistry- 211
- 3. Semester / Year: first -2024
- 4. Description Preparation Date:32-3-2024
- 5. Available Attendance Forms: 2hr
- 6. Number of Credit Hours (Total) / Number of Units (Total):45hrs
- 7. Course administrator's name (mention all, if more than one name) Name: Dina Adil Najeeb Email: dinachem70@gmail.com
- 8. Course Objectives

Course Objectives

- 1- Introducing students to the main basic concept related to descriptive inorganic compounds Formation
- Focusing on the chemical and physical property of son group and how they are prepare
- 9. Teaching and Learning Strategies

Strategy

1-Introduce students to the basic concepts of some property group elements.

2- introduce to the property of compounds and its reactivity

10. Cou	rse Struc	ture			
Neek	Hours	Required Learning	Unit or	Learning	Evaluation
		Outcomes	subject name	method	method
1	2	Group(V) A elements	- General properties b- Electronic structure and oxidation states	Explanation of the article and Use of illustrat	Short oral and written exams
2	2	Group(V) A elements	- Nitrogen: c.1- Occurrence and properties c.2- Preparation and uses of elemental nitrogen	Explanation of the article and Use of illustrations	Short oral and written exams
3	2	Group(V) A elements	- Covalent compounds of nitrogen ; preparation , properties and uses. Compound of oxide. S tates - 3,-2,- 1,+1,+2,+3,+5 c.4- Ionic compounds of nitrogen	Explanation of the article and Use of illustrations	Short oral and written exams
4	2	Group(V) A elements	Photochemical Smog d-Phosphorus d.1- Occurrence and properties d.2- The free element d.3- Compounds of phosphorus	Explanation of the article and Use of illustrations	Short oral and written exams
5	2	Group(V) A elements	Oxides of phosphorus - Phosphoric acid and phosphates - Polymeric phosphoric acids and their anions - Phosphorus acid	Explanation of the article and Use of illustrations	Short or written exa
6	2		Mid Exam	6	2

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7	2	- Group III elements	- General properties b- Electronic structure and oxidation state c- Oxygen c.1- Preparation and uses c.2- Ozone	Explanation of the article and Use of illustrations	Short oral and written exams
8	2		Compounds of oxygen - Ionic oxides - Covalent oxides - Peroxides and superoxides	Explanation of the article and Use of illustrations	Short oral and written exams
9	2		Sulfur d.1- Occurrence and properties - The free element d.3- Compounds of sulfur - Sulfur dioxide and sulfurous acid - Sulfur trioxide and sulfuric acid	Explanation of the article and Use of illustrations	Short oral and written exams
10	2		Acid rain - Other compounds of sulfur e- Selenium, Tellurium and Polonium e.1- Properties e.2- Compounds and uses	Explanation of the article and Use of illustrations	Short oral and written exams
11	2		Occurrence of halogens b- Properties of the free elements c- Preparation of the free elements	Explanation of the article and Use of illustrations	Short oral and written exams
12	2		Compounds of the halogen d.1- Binary halides of metals d.2- Hydrogen halides d.3- Oxoacids and oxoanions e- Other halogen compounds of the nonmetals	Explanation of the article and Use of illustrations	Short oral and written exams

13	2	Group III elements	Electronic structure and properties b- Preparation and properties of Xenon compounds	Explanation of the article and Use of illustrations	Short oral and written exams			
14	2	Group III elements	Mid exam	Explanation of the article and Use of illustrations	Short oral and written exams			
11. Co	ourse Eva	aluation						
Distributi preparati	ng the sco on, daily o	ore out of 100 accordin ral, monthly, or written e	g to the tasks exams, reports .	assigned to the st etc	udent such as dail			
12. Le	arning ar	nd Teaching Resource	S					
Required t	textbooks (curricular books, if any)	- Inorgan	ic Chemistry Jame	es E. House			
Main refer	ences (sou	irces)	Ca	atherine E. Housecroft	and Alan G. Sharpe			
Recomme	nded bool	ks and references (scie	ntific					
journals, r	eports)							
Electronic	Reference	s Websites	We	Web site at www.books.elsevier.com				

1 Course Name: Inorganic Chemistry 2 Course Code: Inorganic chemistry - 211 3 Semester / Year:second 4 Description Preparation Date:23-3-2024 5 Available Attendance Forms: 2hrs 6 Number of Credit Hours (Total) / Number of Units (Total) 45 hours 7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com - Introducing students to the main basic conceptive inorganic compounds Formation. 8 Course Objectives - Introducing students to the main basic conceptive inorganic compounds Formation. 6 Number of Learning Strategies Strategy A1. Introduce students to the basic concepts of some property group elements. A2. introduce to the property of compounds and its reactivity		
Course Name: inorganic Chemistry Course Code: Inorganic chemistry - 211 Semester / Year:second Description Preparation Date:23-3-2024 Available Attendance Forms: 2hrs Number of Credit Hours (Total) / Number of Units (Total) 45 hours Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com Course Objectives Course Objectives Introducing students to the main basic concep related to descriptive inorganic compounds Focusing on the chemical and physical property some group and how they are prepare	1 Carrier N	
2 Course Code: Inorganic chemistry- 211 3 Semester / Year:second 4 Description Preparation Date:23-3-2024 5 Available Attendance Forms: 2hrs 6 Number of Credit Hours (Total) / Number of Units (Total) 45 hours 7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives • Introducing students to the main basic conception of the chemical and physical property some group and how they are prepare •	1 Course Name: Inorgani	c Chemistry
2 Course Code: Inorganic chemistry- 211 3 Semester / Year:second 4 Description Preparation Date:23-3-2024 5 Available Attendance Forms: 2hrs 6 Number of Credit Hours (Total) / Number of Units (Total) 45 hours 7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives Course Objectives		
3 Semester / Year:second 4 Description Preparation Date:23-3-2024 5 Available Attendance Forms: 2hrs 6 Number of Credit Hours (Total) / Number of Units (Total) 45 hours 7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives Course Objectives -Introducing students to the main basic concept related to descriptive inorganic compounds Formation. Focusing on the chemical and physical property some group and how they are prepare • definition some principle of in chemistry • united to descriptive inorganic compounds Formation. 9 Teaching and Learning Strategies Strategy A1. Introduce the basic concepts of some property group delements. A2. introduce to the property of compounds and its reactivity	2 Course Code: Inorganic	chemistry-211
3 Semester / Year:second 4 Description Preparation Date:23-3-2024 5 Available Attendance Forms: 2hrs 6 Number of Credit Hours (Total) / Number of Units (Total) 45 hours 7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives Course Objectives		
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5 Available Attendance Forms: 2hrs 6 Number of Credit Hours (Total) / Number of Units (Total) 45 hours 7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives Course Objectives Introducing students to the main basic concept related to descriptive inorganic compounds Formation. Focusing on the chemical and physical property some group and how they are prepare 9 Teaching and Learning Strategies Strategy A1. Introduce students to the basic concepts of some property group clements. A2. introduce to the property of compounds and its reactivity	4 Description Preparation	n Date:23-3-2024
5 Available Attendance Forms: 2hrs 6 Number of Credit Hours (Total) / Number of Units (Total) 45 hours 7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives Course Objectives - Introducing students to the main basic concept related to descriptive inorganic compounds Formation. Forcusing on the chemical and physical property some group and how they are prepare • definition some principle of in chemistry •		
6 Number of Credit Hours (Total) / Number of Units (Total) 45 hours 7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives Course Objectives - Introducing students to the main basic concept related to descriptive inorganic compounds Formation. Focusing on the chemical and physical property some group and how they are prepare 9 Teaching and Learning Strategies Strategy A1. Introduce students to the basic concepts of some property group elements. A2. introduce to the property of compounds and its reactivity	5 Available Attendance Fo	rms: 2hrs
7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives Course Objectives Introducing students to the main basic conception related to descriptive inorganic compounds Formation. Introduce for the chemical and physical property some group and how they are prepare. • Methanistry • 9 Teaching and Learning Strategies Strategy A1. A1. A1. Int	6 Number of Credit Hours	(Total) / Number of Units (Total) 45 hours
7 Course administrator's name (mention all, if more than one name) Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives Course Objectives - Introducing students to the main basic conception related to descriptive inorganic compounds Formation. Focusing on the chemical and physical property some group and how they are prepare • - Course Objectives • - Course objective inorganic compounds formation. • - Focusing on the chemical and physical property some group and how they are prepare • - Course • - Cou		
Name: Dina Adil Email: dinachem70@gmail.com 8 Course Objectives Course Objectives - Introducing students to the main basic conceprelated to descriptive inorganic compounds Formation. Focusing on the chemical and physical property some group and how they are prepare • definition some principle of in chemistry •	7 Course administrator's	name (mention all, if more than one name)
8 Course Objectives -Introducing students to the main basic concept related to descriptive inorganic compounds Formation. Focusing on the chemical and physical property some group and how they are prepare • • •	Name: Dina Adil Email: dinachem70@gr	nail.com
8 Course Objectives - Introducing students to the main basic concept related to descriptive inorganic compounds Formation. Focusing on the chemical and physical property some group and how they are prepare - definition some principle of in chemistry 9 Teaching and Learning Strategies		
Course Objectives - Infouncing students to the half basic concept related to descriptive inorganic compounds Formation. Focusing on the chemical and physical property some group and how they are prepare • definition some principle of in chemistry • • • • • • • • • • • •	8 Course Objectives	Introducing students to the main basic concert
definition some principle of in chemistry 9 Teaching and Learning Strategies Strategy A1. Introduce students to the basic concepts of some property group elements. A2. introduce to the property of compounds and its reactivity 25	Course Objectives	related to descriptive inorganic compounds Formation. Focusing on the chemical and physical property some group and how they are prepare
9 Teaching and Learning Strategies Strategy A1. Introduce students to the basic concepts of some property group elements. A2. introduce to the property of compounds and its reactivity		definition some principle of in chomistry
O Teaching and Learning Strategies Strategy A1. Introduce students to the basic concepts of some property group elements. A2. introduce to the property of compounds and its reactivity		•
9 Teaching and Learning Strategies Strategy A1. Introduce students to the basic concepts of some property group elements. A2. introduce to the property of compounds and its reactivity		•
Strategy A1. Introduce students to the basic concepts of some property group elements. A2. introduce to the property of compounds and its reactivity	9 Teaching and Learning S	Strategies
A2. introduce to the property of compounds and its reactivity	A1. Introduce students to the basic concepts of some property group elements.	
25	A2. introduce	e to the property of compounds and its reactivity
		25

Week	Hours	Required	Unit or	Learning	Evaluation	
		Learning	subject	method	method	
		Outcomes	name			
1	2 hour	Symmetry group theory	-Symmetry operations and symmetry elements - Identity	Explanation of the article and Use illustration	Short oral a exams	nd
2	2 hour		Center of symmetry - Rotational axis - Mirror plane -Improper rotational axis	Explanation of the article and Use of illustrations	Short oral a exams	nd
3	2 hour		Pointgroups - Applications	Explanation of the article and Use of illustrations	Short oral a exams	nd
4	2 hour	Radioactivity and nuclear chemistry	Natural radioactivity -Disintegration of radioactive elements -Rate of disintegration and half dife	Explanation of the article and Use of illustrations	Short oral a exams	nd
5	2 hour		Artifical radioactivity - Nuclear reactions - Energetic of nuclear reactions	Explanation of the article and Use of illustrations	Short oral a exams	nd
6	2 hour		Mid Exam	6	2 hour	
7	2 hour		Types of nuclear reactions - Induction of nuclear reaction - By charged particles - By neutrons	Explanation of the article and Use of illustrations	Short oral a exams	nd
8	2 hour		Nuclear fission - Nuclear fusion - Synthetic elements	Explanation of the article and Use of illustrations	Short oral a exams	nd
9	2 hour	Acid - base Chemistry	Acid - base Concepts : a- Bronsted - Lowery definition b- Lux - Flood	Explanation of the article and Use of illustrations	Short oral a exams	nd

10	2 hour		Solvent system definition d- Le wis definition e- A generalized acid - base concept :	Explanation of the article and Use of illustrations	Short oral a exams	nd wi	
11	2 hour		Acidity of oxy acids 3- Basically of metal oxides 4- Hydration and hydrolysis reactions	Explanation of the article and Use of illustrations	Short oral a exams	nd wi	
12	2 hour		Basicity of substituted amines f- Hard and soft acid , and bases	Explanation of the article and Use of illustrations	Short oral a exams	nd wi	
13	2 hour		classification of acids and bases as hard or soft 2- Electronegtivity and hardness and softness .	Explanation of the article and Use of illustrations	Short oral a exams	nd wi	
14	2 hour		Mid exam	14	2 hour		
11 Cou	rse Evaluation	L					
Distributi preparati	ing the score out o on, daily oral, month	f 100 according 1ly, or written exa	to the tasks ass ms, reports et	signed to the stu	dent such as da	ily	
12 Lea	rning and Teachin	g Resources					
Required	textbooks (curricular	books, if any)	1- Inorganic Ch	emistry James E.	House		
Main refer	rences (sources)		Catherine	E. Housecroft and A	Alan G. Sharpe		
Recomme	nded books and refe	erences (scientific					
journals, r	eports)						
Electronic	References, Website	S	Web site at www.books.elsevier.com				

1 Course Name: Inorganic Chemistry

2 Course Code: CHEM 311

- 3 Semester / Year: First sem. 2023-2024
- 4 Description Preparation Date:2023-2024
- 5 Available Attendance Forms: attending
- 6 Number of Credit Hours (Total) / Number of Units (Total): 3 hours for each sem.
- 7 Course administrator's name (mention all, if more than one name) Name: Assistant. Professor. Farah Muaiad Ibrahim, Dr. Ammar Jehad Sac Email: farah.muaiad@nahrainuniv.edu.iq
- 8 Course Objectives

Course Obj	aching	and Learnir	• • • • • • • • • • • • • • • • • • •	ntroduction to Coordi Define the transition properties of transition different oxidation s electronic arrangement describe the redox che elements and the prep metal compounds, Define the concept of with examples and complexes and types preparation of comple What are the most explain the formation of the most accepted th First: Chain Theory Second: Werner's the B- Complex writing naming coordinate co and the interactions presence of transition ntroduction to the elements. Know the examples.	nate Chemistry includ elements and chem n elements as well as the states. And know at of transitional elements emistry of some transit aration of some transit aration of some transit f coordinate compound geometric shapes f coordinate compound geometric shapes f coordinate compound geometric shapes f coordinate compound exes. important theories the of complexes and what eory and includes? ory. method and rules impounds f uses preparation at the elements. isomers of transit types of isomers we
Strategy	1 p ti ty s 2 w	. The main strates articipation in the ninking skills. Thi ypes of simple ex tudents. . Ask students a n /hy. Give the student	gy that will be adopted it e exercises, while at the s will be achieved throu periments involving so range of thinking questi	in delivering this module is e same time refining and igh classes, interactive tuto ome sampling activities the ons during lectures, such ire subjective interpretation	is to encourage students' expanding their critical prials and by considering that are interesting to the as what, how, when and
10 Cour	se Str	ucture	is some duties that lequ		
Week	Hou	Required	Unit or subject	Learning method	Evaluation
	rs	Learning	name		method
		Outcomes			
1		norganic	detailed explanation	attending	nthly exams and quizzes

		introduction to	
_		transition metals	
2	horganic	Transition elements	
	hemistry	and chemical	
		perties of transition	
		elements as well as	
		eir various oxidation	
		states	
3	horganic	Know the electronic	
	hemistry	arrangement of the	
	/	ansitional elements	
		and the most	
		portant compounds	
		of the transitional	
4		elements	
4	norganic	Redox chemistry of	
	nemistry	some transition	
		elements and	
		reparation of some	
		transition metal	
		compounds	
5	horganic	Definition of the	
	hemistry	concept of	
	,	coordination	
		compounds with	
		examples	
6	horganic	Know the types of	
0	omistry	ligands used to	
	iernisu y	nganus useu to	
7	Porgonia	prepare complexes.	
/	iorganic	Aid1-term Exam the	
0	lemistry	No serie e de s	
8	norganic	Naming the	
	hemistry	coordination	
		compounds	
9	horganic	Structures of metal	
	hemistry	complexes	
10	horganic	Series theory and	
	hemistry	Werner's theory.	
11	horganic	Application of	
-	hemistry	Werner's theory	
12	hordanic		
	homistry	Mid2-term Exam	
12	borgonia	()Introduction to	
T2	iorganic	()Introduction to	
	nemistry	isomers of	
		coordination	
		compounds.	
14	horganic	classification of	
	hemistry	mers with examples	
15	horganic	Preparatory week	
-	hemistry	before the final	
		eyam	
		CAUIII	
	 Encoderations 		

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports etc Quizzes (week5,10) 10% (10) Assignments (week4,14) 10% (10) Projects / Lab. no Report: The report is in week 13 and the daily preparation and participation are followed daily) 10% (10) Midterm Exam(week7,12) 2 hr. 10% (10) Final Exam 3hr (week 16) 60% (60)					
12 Learning and Teaching Re	12 Learning and Teaching Resources				
Required textbooks (curricular book					
any)					
Main references (sources)	oduction to Inorganic Chemistry (Wikibook),2024, Penn te University ganic chemistry. Fifth edition Gary L. Miessler, Paul J. her, Donald A. Tarr, Pearson Education, Inc				
Recommended books and	rdination chemistry, Fred Basolo, Ronald C. Johnson,				
references (scientific journals,					
reports)					
Electronic References, Websites	s://byjus.com/jee/coordination-compounds s://scienceinfo.com/transition-metals s://www.studysmarter.co.uk/explanations/chemistry/in anic-chemistry/transition-metals/				

- 1. Course Name: Inorganic Chemistry
- 2. Course Code: CHEM 312
- 3. Semester / Year: second sem. 2023-2024
- 4. Description Preparation Date:2023-2024
- 5. Available Attendance Forms: attending
- 6. Number of Credit Hours (Total) / Number of Units (Total): 3 hours for each sem.
- 7. Course administrator's name (mention all, if more than one name) Name: Assistant. Professor. Farah Muaiad Ibrahim, Dr. Ammar Jehad Sac Email: farah.muaiad@nahrainuniv.edu.iq

8. Course Objectives	
Course Objectives	Introduce students to the basic concepts of
	synergistic theories of coordinate compounds
	Give the student an accurate description of the
	theories of contemporaneity
	Valence bond theory, magnetic measurements ar
	number of individual electrons for complexes of
	geometric shapes: tetrahedral plane, octahedral ;
	plane square, internal orbital complexes and
	external orbital complexes.
	 Crystal field theory, measurement of crystal fi
	energy in the case of a strong and weak field,
	knowledge of electron duplex energy and quadru
	deformation in octahedral complexes (Jeanne:
	Teller deformation) and interpretation of the colo
	of complexes
	– Orbital molecular theory of ${f \sigma}$ in octahedral
	complexes, molecular orbital diagram (MOT) for
	I

		hexagonal co complex cont method	mplexes, enerς aining pi−π boi	gy level diagram of nds and diagrams
		And describe	thermodynam	ic stability and mot
9 Teachin	a and Learning	Strategies		
9. Teachin Strategy	g and Learning	Strategies	ring this module is	s to encourage students'
9. Teachin Strategy 10. Course St	g and Learning 1. The main strategy participation in the thinking skills. Th considering types interesting to the str 2. Ask students a ra why. 3. Give the student ructure	Strategies y that will be adopted in deliver exercises, while at the same this will be achieved throug of simple experiments involudents. nge of thinking questions during s some duties that require sub	ring this module is time refining and h classes, interact ving some samp ing lectures, such a jective interpretati	s to encourage students' expanding their critical ctive tutorials and by ling activities that are as what, how, when and ons.
9. Teachin Strategy 10. Course St Week Hours	g and Learning 1. The main strategy participation in the thinking skills. Th considering types interesting to the str 2. Ask students a ra why. 3. Give the student ructure Required	Strategies y that will be adopted in deliver exercises, while at the same the is will be achieved throug of simple experiments invol- udents. nge of thinking questions during s some duties that require sub- Unit or subject	ring this module is time refining and h classes, interact ving some samp ing lectures, such a jective interpretati	s to encourage students' expanding their critical ctive tutorials and by ling activities that are as what, how, when and ons. Evaluation
9. Teachin Strategy 10. Course St Week Hours	g and Learning 1. The main strategy participation in the thinking skills. Th considering types interesting to the str 2. Ask students a ra why. 3. Give the student ructure Required Learning Outcomes	Strategies y that will be adopted in delive exercises, while at the same this is will be achieved throug of simple experiments invol- udents. nge of thinking questions duri- s some duties that require sub- Unit or subject name	ring this module is time refining and h classes, interact ving some samp ing lectures, such a jective interpretati Learning method	s to encourage students' expanding their critical ctive tutorials and by ling activities that are as what, how, when and ons. Evaluation method
9. Teachin Strategy 10. Course St Week Hours 1 3	g and Learning 1. The main strategy participation in the thinking skills. Th considering types interesting to the str 2. Ask students a ra why. 3. Give the student. 3. Give the student. ructure Required Learning Outcomes Inorganic chemistry	Strategies y that will be adopted in deliver exercises, while at the same the sis will be achieved throug of simple experiments involudents. nge of thinking questions durf s some duties that require sub Unit or subject name Introduce students to t basic concepts of theories for coordinatic compounds	ring this module is time refining and h classes, interact ving some samp ing lectures, such a jective interpretati Learning method attending	s to encourage students' expanding their critical ctive tutorials and by ling activities that are as what, how, when and ons. Evaluation method monthly exams ar quizzes
9. Teachin Strategy 10. Course St Week Hours 1 3 2 3	g and Learning 1. The main strategy participation in the thinking skills. The considering types interesting to the stripheresting to the stripher	Strategies	ring this module is time refining and h classes, interact ving some samp ing lectures, such a jective interpretati Learning method attending	s to encourage students' expanding their critical ctive tutorials and by ling activities that are as what, how, when and ons. Evaluation method monthly exams ar quizzes

7	3	Inorganic chemistrv	Magnetic properties of complexes with	
			geometric shapes:	
			tetrahedral octahedral	
			and square planar	
5	3	Inorganic	Crystal field theory an	
5	5	chemistry	measurement of the	
		enernody	amount of energy of	
			splitting of the	
			crystalling field in the	
			crystalline lick in the	
			weak field	
<u> </u>	2	Inorganic	describe the types of	
0	5	chemistry	strong and weak	
		chernisery	Strong and weak	
			ligands and their	
			the energy splitting	
7	3	Inorganic		
,	5	chemistrv	Mid1-term Exam the	
8	3	Inorganic	Interpretation of the	
		chemistry	colours of complexes	
9	3	Inorganic	The energy of splitting	
		chemistry	and deformation in	
			octahedral complexes	
			(Jhan Teller) Scientific	
			activities	
10	3	Inorganic	Orbital molecular	
		chemistry	bonding σ in octahedra	
			complexes and	
			molecular orbital	
			diagram	
11	3	Inorganic	Applications of	
		chemistry	octabedral molecular	
			diagram	
			diagram	
12	3	Inorganic	Mid2 town France	
		chemistry	MIG2-term Exam	
13	3	Inorganic	describe the energy leve	
		chemistry	diagram of an octahedra	
			complex containing рі п	
			bonds and the molecula	
14	3	Inorganic		
- 1		chemistry	thermodynamic stability	
			and motor stability and	
			factors affecting the	
			stability	
15	3	Inorganic	Preparatory week	
		chemistry	before the final exam	

Distributing the score out of 100 according to the tasks assigned to the student such as
daily preparation, daily oral, monthly, or written exams, reports etc
Quizzes (week5,10) 10% (10)
Assignments (week4,14) 10% (10)
Projects / Lab. no
Report: The report is in week 13 and the daily preparation and participation are
followed daily) 10% (10)
Midterm Exam(week7,12) 2 hr. 10% (10)
Final Exam 3hr (week 16) 60% (60)

12. Learning and Teaching Resources			
Required textbooks (curric			
books, if any)			
Main references (sources)	oduction to Inorganic Chemistry (Wikibook),2024, Penn te University ganic chemistry. Fifth edition Gary L. Miessler, Paul J. her, Donald A. Tarr, Pearson Education, Inc		
Recommended books and references (scientific journals, reports)	rdination chemistry, Fred Basolo, Ronald C. Johnson, ond edition		
Electronic References, Websites	s://byjus.com/jee/coordination-compounds s://scienceinfo.com/transition-metals s://www.studysmarter.co.uk/explanations/chemistry/inorg -chemistry/transition-metals/		
1 Course Na	me: Inorganic Chemi	stry	
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2 Course Co	de:		
3 Semester	/ Year: second / 202	23-2024	
4 Descriptio	on Preparation Date:2	2024-3-23	
p			
5 Available A	Attendance Forms:		
6 Number of	Credit Hours (Total) /	Number of Uni	ts (Total)
2			
7 Course ac	al +2 practical / 3 dministrator's name (mention all. if	more than one name)
Name: Han Email: han	nan Abdoulatief Ibral nan.ibrahiem@nahrai	niem nuniv.edu.iq	
8 Course Ob	viectives		
Course Objectives		•	The students learn color transition metals comple and the reasons aperances The students learn concept of term symbol a learn how calculate it Study the mechanisum inorganic reactions and a to distinguish between th Know the nephelaux effect and the facto effecting of it
9 Teaching a	and Learning Strategie	S	
Strategy	Theoretical le	ctures and pra	ctical study
	·	36	

10 Course	e Structur	e			
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
first	2	Color of Transiti Metal Complexes	Inorganic Chemistry	Explanation	Exam
second	2	Term symbol	Inorganic Chemistry	Explanation	Exam
thierd	2	Ligand Substitution	Inorganic Chemistry	Explanation	Exam
fourth	2	Types of Substitution Mechanisms	Inorganic Chemistry	Explanation	Exam
fifth	2	Substitution Square Plar Complexes	Inorganic Chemistry	Explanation	Exam
sixth	2	Trans-Effect	Inorganic Chemistry	Explanation	Exam
seventh	2	Exam 1	Inorganic Chemistry	Explanation	Exam
eightth	2	Substitution a racemization octahedral complexes	Inorganic Chemistry	Explanation	Exam
ninth	2	The Eigen-Wilk mechanism	Inorganic Chemistry	Explanation	Exam
tenth	2	self- exchan reactions	Inorganic Chemistry	Explanation	Exam
eleventh	2	conjugate–base mechanism (Dcb	Inorganic Chemistry	Explanation	Exam

journale ropor	S)				
	DOOKS	and references (SCIE			
			Z-I CA AN Th	THERINE E . D ALAN G. SHA	HOUSECRC
			M. 20	V. Twigg 12	
	X -	,	Or	ganometallic R	eactions
Main reference	s (source	es)	jai.	Mechanisms o	f Inorganic a
			of Jar	structure and	l reactivity
Required textb	ooks (cu	rricular books, if any)	Inc	organic Chemis	stry ,Princip
5%presence 12 Learning	g and T	eaching Resources	;		
20%queses 5%class partie	cipation				
preparation, c	laily ora	l, monthly, or written	exams, reports	. etc	5
Distributing th	Evaluat	out of 100 according	to the tasks assign	ned to the student	t such as dailv
11 Course	Evoluot	ion			
fifteenth	2		Inorganic Chemistry	Explanation	Exam
		review	_		
	-		Chemistry		
Fourteenth	2	The Nephelauxe	Inorganic	Explanation	Exam
		Reactions	Chemistry		
Thertenth	2	Mechanism Electron Trans	Chemistry Inorganic	Explanation	Exam
Twelveth	2	Exam 2	Inorganic	Explanation	Exam
		mechanism)			

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 1 Course Name: Organic 2 Course Code: CHEM 232 3 Semester / Year: Semester 2, Year 2 4 Description Preparation Date: 28/1/2024
 2 Course Code: CHEM 232 3 Semester / Year: Semester 2, Year 2 4 Description Preparation Date: 28/1/2024
 3 Semester / Year: Semester 2, Year 2 4 Description Preparation Date: 28/1/2024
4 Description Preparation Date: 28/1/2024
5 Available Attendance Forms: Attendance
6 Number of Credit Hours (Total) / Number of Units (Total): 3
7 Course administrator's name (mention all, if more than one name) Name: Zahraa Sabah Saeed Email: zahraa.sabah@nahrainuniv.edu.iq
8 Course Objectives
Course Objectives 1- Enabling students to acquire knowledge and illusion of organic chemistry 2- Enabling students to acquire knowledge and illusion of the chemical structures of organic compounds 3- Enabling students to acquire knowledge and understanding of reactions in organic chemistry 4- Students acquire knowledge and knowledge of practical experiments in personal chemistry
9 Teaching and Learning Strategies
Strategy Lecture method and use of the interactive whiteboard - Explanation and clarification - Providing students with the basics and additional topics related to the outcomes of organic chemical thinking and analysis - Forming discussion groups during lectures to discuss organic chemistry topics that require thinking and analysis - Asking students for a set of thinking questions During lectures, he explains the what, how, when and why of specific topics Giving students homework that requires self- explanation in causal ways.
10 Course Structure

Week	Hours	Required	Unit or subject	Learning	Evaluation
		Learning	name	method	method
		Outcomes			
1	5	Introducing	alkyl	Blackboard	Daily
		the student to	halides	and data	exams and
		the properties		show	homework
		of alkyl			
		halides			
2	5	Introducing	preparing	Blackboard	Daily
		the student to	alkyl halides	and data	exams and
		methods for		show	homework
		preparing			
2		alkyl halides	una ati a za a	Dla al-la a arr d	Deile
3	5	introducing the	reactions	and data	Dally oxame and
		methods for	alkyl hanues	show	homework
		reactions alkyl		5110 W	nomework
		halides SN2			
4	5	Introducing	reactions	Blackboard	Daily
		the student to	alkyl halides	and data	exams and
		methods for		show	homework
		reactions alkyl			
		halides SN1	-		
5	5	Introducing	elimination	Blackboard	Daily
		the student to	reactions of	and data	exams and
		the E2	alkyl halides	Show	nomework
		reactions of			
		alkyl halides			
6	5	Introducing	elimination	Blackboard	Daily
		the student to	reactions of	and data	exams and
		the E2	alkyl	show	homework
		elimination	halides		
		reactions of			
		alkyl halides			
7	5	Mid	Mid	Blackboard	Daily
		exam	exam	and data	exams and
				show	homework
8	5	Introducing	Alcohols	Blackboard	Daily
		ule student to	and their	and data	exams and
		alcohois and	properties	SHOW	nomework

		their			
	-	characteristics	D		וי ת
9	5	Introducing	Preparation	Blackboard	Daily
		the student to	of alcohol	and data	exams and
		methods for		show	homework
		preparing			
		alcohol			
10	5	Introducing	Reaction of	Blackboard	Daily
		the student	alcohol	and data	exams and
		to methods		show	homework
		for reaction			
		alcohol			
11	5	Introducing	Introduction	Blackboard	Daily
		the student to	to ethers	and data	exams and
		the properties	and their	show	homework
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		naming them,			
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		reactions			
12	5	Introducing	Amines and	Blackboard	Daily
		the student to	their	and data	exams and
		amines and	properties	show	homework
		their			
		properties			
13	5	Introducing	Preparation	Blackboard	Daily
		the student to	of amines	and data	exams and
		the methods of		show	homework
		preparing			
		amines			
14	5	Introducing	Amine	Blackboard	Daily
		the student to	reactions	and data	exams and
		the reactions	and their	show	homework
		of amines	detection		
15	5	revision	revision	Blackboard	Daily
				and data	exams and
				show	homework
11 Cour	se Eval	uation			
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		d Teaching Resou	Irces		
12 Learr	ing and	a readining reddu			
12 Learr	and		any) Organic Chem	nistry - Paula Yurkanis B	Bruice, 7th Ed, 2014

Main references (sources)	 Organic chemistry, Morrison and Boyd Organic Chemistry, Clayden J., Creeves N., Warren S and Wother P., Oxford, 2001
Recommended books and references (scientific	http://www.chemicalprocessing.com/
journals, reports)	
Electronic References, Websites	http://www.bytoco.com/

1. Course Name: Organic chemistry 2. Course Code: CHEM 431 3. Semester / Year: Second semester/ 2023-2024 4. Description Preparation Date: 28/1/2024 5. Available Attendance Forms: Attendance 6. Number of Credit Hours (Total) / Number of Units (Total) Two hours per week 7. Course administrator's name (mention all, if more than one name) Name: Dr. Mohammed Hussein Ali Email: mohammed.mashhadani@nahrainuniv.edu.iq 8. Course Objectives Course Objectives Prabling students to obtain knowledge and understanding of organic chemistry sciences especially about hetero organic componds. Emables tudents to obtain knowledge and understanding of chemister sciences especially about hetero organic componds. Emables tudent is to abtain knowledge and understand of chemist sciences especially about hetero organic chemistry sciences especially about hetero organic sciention knowledge and understand of chemistic						
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3-4 2 Classification Classification Active learni Discussion	1-2	2	Introduction	Introduction	Active learni	Discussion
hataroavalia aomnoum hataroavalia	3-4	2	Classification	Classification	Active learning	Discussion
neterocyclic compoun neterocyclic			heterocyclic compoun	heterocyclic		
5-6 2 Nomenclature Nomenclature Active learnit Discussion	5-6	2.	Nomenclature	Nomenclature	Active learni	Discussion
heterocyclic compoun heterocyclic			heterocyclic compoun	heterocyclic		
compounds		1		compounds		

	2	Structure and aromatic	Structure		Active learn	Exercise	
	2	of pyrrole. fir	aromaticity	of pyrre			
		thiophene and pyridine	furan. thior	ohene a			
		and have and block	pyridine				
7-8	2	Methods of synthe	Methods of	f synthe	Active learn	Exam	
	_	properties and chemi	properties	-			
		reactions of Pyrre	chemical re	eactions			
		Furan, Thiophene	Pyrrole,	Fur			
		Pyridine	Thiophene	i			
			Pyridine	1			
9-11	2	Methods of synthe	Methods of	t synthe	Active learning	Homewor	K
		properties and chemi	properties				
		reactions of Pyrre	chemical re	eactions			
		Puridine	Thiophene	1.01			
			Pyridine				
12-15	2	Comparison of basic	Comparison		Active learn	Discussi	on
		of Pyridine, Piperid	basicity of	Pyridi			
		and Pyrrole	Piperidine a	nd Pyrro			
11. Co	urse Eva	luation					
Distributir	ng the sco	re out of 100 according	to the tasks	assigne	ed to the stude	nt such as d	ailv
preparatio	on, daily o	ral, monthly, or writte	n exams, rep	orts	etc		j
12 Le	arning ar	d Teaching Resour	200				
12. 20	arring ar	la roadhing roodan					
Required to	extbooks (curricular books, if any)	HET	EROCY	CLIC COMP	JUNDS	,
			Co-C	oordir	nator – Dr. Sr	ialini Sing	gh
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1	C N			
1.	Course Name	: Physical Chem	istry- Kinetic chemistry	V
		J		/

2. Course Code:

- 3. Semester / Year: 1st Semester/Third Year
- 4. Description Preparation Date:2023-2024

5. Available Attendance Forms: Attendance

- 6. Number of Credit Hours (Total) / Number of Units (Total)/2hours per weak for the theortical and 2hours per weak for the laboratory
 2 hours for (Class lecture)+ 2 hours for (Lab) for 3 groups.
- 7. Course administrator's name (mention all, if more than one name) Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam Email: <u>asmaa.albayaty@nahrainuniv.edu.iq</u>

Lab Stuff:

Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam

Assist.: Eklas Abd Alkadar Lecturer Assistant :Ala'a Abd Al-Razaq

> Lecturer Assistant Doha Abd Al-KAream Lecturer Assistant :Aisha Jamal Jameal Lecturer Assistant Qutban Ibraheam Hussiean

8. Course Objectives

Course Objectives: The main goal of this course to give the basic principle of

Kinetic chemitry and learn how can calculate the rate and order of the reaction and its applicti in chemistry.

9. Teaching and Learning Strategies

Strategy	1- Using the textbook which is available in the Department library a
	its specific for the undergraduate students, and the chapters
	Needed are Ch.22-23.
	2- Give the homework
	3- Present the lecutura and solve the problem for each sections

10. C	ourse S	tructure			
Week	Hours	Required	Unit or subject	Learning	Evaluation
		Learning	name	method	method
		Outcomes			
1	2	Why we study Kinetic chemistry	The name of Subjects will Take during the Semester and why Need to study Kinetic chemistry.	Present the lectures	-
2-5	2	Answer why?	 1-Kinetic 2-Expreation of reaction rate 3- The rate law and Its component 4- Homework 	Present the lectures	Quiz Each Class
6-8	2	Answer why?	 5- Reaction Order a its terminology in chemistry. 6-Determination of reaction order. 7- Determination of order and reaction rate Laws. 8- Homework 	Present the lectures	Quiz

		Answer why?	9- Determinat	ion	
9-11	2		of rate consta	nt Present	Quiz
			(K) 10 Integrated	the	
			I ow of first-or	dor	
			Reaction	uer	
			11-Integrated	rate	
			Law of Second	-	
			Order Reaction	n.	
			12		
			- Integrated ra	te	
			Law of Third-c	order	
			Reaction		
			13- Integrated	rate	
			Law of Zero-o	rder	
			Reaction		
			14- Half life tin	ne	
			-15 Raction ra	te	
			And its		
			Dependency		
			On the temp.		
12	2		E		
			Exam		
12	2		17Theories of		
13	2		Chemical	Present	Quiz
			A Collector Th	uie ooru locturoo	
			h-Transion the	ory lectures	
				lon y	
14			Fyam		
15	2		Answer questi	ons	
			iniswei questi		
11.	Course	Evaluation			
Distrib	uting the	score out of 100 ac	cording to the ta	asks assigned to the st	udent such as dailv
prepar	ation, da	ily oral, monthly, or	written exams,	reports etc	- - - - - - - - - -
12.	Learnin	g and Teaching R	esources		
Require	ed textboo	oks (curricular books	, if any)	Physical Chemistry	1
Main re	eferences	(sources)		Physical Chemistry	7
Recomi		books and refe	rences	-	
scienti	ne journa	is, reports)			
	nia Dofor	ncae Waheitae		_	

	Course Description Form								
	1 Course Name: An	alytical Chemistry							
	2 Course Code:	2 Course Code:							
	3 Semester / Year:2	2023-2024							
	4 Description Prepa	aration Date: 20/3/2024							
	5 Available Attendar	ice Forms: presence							
	6 Number of Credit	Hours (Total) / Number of U	Jnits (Total): 8 Hours						
	7 Course administr Name: Dr. Dalia M Email: Dalia.mahr	ator's name (mention all, Iahmood Jamil mood@nahrainuniv.edu.io	if more than one name)						
	8 Course Objectives	5							
C	Course Objectives 1.Teach students the most important basics of analytical separation methods and provide a comprehensive explanation of each method. 2.The basics of chromatography were learned and isc			pe					
	9 Teaching and Lea	rning Strategies							
SI	ategy	The main strategy to be ado student participation in exer and tests. Furthermore, enco	pted in delivering this unit is to encourage rcises provided during class, homework ourage student participation in discussion panels						
		49							

1	Course Str	ucture				
W	eek	Hours	Required Learning	Unit or subject	Learning	Evaluation
			Outcomes	name	method	method
	First	2 Hours	A.Cognitive goals A1. Knowledge analytical separation metho A2-Solve the problems related each method A3- Understandin the basics methods	Separation and definition of Analytical Chemistry	Data Show	Exam
	Second	2 Hours	Principate	Definition	Data Show	Exam
	Third	2 Hours	Separation Organic and organic Compoun	Definition	Data Show	Exam
	Fourth	2 Hours	Extraction a Separation Ions	Definition	Data Show	
	Fifth	2 Hours	Distillation	Definition	Data Show	Exam
	Sexth	2 Hours	Mid			Marked
	Seventh	2 Hours	Chromatography	Definition	Data Show	Exam
	1 Course Eva	aluation				
))]	stributing the s eparation, daily	core out of 100 a / oral, monthly, or	ccording to the tasks a written exams, repor	ssigned to the stude	ent such as dai	ly
ł	2 Learning a	nd Teaching Res	sources			
R	quired textbook	s (curricular books	, if any)	Skooge		
М	in references (s	sources)		Book of analytical Cherry	l Chemistry-	
			50			

		Book of analytical Chemistry-	
		Skooge	
R	commended books and references (scientific journals,	International journals affiliated	
re	borts)	with Elsiver and Clarivate	
-		in the field of methodological	
		topics	
EI	ctronic References, Websites	New Paper in Course	

1	0	NT.							
1	Cour	se Name:							
Analytical chemistry									
2 Course Code:									
121	a a								
3	Seme	ester / Year:	001 2002 First source						
	Doco	ription Propagation Dates	2024-2023 first serifi	ester					
+ 22/27	$\frac{1}{2024}$,						
<u>23/3/</u> 5	Avai	able Attendance Forms:							
Atter	nded lec	tures							
6	Num	ber of Credit Hours (Tot	al) / Number of Uni	ts (Total)					
	(0.1)								
7	Cour	se administrator's name	(mention all, if more	than one name)					
	Nam	e: Rana Abd Hammza							
	Emai	l: rana.abd@nahrainuniv	.edu.iq						
8	<u>C</u> our	se Objectives							
Cour	se	 Introducing students to 	the basic concepts a	related to descripti	ve analysis methods				
Obje	ctives	• Focus on the method of	f precipitation of ele	ments in descriptiv	ve analytical chemistry and				
		calculating their quantitie	2S						
		• Teach the student now	to calculate the amo	uni of regimented	materials infougn the use				
0		bing and Learning Strate	niou.						
Strat		- Providing students with	the basics and addi	tional tonics relate	ed to thinking outcomes				
Suut	с _Б у	- Discussing lesson topic	s that require think in	ng and analysis. v	vith students participating				
		In a mini-discussion circ	le during the lecture		1 1 0				
		- Raising a group of intel	lectual questions du	uring the lecture time	me, which increases and				
		Motivates students to an	alyze, conclude, and	reach the correct	answer.				
		- Giving students hom	ework that requires	self-explanation					
		- Linking the lecture curi	iculum with practic	al applications, es	specially with our daily				
10	Course	lives Stanoture							
1U We	Hours	Required Learning	Unit or subject	Learning	Evaluation method				
ek	Tiours	Outcomes	name	method					
1	2 hour	Introducing the stude		Explanation of	Short oral and written exams				
		to the subject of	Introduction of	the article and					
		descriptive analysis	and classification	Use of illustration					
		analytical chemistry							
2	2 hour	Introduce the student	gravimetric metho	Explanation of	Short oral and written exams				
		the methods of	properties,	the article and					
		sedimentation and th	precipitation	Use of illustration					
		characteristic s	gravimetric,						
2	21	T	examples	E1-	Character and the first				
5	2 hour	Learn about arithmet	Calculation	Explanation of	Snort oral and written exams				
		metnods		une article and					
				Use of mustratio					

4	2 hour	Identify the best	Properties of	Explanation of	Short oral and written exams
		characteristics of the	precipitates and	the article and	
		precipitating agent an	precipitating agent	Use of	
		the methods of forming		illustratio	
		the precipitate			
5	2 hour	Identify the types of	factors that	Explanation of	Short oral and written exams
		sediments and their	determine the	the article and	
		specifications	particle size of	Use of illustration	
			precipitate, Colloi		
			precipitate and		
			structure,		
6	2 hour		Mid Exam		
7	2 hour	Recognize the types	coagulation of	Explanation of	Short oral and written exams
		sedimentation	colloids, types of	the article and	
			precipitation	Use of illustration	
8	2 hour	Identify the	Mechanism of	Explanation of	Short oral and written exams
		sedimentation	precipitate formati	the article and	
		mechanism Identify		Use of illustration	
		methods of			
9	2 hour	sedimentation in	Precipitation from	Explanation of	Short oral and written exams
		homogeneous solution	homogeneous	the article and	
			solution, drying an	Use of illustration	
			ignition of		
			precipitate, types		
1.0			organic reagents	T 1 1 0	~
10	2 hour	Identify the gravimetr	Application of	Explanation of	Short oral and written exams
		method applications	gravimetric metho	the article and	
		x		Use of illustratio	
11	2 hour	Learn about the types	types of titration	Explanation of	Short oral and written exams
		titration method and	curves, solubility	the article and	
		now to calculate it	precipitates,	Use of illustration	
10	2 hours	Identify the trace of	Calculation	Explanation of	Short and written average
12	∠ nour	soturation of the	mixtures of onion	Explanation of	short oral and written exams
		saturation of the	mixtures of amon,	Use of illustration	
		mixture and now to	indicators for	Use of mustratio	
		calculate it	indicators for		
			precipitation utrati		
13	2 hour	Recognize how	Complexometric	Explanation of	Short oral and written exams
		complexes are formed	reaction and	the article and	
		and how to correct th	titration, EDTA	Use of	
			titrations. EDTA	illustrations	
			· · · · · · · · · · · · · · · · · · ·		
			equilibrium titrati		
			equilibrium, titration curves		

11 Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports.... etc

12 Learning and Teaching Resources	12 Learning and Teaching Resources					
Required textbooks (curricular books, if any)						
	1-Analytical chemistry, skoog 2 nd edition Fundamentals of analytical chemistry, skoog 8 th edition					
Main references (sources)						
	1- Fundamentals of Analytical Chemistry 9e					
	by Douglas A. Skoog"					
	2-Fundamentals of Analytical Chemistry 8e by					
	Douglas A. Skoog					
Recommended books and references (scientific						
journals, reports)						
Electronic References, Websites						

Course Description Form

	11 Se Nallle:	atography				
	inguital Chemistry - Chronia	ltography				
	Irse Lode:					
	EM 322					
$\frac{3.500}{5.500}$	nester / Year:					
A Description Propagation Date:						
4. Des	$\frac{4.22}{22}$					
<u> </u>	vijable Attendance Former					
J. AVC	inable Attenuance Forms.					
6 Number of Crodit Hours (Total) / Number of Units (Total)						
0. Nul	liber of credit flours (fotal	J / Number of Offics (Total)				
40						
7 (0)	urse administrator's name (mention all if more than one name)				
<u> </u>	ne Dr. Sahar Samir Moham	med Alabdullah				
Em	ail: sahar.alabdullh@nahra	inuniv.edu.ia				
8. Coi	ırse Objectives					
Course Obj	ectives	1 .Knowledge of chromatography				
		concepts and their practical				
		applications in laboratory and public				
		2 How to calculate different				
		concentrations of a group of mixed materials and analyze them				
		electrolyte				
		3. Knowledge of chronographic				
		types				
		4. Know the account				
		Chromatography and its				
		applications				
		5. Quantitative analysis for chemical				
		mixtures in chromatography				
		concept and applications				
9. Tea	ching and Learning Strateg	ies				
tratogy	A- Cognitive goals.					
ualegy	A1. Like learning					
ategy	A2- Attention					
ou ategy		the professor during the lecture				
ou ategy	A3- General Interaction with					
ou ategy	B The skills goals special t	o the course				
u ategy	 B. The skills goals special t B1 - attraction and interact 	tion				
uategy	 A3- General Interaction with B. The skills goals special t B1 - attraction and interact B2 - Questions 	tion				

Teaching and Learning Methods
Power point paper lectures Examples from YouTube and the Internet
Assessment methods
Frequent participation, continuous attendance, daily interaction during lecture time, and daily and monthly exam scores
C. Affective and value goals C1. Attention
C 2. Attendance
C 3. Sending the reasons for the emergency absence
C4. Respect the time of the lectures and delivery of duties on time
D. General and rehabilitative transferred skills(other skills relevant employability and personal development)
D1. Act diplomatically and respect others
D2. Respect for colleagues

10. Course Structure Week Hours Required Unit or subject Learning Evaluation method method Learning name Outcomes introduction 2 Questions chromatography and its Detailed introduction applications, detailed explanation explanation, direct questions students 2 Liquid chromatography Detailed explanation 2 Chromatography Detailed Daily exam explanation 2 chromatography Detailed Lecture explanation 2 Solve problems Gas chromotography Power point and answers 2 Equations Gas chromotography Power point examples 2 electrophoresis Power point 2 Mid exam 11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student daily preparation,

exam after each 4 weeks as monthly

written exams

reports

activities during the course

12. Learning and Teaching Resources

1. Fundamentals of Analytical Chemistry
by Douglas A. Skoog
2. Principles of Instrumental Analysis,
7th Edition
1. Fundamentals of Analytical Chemistry
by Douglas A. Skoog

	2. Principles of instrumental analysis
	(Skoog, Douglas
Recommended books and references	chemical journals
(scientific journals, reports)	Material sciences
	Chromatographic books
Electronic References, Websites	Google scholar

	Course Description Form						
1. Co	1. Course Name: Physical chemistry						
2 Cou	rse Code); ;					
3 Ser	nester / `	Year:					
Second s	semester,	/fourth year					
4 De	scription	Preparation Date:					
7/10/2023)						
5 Av	ailable At	ttendance Forms:					
Attendan	ce time	Cradit Uqura (Total) / N	In the of Unite (To	tal)			
30							
7 Co	urse adr	ministrator's name (m	ention all, if more	than one name)			
Na Em	me: Dr. K ıail: khali	(halida Abaid Samawi ida.samawi@nahrainเ	univ.edu.iq				
8 Co	urse Obje	ectives					
Course Obj	ectives		•	Rotational movem	ient		
			•	Hydrogen atom			
9 Tea	aching an	nd Learning Strategies	· · · · · · · · · · · · · · · · · · ·	1 11. 1 1 . 1	1,1		
Strategy	 Strategy 1- Providing the students with the basics and additional topics related to thinking outcomes 2- Discuss the topics of the lesson that require focus and thinking 3- Ask a set of intellectual questions during the lecture, which motivates the students to focus and conclusions Giving the students homework to motivate them to search by solving the 						
10 Cour	se Struct	ture					
Week	Hours	Required Learning	Unit or subject name	Learning method	Evaluation		
		Outcomes			method		
			- 58				

1	2	introduction to the rotational energy of the molecule, the Schrödinger equation and th wave function	-Rotational motion of a particle -The schrodinger equation and the wave function -Normalization - Quantization of	Explanation and demonstration tools Explanation an demonstration	Short oral and written exams
		- stifle energy A molecule in a spherical surfac	energy - Particle on sphere	tools	
3	2	-Schroedinger equation -Separation of variables	-The schrodinger equation -Separation of variable -The P- equation – Legendre and associated legendre with examples	Explanation an demonstration tools	Shor oral a writte exam
4	2	perfect wave function Physical	-Orthonormality of the P(theta) functions -The comple wave functio (Spherical Harmonic)	Explanation an demonstration tools	Shor oral a writte exam
5	2	-representation rotational oscillator and introduction to angular momentum	-Physical Representation of spherical harmonics -Introduction to angular momentum	Explanation and demonstration tools	Shor oral a writte exam
6	2		Mid Exam	Explanation an demonstration tools	Shor oral a writte exam
			- 59		

7	2	3D Rotation of	-Three dimension	Explanation and	Shor
	ı	Particle with	rotation when the	demonstration	orai a writte
	i	Examples	particle rotates in	tools	exam
	i		the components	ļ	1
0	⊢		-Example	ļ]	ļ]
8	2	Quantum energ	-Quantization of	Explanation an	Short orai and written exams
	ı	angular	energy and	demonstration	
	i	momentum, an	angular	toois	
	ı	split of utatoring	momentum Potation of	ļ	
	ı	molecules	-KOtation of	ļ	1
	ı	ļ	molecules	ļ	
	ı		(rigid rotator		1
9	2	Hvdrogen.	-Hydrogen and	Explanation and	Short oral and
	ı	hvdrogen-like	hvdrogen like	demonstration	written exams
	ı	atoms, and their	atoms	tools	
	ı	eigenvalues	- The energy		1
	i		eigen values	ļ	
10	2	perfect wave	-Complete	Explanation an	Short oral and
	ı	function	wave functio	demonstration	written exams
	ı		or atomic	tools	
	ı		orbitals of	ļ	1
	i		hydrogen like		1
11	⊢		atoms		ļļ
11	2	Importance of	Significance of	Explanation an	
	ı	quantum	the quantum	demonstration	
	ı	numbers II, I, III	numbers n,ı,ıvı	toois	1
12	2	Coordinated	EXamples	Evolution an	Short oral and
14		wave functions	-Normalized nyurogen- like wave functions	demonstration	written exams
	i	hvdrogen-like	-Zeeman effect an	tools	
	i	atoms. Zeeman	magnetic quantun number		
	i	phenomenon, a		ļ	
	i	magnetic	i I	ļ	
	ı	quantum numb	I]		_
13	2	Atomic orbitals	-Atomic orbitals	Explanation an	Short oral and
	i		-Orbitals in real	demonstration	written exams
	i		form	tools	
	<u> </u>		-Example		ļļ
14	2	ļ	Mid Exam	Explanation an	Short oral and written exams
	i		i I	demonstration	William
15				tools	ļ
1.5	5		Mid exam		
	L	1		I	
			- 60		

11 Course Evaluation	
Distributing the score out of 100 according to the tasks a daily oral, monthly, or written exams, reports etc	ssigned to the student such as daily preparation,
12 Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1-Physical chemistry, Peter Atkins 8 th
	edition
	2- Physical chemistry, Peter Atkins 9th edition
Main references (sources)	-
Recommended books and references (scientific journals,	-
reports)	
Electronic References, Websites	-

1	C N			
1.	Course Name	: Physical Chem	istry- Kinetic chemistry	V
		J		/

2. Course Code:

- 3. Semester / Year: 1st Semester/Third Year
- 4. Description Preparation Date:2023-2024

5. Available Attendance Forms: Attendance

- 6. Number of Credit Hours (Total) / Number of Units (Total)/2hours per weak for the theortical and 2hours per weak for the laboratory
 2 hours for (Class lecture)+ 2 hours for (Lab) for 3 groups.
- 7. Course administrator's name (mention all, if more than one name) Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam Email: <u>asmaa.albayaty@nahrainuniv.edu.iq</u>

Lab Stuff:

Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam

Assist.: Eklas Abd Alkadar Lecturer Assistant :Ala'a Abd Al-Razaq

> Lecturer Assistant Doha Abd Al-KAream Lecturer Assistant :Aisha Jamal Jameal Lecturer Assistant Qutban Ibraheam Hussiean

8. Course Objectives

Course Objectives: The main goal of this course to give the basic principle of

Kinetic chemitry and learn how can calculate the rate and order of the reaction and its appliction in chemistry.

9. Teaching and Learning Strategies

Strategy	1- Using the textbook which is available in the Department library a
	its specific for the undergraduate students, and the chapters
	Needed are Ch.22-23.
	2- Give the homework
	3- Present the lecutura and solve the problem for each sections

10. C	ourse S	tructure			
Week	Hours	Required	Unit or subject	Learning	Evaluation
		Learning	name	method	method
		Outcomes			
1	2	Why we study Kinetic chemistry	The name of Subjects will Take during the Semester and why Need to study Kinetic chemistry.	Present the lectures	-
2-5	2	Answer why?	 1-Kinetic 2-Expreation of reaction rate 3- The rate law and Its component 4- Homework 	Present the lectures	Quiz Each Class
6-8	2	Answer why?	 5- Reaction Order a its terminology in chemistry. 6-Determination of reaction order. 7- Determination of order and reaction rate Laws. 8- Homework 	Present the lectures	Quiz

		Answer why?	9- Determina	ation	-	
9-11	2		of rate cons	tant	Present	Quiz
			(K)	ad nata	the	
			I ow of first-	ordor	lectures	
			Reaction	oruer		
			11-Integrate	d rate		
			Law of Secon	nd-		
			Order Reacti	ion		
			12	.011.		
			- Integrated	rate		
			Law of Third	l-order		
			Reaction			
			13- Integrate	ed rate		
			Law of Zero-	-order		
			Reaction			
			14- Half life	time		
			-15 Raction	rate		
			And its			
			Dependency	7		
			On the temp			
12	2			JIK		
			Exam			
10	2		17Theories	of		
15	2		Chemical		Present	Quiz
			Kinetic		the	
			a-Collosion	heory	lectures	
			D-ITANSION L	neory		
14			Fyam			
15	2		Answer ques	stions		
			inswer que			
11.	Course	Evaluation				<u> </u>
Distrib	uting the	score out of 100 ac	cording to the	e tasks a	ssigned to the stud	lent such as daily
prepar	ation, da	ily oral, monthly, or	· written exan	ns, repo	rts etc	2
12.	Learnin	g and Teaching R	esources			
Require	ed textboo	oks (curricular books	, if any)	Phys	ical Chemistry	
Main re	eferences	(sources)		Phys	ical Chemistry	
Recomi		books and refe	rences	-		
scienti	ne journa	is, reports)				
	nia Dofor	ncae Waheitae	1	-		

- 1. Course Name: Electrochemistry
- 2. Course Code:
- 3. Semester / Year: second Semester/Third Year
- 4. Description Preparation Date:2023-2024
- 5. Available Attendance Forms: Attendance
- 6. Number of Credit Hours (Total) / Number of Units (Total)/2hours per weak for the theortical and 2hours per weak for the laboratory
 2 hours for (Class lecture)+ 2 hours for (Lab) for 3 groups.
- 7. Course administrator's name (mention all, if more than one name) Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam Email: <u>asmaa.albayaty@nahrainuniv.edu.iq</u>

Lab Stuff:

Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam

Assist.: Eklas Abd Alkadar Lecturer Assistant :Ala'a Abd Al-Razaq

> Lecturer Assistant Doha Abd Al-KAream Lecturer Assistant :Aisha Jamal Jameal Lecturer Assistant Qutban Ibraheam Hussiean

8. Course Objectives

Course Objectives: The main goal of this course to give the basic principle of

Electrochemistry and learn how can calculate the EMF of the cell and its applictions in chemis

9. Teaching and Learning Strategies

Strategy	1- Using the textbook which is available in the Department library a
	its specific for the undergraduate students, and the chapters
	Needed are Ch.22-23.
	2- Give the homework
	3- Present the lecutura and solve the problem for each sections
	Where is needed.

Neek	Hours	Required	Unit or subject	Learning	Evaluation
		Learning	name	method	method
		Outcomes			
1	2	Why we study Electrochemistry	The name of Subjects will Take during the Semester and why Need to study Electrochemistry.	Present the lectures	_
2-5	2	Answer why?	 1-Electrical conductivity of solutions. 2- equivalent conductance. 3-The Arrhenius Theory of Dissociation 4- Collective properties of Aqueous solutions electrolyte. 5-Dissociation of equilibrium. 	Present the lectures	Quiz Each Class
6-8	2	Answer why?	 Electrolysis and electrode process 7-Transfer Numbers 8-Ionic Conductanc 9- Ionic mobility 10- Applications of conductivity 11- Dielectric constants and the role of solvent 	Present the lectures	Quiz
		Answer whv?			

9-11 2 If a bill of strong bill bill of strong bill bill bill bill bill bill bill bil	Q_11	2		12- Conductance	Present	Ouiz			
Electrolyte. 13-Types of electrodes 14-EMF of Cell 15-Applications of EMF a-Thermodynamic Functions 16-Discuss the Debye-Hukel theor and its applications 17-Types of cells 18-PH definitions a measurements 19-Calculate the Ksp,Kthect.lectures122Exam132Answer questions142 2Exam Answer questions142 2Exam Answer questions	9-11	2		of strong	the	Quiz			
13. Types of electrodes 14- EMF of Cell 15- Applications of EMF a- Thermodynamic Functions 16- Discuss the Debye-Hukel theori and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.122Exam132Answer questions142 2Exam Answer questions142 2Exam Answer questions				Electrolyte.	lectures				
12213214Exam15214ExamAnswer questions				13- Types of					
14- EMF of Cell 15- Applications of EMF a- Thermodynamic Functions 16- Discuss the Debye-Hukel theor; and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.122132142 215211. Course Evaluation				electrodes					
15- Applications of EMF a- Thermodynamic Functions 16- Discuss the Debye-Hukel theory and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.122132142 215211. Course Evaluation				14- EMF of Cell					
EMF a - Thermodynamic Functions 16- Discuss the Debye-Hukel theory and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.122132142 215211. Course Evaluation				15- Applications of					
a- Thermodynamic Functions 16- Discuss the Debye-Hukel theory and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.122132142 215211. Course Evaluation				EMF					
Functions 16- Discuss the Debye-Hukel theory and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.122132142 215211. Course Evaluation				a- Thermodynamic					
16- Discuss the Debye-Hukel theory and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.12213214215211. Course Evaluation				Functions					
Debye-Hukel theor: and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.12213214215211. Course Evaluation				16- Discuss the					
and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.1221321422Exam Answer questions11. Course Evaluation				Debye-Hukel theor					
17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kthect.12213214215211. Course Evaluation				and its applications					
12212213214215211. Course Evaluation	17- Types of cells								
Implements 19- Calculate the Ksp,Kthect.12213214215211. Course Evaluation	18-PH definitions a								
122Exam132Answer questions142Exam152Exam11. Course EvaluationEvaluation	19- Calculate the								
122Exam132Answer questions142Exam152ExamAnswer questionsImage: Answer question statement of the statement of	Ksn.Kthect.								
122Exam132Answer questions142Exam Answer questions11. Course Evaluation	Ksp,Kuieet.								
13 2 Answer questions 14 2 Exam 15 2 Exam 11. Course Evaluation Evaluation	12 2 Exam								
13 2 Answer questions 14 2 Exam 15 2 Exam Answer questions Image: Comparison of the second se									
14 2 15 2 15 2 11. Course Evaluation	13	2		Answer questions					
14 2 Exam 15 2 Exam Answer questions Image: Comparison of the second seco	10	-		L L					
14 2 15 2 11. Course Evaluation	11	2							
15 2 Answer questions 11. Course Evaluation	14	2 2		Exam					
11. Course Evaluation	15	Z		Answer questions					
11. Course Evaluation									
11. Course Evaluation									
	11. Course Evaluation								
Distributing the score out of 100 according to the tasks assigned to the student such as dail	Distrib	uting the	score out of 100 ac	cording to the tasks a	assigned to the stud	ent such as daily			
preparation, daily oral, monthly, or written exams, reports etc									
12. Learning and Teaching Resources									
Dequired to the ake (ourrigular backs if any) Deviced Chemistry	Docuire	d to the -		if any Dhree	vical Chomistry				
required textbooks (curricular books, if any) Physical Cheffistry	Require		iks (curricular books,	rily rilys					
Main references (sources) Physical Chemistry	Main re	ferences	(sources)	Phys	sical Chemistry				
Recommended books and references -	Recomm	nended	books and refer	rences -					
(scientific journals, reports)	(scientif	ic journal	s, reports)						
Electronic References, Websites -	Electror	nic Refere	nces, Websites	-					

Course Nem	2.					
	c. Physical chemistry					
Course Code	s.					
CHFM 241						
Semester / Y	Cilian 241					
Benkster / 1	Second semester /2024					
Description	Prenaration Date:					
Description	1/9/2023					
Available At	tendance Forms:					
Attending lea	ctures+ lab					
Number of C	Credit Hours (Total) / Number of Units (Total)					
30 theory + 3	30 practical lab					
2						
Course admin	nistrator's name (mention all, if more than one name)					
Name: abeer	· khazaal shams					
Email: abeer	.k.shams@nahrainuniv.edu.iq					
Course Obje	ctives					
Teaching and Strategy	 Understanding the fundamental gas laws, including Boyle's law, Charles's law, and Avogadro's law, and their mathematical relationships. Applying gas laws to predict the behavior of ideal gases under different conditions of pressure, volume, and temperature. Solving numerical problems involving gas properties, such as finding unknown variables using the ideal gas equation. Analyzing deviations from ideal gas behavior and understanding the concept of real gases. Exploring the concept of gas mixtures and applying the laws to analyze gas mixtures' properties. Understanding the concept of energy and its various forms, such as internal energy, work, and heat. Applying the First Law to analyze various thermodynamic processes, such as isothermal, adiabatic, and isobaric processes. Evaluating and calculating the energy transfer as work and heat in different systems and processes. Understanding the relationship between the First Law and the concepts of enthalpy and specific heat capacity. Recognizing the importance of the First Law in understanding energy efficiency and energy conservation in various applications and processes. Demonstrating the ability to perform energy calculations and problem-solving exercises involving the First Law of Thermodynamics. Communicating effectively about gas laws and the First Law of Thermodynamics through written reports and presentations. 					
	achieve the objectives of the curriculum through:					

Interactive lessons: These include discussions and interactive exercises that encourage student participation and engagement with the educational content.

Cooperative learning: Relies on student collaboration to solve homework assignments and learning tasks distributed to them.

Self-learning: Involves holding seminars to present and discuss various topics, focusing on motivating students to use available learning resources and develop their self-learning skills.

Use of modern techniques: Includes the use of technological tools such as computing and multimedia in the teaching and learning process.

Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Connect particle behavior to macroscopic properties of the gas. Connect symbolic representations of pressure, temperature, volume, and particle number to model representations and to real- world measurements.	The states of matter and gases laws	Explanatio n and examples	
2	2	Define and explain effusion and diffusion State Graham's law and use it to compute relevant gas properties	The molar volume of a gas, Dalton's Law, Graham's Law of Diffusion and Effusion	Explanatio n and examples	
3	2	Describe the physical factors that lead to deviations from ideal gas behavior	non-ideal gas behavior, The compression factor, Z, Differentiate between Macroscopic and	Explanatio n and examples	

		Explain how these factors are represented in the van der Waals equation Define compressibility (Z) and describe how its variation with pressure reflects non-ideal behavior Quantify non- ideal behavior by comparing computations of gas properties using the ideal gas law and the van der Waals	Microscopic Approaches		
4		(Z) and describe how its variation with pressure reflects non-ideal behavior Quantify non- ideal behavior by comparing computations of gas properties using the ideal gas law and the van der Waals equation Use kinetic	kinetic theory of	Explanatio	
4	2	theory to explain the properties of gases,	gases, Maxwell- Boltzmann distribution curve	examples	
Exam I	2				MIDTERM #1 Duration: 60 min;
6	2	Use thermodynamic terminology correctly. 2. Explain fundamental thermodynamic properties.	Thermodynamic equilibrium,the zero law of thermodynamics,	Explanatio n and examples	
7	2	State the first law of thermodynamic s Define enthalpy and explain its classification as a state function Write and balance	THE FIRST LAW OF THERMODYNA MIC	Explanatio n and examples	

	1		1	1	
		thermochemical			
		equations			
		Calculate			
		enthalpy			
		changes for			
		various			
		chemical			
		reactions			
		Explain Hess's			
		law and use it to			
		compute			
		reaction			
		enthalpies			
8		L L	Seminar	Explanatio	
	2			n and	
				examples	
9		Students will	Thermochemistry	Explanatio	
		understand the	j	n and	
		difference		examples	
		between heat		T	
		and			
		temperature			
		2) Students will			
		understand how			
	2	heat transfers			
		3) Students will			
		be able to			
		distinguish			
		botwoon on			
		and exothermic			
		process.			
		4) Students will			
		be able to			
		identify and			
		explain the			
		effect			
		temperature and			
		heat have on the			
		rate of a			
		chemical			
		reaction			
Exam					MIDTERM #2
II	2				Duration: 60
					min;
11		Explain the	Calorimetry	Explanatio	
		technique of		n and	
	2	calorimetry		examples	
		Calculate and		r r	
		interpret heat			
		and related			
	L		l		1
·	1		Γ	<u>г</u>	
---	--	---	--	--	--
		properties using			
		typical			
		calorimetry data			
12		Understand the	Types of heat of a	Explanatio	
		concept of heat	reaction	n and	
		of reaction.		examples	
		Understand the			
		difference			
		between			
		exothermic and			
	2	endothermic			
	2	reactions.			
		Use heat of			
		reaction in			
		calculations.			
		Use the extent			
		of reaction in			
		heat of reaction			
		calculations.			
13	_		HESS'S LAW,	Explanatio	
	2		Kirchhoff's Law	n and	
1.4		D	TT 7 1 1 1	examples	
14		Describe the	Work done in	Explanatio	
		concepts of	chemical process	n and	
		work done in		examples	
		chemical			
		process			
	2	• Apply			
	2	unermodynamic			
		principles to			
		solve practical			
		problems in			
		physical and			
		systems			
15		5y5101115.	Seminar	Explanatio	
	1	1	Somman		
10	2			n and	
10	2			n and	
	2 Evaluation			n and examples	
Course E	2 Evaluation	10%		n and examples	
Course E Quizzes Midterms	2 Evaluation	10% on 70%		n and examples	
Course E Quizzes Midterms Seminar	2 Evaluation examination	10% on 70% 15%		n and examples	
Course E Quizzes Midterms Seminar Attend	2 Evaluation examination	10% on 70% 15% 5%		n and examples	
Course E Quizzes Midterms Seminar Attend Total	2 Evaluation examination	10% on 70% 15% 5% 100%		n and examples	
Course E Quizzes Midterms Seminar Attend Total	2 Evaluation examination	0n 70% 15% 5% 100% ching Resources		n and examples	
Course E Quizzes Midterms Seminar Attend Total Learning Required	2 Evaluation examination g and Teac textbooks	10% on 70% 15% 5% 100% ching Resources (curricular	Physical Chemistry/	n and examples	9th edition /
Course F Quizzes Midterms Seminar Attend Total Learning Required books if	2 Evaluation examination g and Tead textbooks any)	0n 70% 15% 5% 100% Ching Resources (curricular	Physical Chemistry/ Oxford university r	n and examples	9th edition /
Course F Quizzes Midterms Seminar Attend Total Learning Required books, if	2 Evaluation examination g and Teac textbooks any)	0n 70% 15% 5% 100% ching Resources (curricular	Physical Chemistry/ Oxford university p	n and examples	9th edition /
Course F Quizzes Midterms Seminar Attend Total Learning Required books, if	2 Evaluation examination g and Teac textbooks any)	10% on 70% 15% 5% 100% ching Resources (curricular	Physical Chemistry/ Oxford university p Laidler K.J. Meise	n and examples	9th edition /
Course F Quizzes Midterms Seminar Attend Total Learning Required books, if Main refe	2 Evaluation examination g and Teac textbooks any) erences (so	10% on 70% 15% 5% 100% ching Resources (curricular	Physical Chemistry/ Oxford university p Laidler, K.J.; Meise Physical chemistry/	n and examples P.W.Atkins/ press/ 2009 er,J.H. and Sau 4th edition/ H	9th edition / ctuary, B.C./ loughton Mifflin
Course F Quizzes Midterms Seminar Attend Total Learning Required books, if Main refe	2 Evaluation examination g and Teac textbooks any) erences (so	10% on 70% 15% 5% 100% ching Resources (curricular	Physical Chemistry/ Oxford university p Laidler, K.J.; Meise Physical chemistry/ Co. / N.Y. / 2003	n and examples / P.W.Atkins/ press/ 2009 er,J.H. and Sau 4th edition/ H	9th edition / ctuary, B.C./ loughton Mifflin

Recommended books and references	Haddad, W.M. Thermodynamics: The Unique
(scientific journals, reports)	Universal Science. Entropy 2017, 19, 621.
	https://doi.org/10.3390/e19110621
Electronic References, Websites	https://chem.libretexts.org/Special:FirstLoginWel
	<u>come?return</u> =

	Physical chemistry
Course Code:	
	CHEM 242
Semester / Year:	
	Second semester /2024
Description Preparation	Date:
Available Attendance F	1/9/2023
Attending lectures+ lab	onis.
Number of Credit Hours	(Total) / Number of Units (Total)
30 theory + 30 practical	lab
Course administrator's r	name (mention all, if more than one name)
Name: abeer khazaal sha	ams
Email: abeer.k.shams@1	nahrainuniv.edu.iq
Course Objectives	
Course Objectives	Understand the fundamental concepts of the second and third laws of thermodynamics, including entropy, heat transfer, and energy conversion. Apply thermodynamic principles to analyze and solve problems related to heat engines, refrigeration systems, power generation, and other thermodynamic processes. Explore how substances transition between phases based on changes in temperature and pressure. Study the phase rule, which governs equilibrium conditions in multi-component systems, including one-component and two- component systems and their phase equilibria. Learn about concepts such as vapor-pressure diagrams, temperature- composition diagrams, and phase boundaries. Understand the concept of chemical potential and its role in achieving equilibrium during phase transitions. Estimate the heat of phase transition based on vapor pressures measured at two temperatures, using the Clapeyron and Clausius-Clapeyron equations.
eaching and Learning	Strategies
Strategy Multiple achieve th	methods are used to ensure access to scientific material and ne objectives of the curriculum through:
Interactive encourage content.	e lessons: These include discussions and interactive exercises that student participation and engagement with the educational

Cooperative learning: Relies on student collaboration to solve homework assignments and learning tasks distributed to them.

Self-learning: Involves holding seminars to present and discuss various topics, focusing on motivating students to use available learning resources and develop their self-learning skills.

Use of modern techniques: Includes the use of technological tools such as computing and multimedia in the teaching and learning process.

Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Gases law and first law of thermodynamic	Refreshment of T.D. equations	Explanatio n and examples	
2	2	-Define the second law - calculate the Engine efficiency	Second law of thermodynamic ,carnot engine	Explanatio n and examples	
3	2	Define entropy Calculate the increase of entropy in a system with reversible and irreversible processes Calculate the increasing disorder of a system	Entropy, microscopic definition of entropy, entropy change for a phase transition	Explanatio n and examples	
4	2	Calculate the entropy for different thermodynamic process	The Calculation of Entropy Changes	Explanatio n and examples	
Exam I	2				MIDTERM #1 Duration: 60 min;
6	2	-Define Helmholtz and free energy functions the change in the Helmholtz	Free energy function	Explanatio n and examples	

		energy to the maximum work			
7	2	Using Gibbs– Helmholtz equation	Combining the First and Second Laws, Gibbs– Helmholtz equation,	Explanatio n and examples	
8	2	Rate equilibrium constant	Applications of the free energy function	Explanatio n and examples	
9	2	 (a) Chemical potential for pure substance: (i) pure ideal gases (ii) pure ideal gases (iii) pure real gases. (b) Chemical potential for mixtures of ideal gases - partial molar Gibbs free energy, the fundamental equation of chemical thermodynamics 	Chemical potential , the fundamental equation of chemical thermodynamics	Explanatio n and examples	
Exam II	2				MIDTERM #2 Duration: 60 min;
11	2	 To understand the basics of a one- component phase diagram as a function of temperature and pressure in a closed system. To be able to identify the triple point, the critical point, and four regions: solid, liquid, gas, and a supercritical fluid. 	Phase equilibrium	Explanatio n and examples	

	1	ſ	Γ		
12			Chemical	Explanatio	
			equilibrium,	n and	
				examples	
	2		Thermodynamic		
	2		equilibrium		
			constant		
			Vant Hoff		
			equations		
13			Seminar	Explanatio	
	2			n and	
				examples	
14		Determine the	Thermodynamic	Explanatio	
		Partial molar	description of	n and	
		quantities	mixtures	examples	
		Partial molar			
	2	volume			
	<i>–</i>	Partial molar			
		Gibbs free			
		onors nee			
		chergy			
15			Seminar	Explanatio	
10	2			n and	
	2			examples	
Course H	Evaluation			examples	
Quizzes		10%			
Midterms	examinati	on 70%			
Seminar		15%			
Attend		5%			
Total		100%			
Learning	and Tea	ching Resources			
Required	textbooks	(curricular books.	Physical Chemistr	y/ P.W.Atkins/ 9th edition /	
if any)		· · · · · · · · · · · · · · · · · · ·	Oxford university press/ 2009		
			value of story	r	
Main refe	erences (so	ources)	Laidler, K.J.; Meiser, J.H. and Sauctuary. B.C./		
		,	Physical chemistry/ 4th edition/ Houghton		
			Mifflin Co. / N.Y.	. / 2003	
Recomme	ended boo	ks and references	Haddad WM Th	ermodynamics: The Unique	
(scientific	iournals	reports)	Universal Science	Entropy 2017 19 621	
	Journus,	10pon	https://doi.org/10?	3390/e19110621	
Flectronic	Reference	es Wehsites	https://chem_libret/	exts org/Special FirstLoginWe	
			loomo?roturn-	CAS. OF Z OPCCMT. FISTLOGINWC	

1	Course	Name:	Biochemi	istrv
-	dourse	runic.	Diochenni	July

2 Course Code: CHEM 352

3 Semester / Year: Second / three

4 Description Preparation Date:22/3/2024

5 Available Attendance Forms: Attendance Forms

6 Number of Credit Hours (Total) / Number of Units (Total): 30 hours/ 2 units

7 Course administrator's name (mention all, if more than one name) Name: Assist. Prof. Dr. Farah A. Rashid , Assist. Prof. Dr. suhad AbdulAzeez Ibrahim Email: <u>farah.rashid@nahrainuniv.edu.iq</u>. <u>Suhad.ibrahiem@nahrainuniv.edu.iq</u>

8	8 Course Objectives						
Course	Course Objectives • To let the student know about the fundamental principle of clinical biochemistry. • Focus on how hormones work and clinical analysis of some enzymes						
9 .	9 Teaching and Learning Strategies						
Strategy	 Strategy Providing students with basics and topics related to thinking outcome Discuss the topic of lesson that required thinking and analysis Raise a set of thinking question during lectures, which increases and motivates student to analyze and conclude Giving student homework that requires self-explanation 						
10 Co	ourse St	ructure					
Week	Hours	Required Learning	Unit or subject name	Learning	Evaluation		
		Outcomes		method	method		
1	2	Utilization of Inorga Nitrogen	Nitrogen cycle , Nitro	Explanation by using clarify tools	Short Oral and written exams		
			- 78				

	1				
2	2	Biogenesis of orga	Reductive amination of	Explanation by	Short Oral
		nitrogen	α-	using clarity	and written
			ketoglutarate,Glutamate	tools	exams
			synthase , Giulannie		
			Agnargin Synthetase		
			Carbomvl phosphate		
			svnthetas		
3	2	Aspects of a.a.	1-Metabolic consequence	Explanation by	Short Oral
- -	_	synthesis and	of the absence of nitrogen	using clarify	and written
I		degredation	storage compounds.	tools	exams
			2-Biosynthesis capacities		
			of organisms		
			3- Transamination	- 1 1	~
4	2	A.A. Degradation and metabolism of	1- Common features of A.A.	Explanation by	Short Oral
		nitrogenous compounds	2-Fates of amino acid carbon	using ciarity	and written
			skeleton	loois	exams
E C	2	Urea Cycle	3- [1] Detoxifying and excretion of	Evolution by	Short Oral
Э	2		ammonia	using clarify	and written
			[2] Urea cycle	tools	exams
		N #9 3d	3 4° 34	R # 31	N/P 11
6	2	Midl	Midi	Midi	
7	2	Ketone body formation	ketone metabolism	Explanation	Short Oral
,	2	Ketolysis and			
	2	Ketolysis and ketogenesis		using clarify to	written ex
8	2	Ketolysis and ketogenesis ketosis	ketone metabolism	using clarify to Explanation	written ex Short Oral
8	2	Ketolysis and ketogenesis ketosis	ketone metabolism	using clarify to Explanation using clarify to	written ex Short Oral written ex
8	2 2 2	Ketolysis and ketogenesis ketosis Cholesterol pathway	ketone metabolism Lipid metabolism	using clarify to Explanation using clarify to Explanation	written ex Short Oral written ex Short Oral
8	2 2 2	Ketolysis and ketogenesis ketosis Cholesterol pathway	ketone metabolism Lipid metabolism	using clarify to Explanation using clarify to Explanation using clarify to	written ex Short Oral written ex Short Oral written ex Short Oral
8 9 10	2 2 2 2	Ketolysis and ketogenesis ketosis Cholesterol pathway Salvage pathway, prop: central	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes	using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to	written ex Short Oral written ex Short Oral written ex Short Oral written ex
8 9 10	2 2 2 2	Ketolysis and ketogenesis ketosis Cholesterol pathway Salvage pathway, prpp: central metabolite in	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes	using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to	written ex Short Oral written ex Short Oral written ex Short Oral written ex
8 9 10	2 2 2 2	Ketolysis and ketogenesis ketosis Cholesterol pathway Salvage pathway, prpp: central metabolite in novo and salvage salvage	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes	using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to	written ex Short Oral written ex Short Oral written ex Short Oral written ex
8 9 10	2 2 2 2	Ketolysis ketogenesisand ketogenesisketosisCholesterol pathwaySalvage pathway, prpp:central metabolite in de novo and salvage pathways	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes	using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to	written ex Short Oral written ex Short Oral written ex Short Oral written ex
8 9 10 11	2 2 2 2	KetolysisandketogenesisketosisCholesterol pathwaySalvage pathway,prpp:centralmetabolite in denovo and salvagepathwaysDe novo synthesis of	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway	using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation	written ex Short Oral written ex Short Oral written ex Short Oral written ex
8 9 10 11	2 2 2 2 2	Ketolysis ketogenesisand ketogenesisketosisCholesterol pathwaySalvage pathway, prpp:central metabolite in de novo and salvage pathwaysDe novo synthesis of ATP , GTP	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis	using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to	written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral written ex
8 9 10 11 12	2 2 2 2 2 2 2	Ketolysis ketogenesisand ketogenesisketosisCholesterol pathwaySalvage pathway, prpp:central metabolite in de novo and salvage pathwaysDe novo synthesis of ATP , GTPuric acid formation ,	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis purine degradation, de n	using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation	written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral
8 9 10 11 12	2 2 2 2 2 2 2	Ketolysis ketogenesisand ketogenesisketosisCholesterol pathwaySalvage pathway, prpp:central metabolite in de novo and salvage pathwaysDe novo synthesis of ATP , GTPuric acid formation , uracil and citidin	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis purine degradation, de n synthesis of pyrimidine	using clarify to Explanation using clarify to	written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral written ex
8 9 10 11 12	2 2 2 2 2 2 2	KetolysisandketogenesisketosisCholesterol pathwaySalvage pathway,prpp:centralmetabolite in denovo and salvagepathwaysDe novo synthesis ofATP , GTPuric acid formation ,uracil and citidinformation	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis purine degradation, de n synthesis of pyrimidine	Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to	written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral written ex
8 9 10 11 12 13	2 2 2 2 2 2 2 2	Ketolysis and ketogenesis and ketogenesis and ketosis and Cholesterol pathway and Salvage pathway, prpp: prpp: central metabolite in novo and salvage pathways De novo synthesis of ATP , GTP uric acid formation , uracil and citidin formation of deoxyribonucleoti des deoxyribonucleoti des	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis purine degradation, de no synthesis of pyrimidine Ribonucleotide reductase (RNR)	Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation	written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral written ex Short Oral written ex
8 9 10 11 12 13	2 2 2 2 2 2 2 2	Ketolysis and ketogenesis and ketogenesis ketosis Cholesterol pathway Salvage pathway, prpp: central metabolite in de novo and salvage pathways De novo synthesis of ATP , GTP uric acid formation , uracil and citidin formation Formation of deoxyribonucleotides	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis purine degradation, de n synthesis of pyrimidine Ribonucleotide reductase (RNR)	Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation	written ex Short Oral written ex Short Oral
8 9 10 11 12 13 14	2 2 2 2 2 2 2 2 2	KetolysisandketogenesisketosisCholesterol pathwaySalvage pathway,prpp:centralmetabolite in denovo and salvagepathwaysDe novo synthesis ofATP , GTPuric acid formation ,uracil and citidinformationFormationofdeoxyribonucleoti desNucleotide degrdation	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis purine degradation, de no synthesis of pyrimid ine Ribonucleotide reductase (RNR)	Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to Explanation using clarify to	written ex Short Oral written ex
8 9 10 11 12 13 14 15	2 2 2 2 2 2 2 2 2 2 Mid2	KetolysisandketogenesisketosisCholesterol pathwaySalvage pathway,prpp:centralmetabolite in denovo and salvagepathwaysDe novo synthesis ofATP , GTPuric acid formation ,uracil and citidinformationFormation ofdeoxyribonucleotidesNucleotide degrdationMid2	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis purine degradation, de n synthesis of pyrimidine Ribonucleotide reductase (RNR) Mid2	Explanation using clarify to Explanation using clarify to	written ex Short Oral written ex Mid2
8 9 10 11 12 13 14 15	2 2 2 2 2 2 2 2 2 2 2 2 3 2 2 3 2 2 3 3 2 2 3	KetolysisandketogenesisketosisCholesterol pathwaySalvage pathway,prpp:centralmetabolite in denovo and salvagepathwaysDe novo synthesis ofATP , GTPuric acid formation ,uracil and citidinformationFormationofdeoxyribonucleotidesNucleotide degrdationMid2	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis purine degradation, de no synthesis of pyrimid ine Ribonucleotide reductase (RNR) Mid2	using clarify to Explanation using clarify to	written ex Short Oral written ex Mid2
8 9 10 11 12 13 14 15 11 Co	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 0 1 2 2 2 2	KetolysisandketogenesisketosisCholesterol pathwaySalvage pathway,prpp:centralmetabolite in denovo and salvagepathwaysDe novo synthesis ofATP , GTPuric acid formation ,uracil and citidinformationFormationofdeoxyribonucleoti desNucleotide degrdationMid2/aluation	ketone metabolism Lipid metabolism nucleotide metabolism biosynthetic routes De novo pathway Purin synthesis purine degradation, de no synthesis of pyrimidine Ribonucleotide reductase (RNR) Mid2	Explanation using clarify to Explanation using clarify to Explanation	written ex Short Oral written ex Mid2

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports etc

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	Biochemistry 4th Edition by Christopher Mathews (Author), Kensal van Holde (Author), Dean Appling (Author)
Main references (sources)	Lehninger Principles of Biochemistry, 4th Edition
	by David L. Nelson (Author), Michael M. Cox
Recommended books and references (scientific journals, reports)	Biochemistry. Jeremy M. Berg, John L. Tymoczko, Lubert– International Edition
Electronic References, Websites	https://www.pearson.com/en- gb/highered-students.html

1 Cou	urse Na	me: Biochemist	ry		
2 Co	urse Co	de: CHEM 451			
3 Ser	nester /	/ Year: First/ Fo	nir		
0 001	nester /	I cult i i by i c	/41		
4 De	scriptio	n Preparation I	Date:22/3/2024		
5 Ava	ailable A	Attendance Form	18:		
6 Nur	mber of	Credit Hours (T	otal) / Number of Units	(Total): 30 hour	s/2 units
				(1000). 50 11000	5/ 2 units
7 00					
Name: (Urse au	MINISTRATOLS IN	ame (mention all, II me Pachid Assist Prof	Ore than one ha	ame)
Email: f	arah.ra	shid@nahrainu	ni <u>v.edu.iq</u> . <u>Suhad.ib</u>	ra <u>hiem@nahrai</u>	nuniv.edu.iq
			*		
8 Coi	urse Ob	jectives			
Course Obj	jectives	To let the Focus on	student know about the fundame	ental principle of clinica	l biochemistry.
9 Tea	aching a	ind Learning Str	ategies		
Strategy	•	Providing studer	nts with basics and topics re	lated to thinking ou	tcome
	•	Discuss the topic Raise a set of th	c of lesson that required thin	king and analysis	and motivates
	-	student to analyz	ze and conclude		
		Giving studen	t homework that requires se	lf-explanation	
10 Cour	se Struc	cture			
Week	Hours	Required	Unit or subject name	Learning	Evaluation
		Learning		method	method
		Outcomes			
1	2	Introducing		Explanation	Short Oral and
		Endocrinology	Endocrinology	by using clarify tools	written exams
2	2	Introducing	Pituitary gland	Explanation by	Short Oral and
		students to Pituitary Gland		using clarity tools	written exams
3	2	Introducing	Hormones and	Explanation by	Short Oral and
		the students to	receptors	using clarify	written exams
	II			0015	
81					

	T	1			
		hormones and			
		their receptors			
4	2	Introducing	Adrenal Gland	Explanation by	Short Oral and
		the students to		using clarify	written exams
		adrenal gland		tools	
		and its disease			
5	2	Introducing	Thyroid Gland	Explanation by	Short Oral and
		the students		using clarify	written exams
		to thyroid		tools	
		gland and its			
		disease			
6	2	Mid1	Mid1	Mid1	Mid1
7	2	Introducing	kidney	Explanation	Short Oral
		the students	-	using clarify to	written exams
		to funct io n			
		of kidney			
		and its			
		disease			
8	2	Introducing	The Importance of Na, K,	Explanation	Short Oral
		the students	Assays in Clinical Practice	using clarify to	written exams
		to function			
		of important			
		of Na,K,Cl			
		and its			
0	2	The extent of its	Understanding the chemistry	Euplanation	Showt Oral
9		impact and	sodium electrolyte and its rela	Explanation	Short Oral
		diseases	diseases	using clarity to	whiteh exams
10	2	The extent of its	Understanding the chemi	Explanation	Short Oral
10	2	impact and	of potassium electrolyte	using clarify to	written exams
		diseases	related diseases		
11	2	related to it	Understanding the chemi	Euplanation	Showt Oral
11		impact and	of calcium, phosphate.	explanation	Short Oral
		diseases	magnesium and mat	using clarity to	whiten exams
		related to it	related to them		
12	2	The extent of its	Study of kidney function tes	Explanation	Short Oral
		impact and		using clarify to	written exams
		related to it			
13	2	Functions and	Study of liver chemistry	Explanation	Short Oral
		processes of		using clarify to	written exams
		food			
11	2	The extent of its	Study of liver chemistry and l	Explanation	Short Oral
TT		impact and	function tests	using clarify to	written exams
		diseases			
1 -		related to it	MG2D	Mada	MEd2
15	Z		MIU2		
11 Cour	rse Eva	luation			

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports etc

12 Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Clinical Biochemistry, Zalva, 2 nd edition Lippincott's Illustrated Reviews: Biochemistry Fifth EditionRichard A. Harvey, PhD
Main references (sources)	
Recommended books and references (scientific journals, reports)	Biochemistry. Jeremy M. Berg, John L. Tymoczko, Lubert– International Edition
Electronic References, Websites	Electronic book Clinical Biochemistry, Allan Gaw, Robert A. Crowan, Denis. St. J.O'Reilly, Micheal J. Stewa and James Shepherd, 2 nd edition, Churchill livingstone, UK

1.0	NT						
1 Co	urse Na	me: Biochemis	try				
2 Course Code: CHEM 451							
3 Sei	nester /	/ Year: First/ Fo	nur				
		100111100/10					
4 De	scrintio	n Prenaration l	Date: 22 /3 /2024				
	<u>ber ip tio</u>	III Tepuluton I					
5 Av	ailable	Attendance Forn	1S •				
0 11							
6 Nu	mber of	Credit Hours (T	Total) / Number of Units	(Total): 30 hour	s/ 2 units		
7.00		Iminiatrataria n	ama (mantian all if m	are then one of			
/ CC	Assist F	Prof Dr Farah /	Ame (menuon all, il m A Rashid Assist Prof	Dr Subad abdu	lazeez ibrahim		
Email:	farah.ra	shid@nahrainu	iniv.edu.ig. Suhad.ibi	rahiem@nahrai	nuniv.edu.ig		
8 Co	urse Ob	jectives					
Course Ob	jectives	• To let the	e student know about the fundame	ental principle of clinica	l biochemistry.		
0. To		Focus on	how hormones work and clinical	analysis of some enzyr	nes		
9 Te	aching a	Ind Learning Str		1 4 1 4 41 1 1			
Strategy	•	Discuss the topi	c of lesson that required thin	king and analysis	licome		
	•	Raise a set of th	inking question during lectur	res, which increases	s and motivates		
		student to analyz	ze and conclude t homework that requires se	If explanation			
		Giving studen	a nonework that requires se				
10 Cour	se Stru	cture					
Week	Hours	Required	Unit or subject name	Learning	Evaluation		
		Learning		method	method		
		Outcomes					
1	2	Introducing		Explanation	Short Oral and		
		students to	Endocrinology	by using	written exams		
2	2	Introducing	Pituitary gland	Explanation by	Short Oral and		
		students to		using clarify	written exams		
3	2	Introducing	Hormones and	Explanation by	Short Oral and		
		the students to	receptors	using clarify	written exams		
		hormones and		tools			
			<u> </u>	<u> </u>			
			84				

4	2	Introducing the students to adrenal gland and its disease	Adrenal Gland	Explanation by using clarify tools	Short Oral and written exams
5	2	Introducing the students to thyroid gland and its disease	Thyroid Gland	Explanation by using clarify tools	Short Oral and written exams
6	2	Mid1	Mid1	Mid1	Mid1
7	2	Introducing the students to funct io n of kidney and its disease	kidney	Explanation using clarify to	Short Oral written exams
8	2	Introducing the students to function of important of Na,K,Cl and its disease	The Importance of Na, K, Assays in Clinical Practice	Explanation using clarify to	Short Oral written exams
9	2	The extent of its impact and diseases related to it	Understanding the chemistry sodium electrolyte and its rela diseases	Explanation using clarify to	Short Oral written exams
10	2	The extent of its impact and diseases related to it	Understanding the chemi of potassium electrolyte related diseases	Explanation using clarify to	Short Oral written exams
11	2	The extent of its impact and diseases related to it	Understanding the chemi of calcium, phosphate, magnesium and mat related to them	Explanation using clarify to	Short Oral written exams
12	2	The extent of its impact and diseases related to it	Study of kidney function tes	Explanation using clarify to	Short Oral written exams
13	2	Functions and processes of food metabolism	Study of liver chemistry	Explanation using clarify to	Short Oral written exams
14	2	The extent of its impact and diseases related to it	Study of liver chemistry and l function tests	Explanation using clarify to	Short Oral written exams
15	2	Mid2	Mid2	Mid2	Mid2
11 Cou	urse Eva	luation		·	
Distribut preparat	ing the s ion, daily	score out of 100 a r oral, monthly, or v	ccording to the tasks ass vritten exams, reports e	igned to the stud tc	ent such as daily
12Lea	irning ar	nd Teaching Reso	ources		

Required textbooks (curricular books, if any)	Clinical Biochemistry, Zalva, 2 nd edition
	Lippincott's Illustrated Reviews:
	Biochemistry Fifth EditionRichard A.
	Harvey, PhD
Main references (sources)	
Recommended books and references (scientific	Biochemistry. Jeremy M. Berg, John L. Tymoczko,
journals, reports)	Lubert– International Edition
Electronic References, Websites	Electronic book
	Clinical Biochemistry, Allan Gaw, Robert A.
	Crowan, Denis. St. J.O'Reilly, Micheal J. Stewa
	and James Shepherd, 2 nd edition, Churchill
	livingstone, UK

1 Co	ırse Nam	e:			
			Geology		
2 Coi	urse Code	יב	deology		
	<u>1100 0000</u>	~			
3 Ser	nester / Y	lear:			
		1 st	Semester / 2023	-2024	
4 De	scription	Preparation	Date:		
			23/3/2024		
5 Ava	ailable Att	tendance For	ms:		
			In Class		
6 Nu	mber of C	redit Hours (Total) / Number of	Units (Total)	
			30 h/ 2 units		
7 Co	urse adm	inistrator's	name (mention al	I, if more that	n one name)
Na	me: Must	afa Sabih Ab	dallh		
Em	all: <u>must</u>	afa.abdallh@	<u>vnahrainuniv.edu</u>	<u>.10</u>	
0.0					
8 Co	urse Obje	ctives			
Course Ob	jectives		• Intro	ducing student to	principles of geology
9 Tea	aching an	d Learning S	trategies		
011		Lourning C			
Strategy		Scientific Educatic	videos		
			viceos		
10 Cour	se Structi				
		ıre			
Week	Hours	Jre Required	Unit or subject	Learning	Evaluation
Week	Hours	Required	Unit or subject	Learning	Evaluation
Week	Hours	Required	Unit or subject name	Learning method	Evaluation method
Week	Hours	Jre Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week	Hours	Required Learning Outcomes	Unit or subject name Introduction to geolo	Learning method Lec.	Evaluation method
Week 1 2 2	Hours	Required Learning Outcomes	Unit or subject name Introduction to geolo Geology and sciences	Learning method Lec. Lec. and videos	Evaluation method Students presentation
Week 1 2 3	Hours 2 2 2 2	Required Learning Outcomes	Unit or subject name Introduction to geolo Geology and sciences Earth format hypothesis	Learning method Lec. Lec. and videos Lec. and videos	Evaluation method Students presentation HW
Week 1 2 3 4	Hours 2 2 2 2 2 2 2	Ure Required Learning Outcomes	Unit or subject name Introduction to geolo Geology and sciences Earth format hypothesis Earth spheres	Learning method Lec. Lec. and videos Lec. and videos Lec. and videos	Evaluation method Students presentation HW Quiz
Week 1 2 3 4 5	Hours 2 2 2 2 2 2 2 2 2 2 2 2 2	Required Learning Outcomes	Unit or subject name Introduction to geolo Geology and sciences Earth format hypothesis Earth spheres Exam	Learning method Lec. Lec. and videos Lec. and videos Lec. and videos	Evaluation method Students presentation HW Quiz
Week 1 2 3 4 5 6-7	Hours 2 4	Jre Required Learning Outcomes	Unit or subject name Introduction to geolo Geology and sciences Earth format hypothesis Earth spheres Exam Metals	Learning method Lec. Lec. and videos Lec. and videos Lec. and videos	Evaluation method Students presentation HW Quiz
Week 1 2 3 4 5 6-7 8-9	Hours 2 2 2 2 2 2 2 4 4	Jre Required Learning Outcomes	Unit or subject name Introduction to geolo Geology and sciences Earth format hypothesis Earth spheres Exam Metals crystallography	Learning method Lec. Lec. and videos Lec. and videos Lec. and videos Lec. and videos	Evaluation method Students presentation HW Quiz Quiz HW
Week 1 1 2 3 4 5 6-7 8-9 10	Hours 2 2 2 2 2 2 2 2 2 2 2 2 4 2	Ure Required Learning Outcomes	Unit or subject name Introduction to geolo Geology and sciences Earth format hypothesis Earth spheres Exam Metals crystallography Introduction on realse guals	Learning method Lec. Lec. and videos Lec. and videos Lec. and videos Lec. and videos Lec. and videos	Evaluation method Students presentation HW Quiz Quiz HW Students presentation
Week 1 2 3 4 5 6-7 8-9 10 11-12	Hours 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 4 4 2 4	Jre Required Learning Outcomes	Unit or subject name Introduction to geolo Geology and sciences Earth format hypothesis Earth spheres Exam Metals crystallography Introduction on rocks cycle Presentation	Learning method Lec. Lec. and videos Lec. and videos Lec. and videos Lec. and videos Lec. and videos Lec. and videos	Evaluation method Students presentation HW Quiz Quiz HW Students presentation
Week 1 2 3 4 5 6-7 8-9 10 11-12 13	Hours 2 2 2 2 2 2 2 2 2 2 2 2 4 4 2 4 2	Ure Required Learning Outcomes	Unit or subject name Introduction to geolo Geology and sciences Earth format hypothesis Earth spheres Exam Metals crystallography Introduction on rocks cycle Presentation	Learning method Lec. Lec. and videos Lec. and videos Lec. and videos Lec. and videos Lec. and videos Lec. and videos Lec. and videos	Evaluation method Students presentation HW Quiz Quiz Quiz HW Students presentation

14	2		Sedime	ntary rocks	Lec.	Students presentation
11 Cours	se Evalua	tion				
daily oral, a written exa presentatio Final exam	attendance ams: 25% on: 10% : 60%	and home w	ork: 5%			
12 Learr	ning and T	eaching Re	sources	5		
Required te	extbooks (cu	rricular books	s, if any)	An Introduc Matthew D. Mosher, 20	tion to Geolo <u>g</u> Affolter, Paul 17	y, Chris Johnson, Inkenbrandt, Cam
Main refere	nces (sourc	es)		Earle, S. (2 BCcampus.	2015). Physica	<i>l Geology</i> . Victoria, B
Recommen	ded book	s and ref	erences	The journal	of geology	
(scientific jo	ournals, repo	orts)				
Electronic F	References,	Websites		Elsevier Wikipedia		

1 Course Name:

			Industrial Chemistr	17	
2 Cou	irse Code	<u>.</u>	indusu lai Chennisu	у	
2 000			CHEM 462		
3 Sen	nester / Y	Year:			
	,	2 nd	^d Semester / 2023-2	024	
4 Des	scription	Preparation	n Date:		
			23/3/2024		
5 Ava	ailable At	tendance For	rms:		
	1 0.0		In Class		
6 Nui	mber of C	Credit Hours	(Total) / Number of U	nits (Total)	
			30 h/ 3 units		
7 0	ursoadr	ninistrator's	name (mention all	if more than a	ne name)
<u> </u>	me∙ Must	afa Sahih Ar	name (mention all, dallh		ne name)
Em	ail: must	afa.abdallh@	nahrainuniv.edu.io	I	
	<u></u>			ŧ	
8 Coi	urse Obje	ctives			
Course Obi	, iectives		Princip	les of industrial	chemistry
			Introdu	icing students to	the theories that
			a desc	cription of bond	ing method bet
				-	0
			monon	ners and polymeri	ic structures
			• The re	ners and polymeri action mechanism	ic structures as and techniques
			• The re	ners and polymeri action mechanism	ic structures as and techniques
9 Tea	aching an	d Learning S	• The re	ners and polymeri action mechanism	ic structures as and techniques
9 Tea Strategy	aching an	d Learning S Scientific 	trategies	ners and polymeri action mechanism	ic structures as and techniques
9 Tea Strategy	aching an	d Learning S Scientific Electroni 	trategies c lecture ic lectures	ners and polymeri action mechanism	ic structures as and techniques
9 Tea Strategy	aching an	d Learning S Scientific Electroni Educatio 	trategies c lecture ic lectures nal videos	ners and polymeri action mechanism	ic structures as and techniques
9 Tea Strategy	aching an	d Learning S Scientific Electroni Educatio 	trategies c lecture c lectures nal videos	ners and polymeri action mechanism	ic structures as and techniques
9 Tea Strategy 10 Cours	aching an	d Learning S Scientific Electroni Educatio 	trategies c lecture c lectures nal videos	ners and polymeri action mechanism	ic structures as and techniques
9 Tea Strategy 10 Cours Week	aching an se Structu Hours	d Learning S Scientific Electroni Educatio Jre Required	monom The reserved trategies c lectures nal videos Unit or subject	Learning	Evaluation
9 Tea Strategy 10 Cours Week	aching an se Structu Hours	d Learning S Scientific Electroni Educatio Required Learning	monom The reserve to the reserve to	Learning method	Evaluation method
9 Tea Strategy 10 Cours Week	aching an se Structu Hours	d Learning S Scientific Electroni Educatio Ure Required Learning Outcomes	trategies e lecture ic lectures nal videos Unit or subject name	Learning method	Evaluation method
9 Tea Strategy 10 Cours Week	aching an se Structu Hours	d Learning S Scientific Electroni Educatio Required Learning Outcomes	trategies e lecture ic lectures nal videos Unit or subject name Polymers-basic	Learning method	Evaluation method
9 Tea Strategy 10 Cours Week	aching an se Structu Hours	d Learning S Scientific Electroni Educatio Required Learning Outcomes	monon The residuation of the residuation	Learning method Lec. videos Lec.	Evaluation method
9 Tea Strategy 10 Cours Week	aching an se Structu Hours 2 2	d Learning S Scientific Electroni Educatio Required Learning Outcomes	monon The residuant of the formation of the residuant of the res	Learning method Lec. videos Lec. videos	Evaluation method Quiz/ HW
9 Tea Strategy 10 Cours Week 1 2 3	aching an se Structu Hours 2 2 2	d Learning S Scientific Electroni Educatio Required Learning Outcomes 	 monon The residual interval in the residual interval inte	Learning method Lec. videos Lec. videos Lec. videos	Evaluation method Quiz/ HW
9 Tea Strategy 10 Cours Week 1 2 3 4	aching an se Structu Hours 2 2 2 2 2	d Learning S Scientific Electroni Educatio Required Learning Outcomes 	 monon The residual of the residual o	Learning method Lec. videos Lec. videos Lec. videos Lec. videos Lec.	Evaluation method Quiz/ HW Quiz Quiz
9 Tea Strategy 10 Cours Week 1 2 3 4	aching an se Structu Hours 2 2 2 2	d Learning S Scientific Electroni Educatio Ure Required Learning Outcomes 	 monon The residual in the residual i	Learning method Lec. videos Lec. videos Lec. videos Lec. videos	Evaluation method Quiz/ HW Quiz Quiz
9 Tea Strategy 10 Cours Week 1 2 3 4 5-6	aching an se Structu Hours 2 2 2 2 4	d Learning S Scientific Electroni Educatio Ure Required Learning Outcomes 	 monon The residual of the residual o	Learning method Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos	Evaluation method Quiz/HW Quiz Quiz/Hw
9 Tea Strategy 10 Cours Week 1 2 3 4 5-6 7-8	aching an se Structu Hours 2 2 2 2 2 4 4	d Learning S Scientific Electroni Educatio Required Learning Outcomes 	 monon The residual interval int	Learning method Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec. videos Lec.	Evaluation method Quiz/HW Quiz Quiz Quiz/Hw

9	2			Exam		
10-1	4			Polymerization	Lec.	Quiz
				technique	videos	
12	2			Presentation	Group	
					discussion	
13	2			Degradation,	Lec.	
				Stability,	videos	
				Environmental		
				Issues		
11 Cours	se Evalua	tion				
written exa Laboratory Final exam 12 Learr	ims: 20% r: 15% : 60% iing and T	eaching	Resources			
Required te	xthooks (ci	urricular bo	oks if any)	Ali M. F. El	A. B. M. & Speigh	t I.G.
r toquir ou to				(2005) Handk	ook of industrial ch	omistry
				(2005). Hunal		
				Organic chem	<i>icals</i> . New York: M	lcGraw-Hill.
Main refere	nces (sourc	(ع <u>م</u> ر		Manas Chanda	. Introduction to P	olvmer Science
Main referen		,00)		Chemistry, CF	RC Press Taylor & F	Francis Group
Recommend	ded book	s and	references	Polymer chemi	istry, Macromolecul	les
				-	-	
(scientific jo	urnals, rep	orts)				
Electronic R	eferences.	Websites		Elsevier		
	,			Wikipedia		

1 Course Name: Industrial Chemistry	
1 Course Ivanie. Industrial Chemistry	
2 Course Code: CHEM 362	
3 Semester / Year: 2 nd / 3 rd	
4 Description Preparation Date: 22/03/2024	4
	1 1
5 Available Attendance Forms: Physical ar	id online
6 Number of Credit Hours (Total) / Numbe	er of Units (Total): 30hrs.
7 Course administrator's name (mention all	if more then one name)
Name: Khalid Waleed Younus Zainulabd	een
Email: Khalid.waleed21@nahrainuniv.ed	u.iq
8 Course Objectives	
	 chemistry, including the composition, properties, and behavior of hydrocarbons and other organic compounds found in crude oil and natural gas reservoirs. Explore the processes involved in the formation, migration, and accumulation of petroleum and natur gas deposits within geological formations, and the factors influencing their distribution and characteristics. Examine the principles of petroleum refining, including the various unit operations and processes used to convert crude oil into valuable products such as gasoline, diesel, jet fuel, and petrochemical feedstoot. Analyze the chemical reactions and transformations occurring during petroleum refining processes, such distillation, cracking, reforming, hydrotreating, and catalytic conversion, and their impact on product quality and yield. Investigate the properties and applications of petroleum-based products and derivatives, including fuels, lubricants, solvents, polymers, and specialty chemicals, and their role in various industries and sectors of the economy. Explore the environmental and sustainability aspect petroleum chemistry, including the impact of petroleum extraction, refining, and utilization on air and water quality, climate change, and ecosystem health, and the strategies for mitigating adverse effer and promoting sustainable practices. Develop critical thinking and problem-solving skills through laboratory experiments, case studies, and research projects related to petroleum chemistry, an apply theoretical knowledge to practical applications and real-world challenges in the petroleum industry.

	 Enhance communication and teamwork skills by engaging in group discussions, presentations, and collaborative projects, and effectively communicate scientific findings and recommendations to diverse stakeholders, including peers, industry professionals and the public. Foster a deeper appreciation for the interdisciplinary nature of petroleum chemistry, and its intersections with geology, engineering, environmental science, economics, and policy, and the importance of interdisciplinary collaboration in addressing comple energy and environmental challenges.
9 Teaching an	d Learning Strategies
Strategy 1. 2. 3. 4. 5. 5. 6. 7. 8. 9. 9.	Lectures: Traditional lectures delivered by the instructor provide foundational knowledge and theoretical concepts in petroleum chemistry. Lectures may incorporate multimedia presentations, visual aids, and real-world examples to enhance understanding and engagement. Laboratory Work: Hands-on laboratory experiments allow students to apply theoretical concepts learned in lectures to practical settings. Laboratory work may include chemical analysis of crude oil and petroleum products, characterization of hydrocarbon properties, and simulation of refining processes. Case Studies: Case studies present real-world scenarios and challenges encountered in petroleum industry, encouraging students to apply critical thinking and problem-solving skills to analyze and propose solutions. Case studies may cover topics such as exploration and production, refining operations, environmental impact assessment, and regulatory compliance. Group Projects: Collaborative group projects enable students to work together to investigate specific topics or problems related to petroleum chemistry. Group projects may involve literature reviews, data analysis, experimental design, and presentation of findings to the class or industry professionals. Field Trips: Field trips when possible, to petroleum facilities, refineries, or research laboratories provide students with firsthand exposure to industry practices, technologies, and challenges. Field trips offer valuable insights into the practical applications of petroleum chemistry and foster connections between academic learning and real-world experiences. Guest Lectures: Inviting guest speakers when possible, from industry, academia, or government agencies to deliver lectures or presentations on specialized topics enriches the learning experience and provides students with diverse perspectives and insights into current trends, research, and career opportunities in the field of petroleum chemistry. Online Resources: Supplemental online resources, such as multimedia presentations, interdiciplin

10 Cours	se Structi	ire			
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1- 2:	2	Introduction to Petroleum Chemistry	Introduction to Petroleu Chemistry	Physical & online	Quiz & Exam
_		 Overview of the petroleum industry and its significance Basic concepts in organic chemistry releva to petroleum Introduction to hydrocarbons and petroleur products 	Che mistry		
		Petroleum Formation and Reservoirs	Petroleu	Physical & online	Quiz & Exam
Week 3- 4:	2	-Geological processes involved in the formation of petroleum -Types of petroleum reservoirs and their characteristics	Formatio n and Reservoir s	e onmie	
		-Exploration and drilling techniques in the petroleum industry		D1 1 1	0.0.5
Week 5- 6:	2	-Chemical composition and Properties -Chemical composition of crude oil and nat gas -Physical and chemical properties of hydrocarbons -Methods for analyzing crude oil composition Patroloum Pafining Processor	Crude Oil Composit ion and Propertie s	Physical & online	Quiz & Exan
Week 7- 8:	2	-Overview of petroleum refining operations -Distillation and fractional distillation -Catalytic cracking, hydrocracking, and reforming processes Refinery Products and Applications	Petroleu m Refining Processes Refinery Products	Physical & online Physical & online	Quiz & Exan
Week 9- 10	2	 -Classification and properties of petroleum products -Applications of fuels, lubricants, solvents, petrochemicals -Quality control and specifications for petroleum products Environmental and Sustainability Aspec 	and Applicati ons Environme l and	Physical & online	Quiz & Exam
Week 11- 12:	2	 -Environmental impact of petroleum extraction, refining, and utilization -Strategies for minimizing pollution and mitigating environmental risks. -Sustainable practices in the petroleum industry -Emerging Technologies and Future Trends 	Sustainabil Aspects		
			Innovation petroleum	Physical & online	Quiz & Exam

Week 13- 14:	2	Innovations in petroleum chemistry a refining technology -Alternative fuels and renewable energy sources -Challenges and opportunities in the fut the petroleum industry	ind chemistry a refining technology	Diversity	
Week 15:	2	Review and Integration -Review of key concepts and topics cov throughout the course -Integration of knowledge from lectures laboratory work, and assignments -Preparation for final assessments and examinations	ered ,	& online	Quiz & Exam
11 0		·			
Distributing	the scor	e out of 100 according to the tasks assign	ed to the student	such as daily	preparation,
 Dational Actional Actiona	iny Prepa endance mpletion ily Oral F ticipation ility to ar poratory V formance curacy of ality of la nthly or sessment izzes, mic ports and mpletion ality of c al Exam: mprehens aluation c	and active participation in class discussion of assigned readings, homework, and pre Presentations: 5% in oral presentations, discussions, and de ticulate and communicate ideas effective Work: 15% e and participation in laboratory experime 5 data collection, analysis, and interpretation boratory reports and documentation Written Exams: 10% s covering course material from lectures, d-term exams, or periodic written assess Assignments: 5% and submission of written assignments, r ontent, analysis, organization, and presen 60% sive assessment covering all course material f knowledge retention, understanding, ar	ns and activities -class exercises ebates during class ly. nts and exercises on readings, and labor nents esearch papers, of tation ial. d application	ss pratory work r projects	
Required te	xtbooks	(curricular books. if any)	(2022). Petrole	um Chemistr	v. doi:
			10.1201/978100	3277354-1	
Main refere	ences (so ded book	urces) s and references (scientific	(2022). The Ch Products. doi: Shahryar, Jafar the Petroleum J	emistry of O 10.1515/978 inejad. (2017 ndustry do	il and Petroleum 3110694529). Introduction to i: 10 1016/B978-
			12-809243-9.00 Vladimir, N., K Ravilya, Z., Sat petroleum hydr	001-8 Coshelev., V., fieva. (2000). ocarbons. Di	, D., Ryabov., Chemistry of rections in resea

	Chemistry and Technology of Fuels and Oils, doi: 10.1007/BF02725255
Electronic References, Websites	Crude Oil Lesson 1 - Crude Oil, Hydrocarbor and Alkanes (youtube.com) Crude Oil Lesson 2 - Fractional Distillation (youtube.com) Crude Oil Lesson 3 - Cracking (youtube.com)

1. Course Name: Pollution

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2. C	ourse	Code:			
3. Se	emest	er / Year: 2023-20	24		
4. D	escrip	tion Preparation D	ate: 21/3/2024		
5. A	vailabl	e Attendance Forms	s: Class Attendance	e	
6. N	umber	of Credit Hours (To	otal) / Number of U	Units (Total) 3	30 hr
7. C N E	ourse ame: <i>I</i> mail: a	administrator's na Assist. Prof. Dr. Ath atheel.alwash@nah	<mark>me (mention all,</mark> eel Hassan Kadhi rain.univ.edu.iq	<u>if more than</u> m	one name)
8. C	ourse	Objectives			
	_		concepts 2-Give th of the cau pollutants 3- Giving t imiting the and soil po	of air, water and e student an acc ses of air, soil a he student an id e causes of wate llutants.	l soil pollutants. surate description and water ea about reducir r, air
9. T	eachin	ig and Learning Stra	itegies		
Strategy	-	Providing studen topics related to Forming discuss Ask the students	ts with the basics and thinking outcomes ion groups during the a set of thinking que	additional lectures to disc stions during th	euss
	-	lectures such as Giving students he	what, how, when and omework that requires	self-explanatio	e topics ns
10. 0	- - >ourse	lectures such as Giving students he Structure	what, how, when and omework that requires	why for specific self-explanatio	e topics ns
10. G Week H	> > ourse	lectures such as Giving students he Structure Required Learning	what, how, when and omework that requires Unit or subject	Learning	e topics ns Evaluation

	1				1
1	2	Introduce students to the basic concepts of pollution	Definition of air, pollution, classification	data show	Oral and written exams
2	2	Introduce students to the basic concepts of pollution	Air pollution Acid Rain	data show	Oral and written exams
3	2	Introduce students to the basic concepts of pollution	Water pollution And its sources	data show	Oral and written exams
4	2	Introduce students to the basic concepts of pollution	Water pollution treatments by activated carbon and membrane	data show	Oral and written exams
5	2	Introduce students to the basic concepts of pollution	Water hardness and their removal methods, groundwater, sources	data show	Oral and written exams
6	2	Introduce students to the basic concepts of pollution	Mid exam	data show	Oral and written exams
7	2	Introduce students to the basic concepts of pollution	Soil Pollution	data show	Oral and written exams
8	2	Introduce students to the basic concepts of pollution	Examples of soil pollution and treatment method	data show	Oral and written exams
9	2	Introduce students to the basic concepts of pollution	Plastic Pollution	data show	Oral and written exams
10	2	Introduce students to the basic concepts of pollution	Photodegradation of plastic	data show	Oral and written exams
11	2	Introduce students to the basic concepts of pollution	Indoor pollution.	data show	Oral and written exams
12	2	Introduce students to the basic concepts of pollution	Mid Exam	data show	Oral and written exams
13	2	Introduce students to the basic concepts of pollution	Municipal waste	data show	Oral and written exams
14	2	Introduce students to the basic concepts of pollution	Recycling of waste	data show	Oral and written exams
15		Introduce students to the b concepts of pollution	Review sections of course		

11. Course Evaluation	11. Course Evaluation				
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports etc					
50 Score of the mid exams					
25 Score for quizzes					
10 for home works					
12. Learning and Teaching Resources					
Required textbooks (curricular books, if a	Required textbooks (curricular books, if ar				
Main references (sources)	Air pollution a Pollution: Caus Harrison).	and its contro es, Effects and	ol (S.C. Bhat Control(Roy		
Recommended books and references					
(scientific journals, reports)					
Electronic References, Websites	Different	sources from	internet		

1	Course Name:
_	

Mathematics

2 Course Code:

3 Semester / Year:

First / Second

4 Description Preparation Date:

2024

5 Available Attendance Forms:

Physical attendance

6 Number of Credit Hours (Total) / Number of Units (Total)

60 ours/ 4 Units

7 Course administrator's name (mention all, if more than one name) Name: Dr. Fatimah Al-Taie

Email: fatimah.altaie@nahrainuniv.edu.iq

8 Course Objectives

Course Objectives
 Learning the basic concepts of mathematics, application in reality, solution of ordinary differential equations with first-, and higher-order and their applications. In addition, different classes of ODEs are considered.

9 Teaching and Learning Strategies

Strategy The learning and teaching strategy is presented by: Providing the students with a sufficient amount of mathematical terms and definitions by attending lectures and presenting on the whiteboard to connect the students with the lecturer to solve as many real-life applications as possible. The pdf lectures, homework, quizzes, and exercises are shared on Google Classroom.

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-2	8	Introduction to DE'	Definition and classification of	lectures	

			Differential Equations (DE's)	
3-6	16	First-order DE's	Methods for solving fi order ODE's	lectures
7-9	12	Higher DE's	The general form of higher-order DE's	lectures
10-11	8	Homogeneous DE's	Definition and method on solving homo. DE's	lectures
12-13	8	Nonhomogeneous DE's	Definition, properties, and methods of solvin non-homo. DE's	lectures
14-15	8	Laplace transform	Definition/properties of Laplace transform and then using Laplace transformation in solv DE's	lectures

Course Evaluation

Pre-final exam: 40%

(Quizzes, homework: 10%, Mid-Exams 30%).

Final exam: 60%

Total: 100%

Learning and Teaching Resources			
Required textbooks (curric			
books, if any)	Earl D. Rainville and Phillip E. Bedient, Elementary Differential Equations, Collier Macmillan Publishers, fifth Edition, New York, 1974.		
Main references (sources)	 [1] C. Henry Edwards and David E. Penney, Differential Equations and Linear Algebra, ser. Pearson International Edition, third edition. Pearson Education, United States of America, 2010. [2] William E. Boyce, and Richard C. DiPrima, Elementary Differential Equations and Boundary Value Problems, John Wiley and Sons, Inc. Seventh edition, United State of America. 2001 		
Recommended books			
and references (scientific	Applications of ODE's		
journals, reports)			
Electronic Reference			
Websites	 1- Google.com 2- https://www.khanacademy.org/math/differential-equations 		