



Course Specifications

Course Title:	Inorganic Reaction Mechanism and Spectra
Course Code:	4024573-2
Program:	Chemistry
Department:	Department of Chemistry
College:	Faculty of Applied Science
Institution:	Umm Al-Qura University

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A. Course Identification

1. Credit hours:
2. Course type a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/> b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: 7 th level / 4 th year
4. Pre-requisites for this course (if any): Coordination Chemistry
5. Co-requisites for this course (if any): None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	75 %
2	Blended	---	---
3	E-learning	---	25%
4	Distance learning	---	---
5	Other	---	---

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	0
3	Tutorial	0
4	Others (E-learning + Exams + office hours)	10
	Total	32

B. Course Objectives and Learning Outcomes

1. Course Description: This course is focused in main principles of inorganic reaction mechanisms and spectra such as rate Laws, labile and inert complexes, mechanism of substitution reactions, trans effect, mechanism for oxidation-reduction reactions, electronic spectra of transition metal complexes, and their energy level diagrams.
2. Course Main Objective By the end of the study of this course students, will be aware fully with: a. The basic concepts of mechanism of inorganic reactions, including the substitution reactions of the ligands and some oxidation & reduction reactions. b. The basic concepts of the vibrational and electronic spectra of the transition metal complexes, which includes the charge transfer and ligand-field spectra.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding:	
1.1	Recognize several concepts and principles related to inorganic reaction mechanism such as complex geometries.	K1
1.2	Recall the history and aims of studying inorganic reaction mechanism.	K1
1.3	Describe the electronic spectra of transition metal complexes and Russell Saunders coupling effects.	K1
1.4	Outline the chemical behavior of inorganic compounds during chemical reactions.	K2
2	Skills:	
2.1	Apply the rate Laws for studying several inorganic chemistry reactions.	S1
2.2	Compare between labile and inert complexes	S2
2.3	Predict the mechanisms of substitution reactions in octahedral complexes - dissociation and association mechanisms.	S2
2.4	Use computers and internet to find all information related to mechanisms of inorganic compounds reactions	S5
3	Values:	
3.1	Work individually to use the on-line libraries for searching and interpreting the course topics.	V2
3.2	Work individually and in a team to predict the mechanism of inorganic reactions	V3

C. Course Content

No	List of Topics	Contact Hours
1	Introduction on the basic concepts of inorganic reaction mechanism.	2
2	The rate Laws for several inorganic chemistry reactions.	2
3	Labile and inert complexes	2
4	Reaction mechanisms of ligand substitution.	2
5	Substitution reactions in square planar complexes, trans effect and the theories for it's explanation.	2
6	Midterm exam	1
7	Reactions include the substitution of coordinating water.	2
8	Methods studying complexes reactions-octahedral & square- planar	2
9	Substitution reactions in octahedral complexes - dissociation and association mechanisms - equilibrium reactions.	2
10	Aqueous ionic complexes, step wise complex formation, factors affecting the stability of complexes, acids and bases.	2
11	Mechanism for oxidation-reduction reaction, inner sphere and outer sphere reactions.	2
12	Introduction in electronic transitions within the complexes	3E
	Electronic transitions in different structures	3E
	Final exam	2
Total		31

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Recognize several concepts and principles related to inorganic reaction mechanism such as complex geometries.	- Lectures using new techniques. - Meeting individual students and groups to solve their problems related to the course.	- Midterm Exam - Activities - Discussion in groups - Final Exam
1.2	Recall the history and aims of studying inorganic reaction mechanism.		
1.3	Describe the behavior of substitution in different geometries of complexes		
1.4	Outline the chemical behavior of inorganic compounds during chemical reactions.		
1.5	Knowing the types of electronic transitions in the complexes	E-learning.	Assignments on blackboard
2.0	Skills		
2.1	Apply the rate Laws for studying several inorganic chemistry reactions.	- Lectures using new techniques.	- Discussing and evaluating the topics
2.2	Compare between labile and inert complexes	- Assigning research questions	that students learn from their textbooks
2.3	Predict the mechanisms of substitution reactions in octahedral complexes - dissociation and association mechanisms.	Lectures using new techniques. Collecting and analyzing data.	- Midterm Exam - Final Exam
2.4	Use computers and internet to find all information related to mechanisms of inorganic compounds reactions	Summarizing the findings of the online research - Class discussions. - Using Internet to create learning activities.	- Individual assignments or oral exam for developing/solving a task - Assignments on blackboard
3.0	Values		
3.1	Work individually to use the on-line libraries for searching and interpreting the course topics.	- Using computer science in finishing reports and other related subjects	- Follow up the project progress - Evaluation of the duties associated with the appropriate use of communication skills
3.2	Work individually and in a team to predict the mechanism of inorganic reactions	- Group working. - Mini seminars prepared by the	- Assessments of student's assignments

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		students to present their team projects or reports. - Visiting the University library and different web-sites to obtain some related subjects	- evaluate solving the equations and problems related to subjects

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments and activities	All weeks	10 %
2	E-learning	All weeks	10 %
3	Mid-term Exam	6	30 %
4	Final Exam (2 hours exam)	12	50 %

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Two office hours per week for each group of students.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	<ul style="list-style-type: none"> • Robert B. Jordan, Reaction mechanisms of inorganic and organometallic systems, 3rd , Oxford University press, 2007. • Smiljko Asperger, Chemical kinetics and inorganic reaction mechanisms, 2ed, Kluwer Academic / Plenum Publisher 2003. • Kazuo Nakamoto, Infrared and Raman Spectra Of Inorganic And Coordination Compounds, John Wiley & Sons , 2009.
Essential References Materials	<ul style="list-style-type: none"> • "Kinetics and Mechanisms of Reaction of Transition Metal Complexes," Ralph G. Wilkins, 2nd Thoroughly Revised Edition, VCH Publishers, 1992, ISBN 9783527282531 (Online book access at http://onlinelibrary.wiley.com/book/10.1002/3527600825) • "Ligand Substitution Processes," C.H. Langford and H.B. Gray, W.A. Benjamin, Inc., 1966 (Online book access at http://caltechbook.library.caltech.edu/100/1/Langford_Lsp.pdf)

	Lecture Synopsis at http://www.chem.ox.ac.uk/icl/dermot/mechanism1/
Electronic Materials	<ul style="list-style-type: none"> • Isisdraw and Chemdraw and Chemoffice • -MS-Office Software • http://scholle.oc.uni-kiel.de/herges/modeling/gliederung.html • http://phycomp.technion.ac.il/~ira/types.html
Other Learning Materials	Non

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	A classroom containing at multi seats and equipped with projector and Internet access (scheduled for 2 hours once a week).
Technology Resources (AV, data show, Smart Board, software, etc.)	Common computer labs connected directly with internet are available for all students with high speed internet access
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Programs for chemical applications.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course learning outcomes.	Peer Reviewer	Checking selected exam papers, and student assignments.
Effectiveness of teaching and assessment.	Program Leaders	Reviewing of final exams and the student's degrees in different exams.
Quality of learning resources	Students	Periodically, completing the questionnaire evaluation of the course.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Quality committee and department Council
Reference No.	1 st meeting
Date	2021

Head of Chemistry Department



Dr Moataz Morad

