هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Lanthanides & Actinides**
Course Code:	**424CHEM3**
Program:	**Bachelor in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**
Version:	**T104 2022**
Last Revision Date:	**1 January 2023**

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3h				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	Level 12 Year 4				
4. Course general Description					

Course Title	Course Number	Contact Hours (CH)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Lanthanides & Actinides	424CHEM3	2	1	3	4	10	322CHEM4

The course aims to give the students basic information about the Solution chemistry, Debye Hückel theory, conductivity measurements and its application, Transport numbers and Ion association

Course objectives: They are to identify the following.

- *Become acquainted with the theory and assumptions of Debye - Hückel*
- *Become acquainted with the electrolytic conductivities and their applications*
- *Become acquainted with the theory of diffusion and transport numbers and implications*
- *Identify Ion Association and the various theories that have addressed ion association.*

Syllabus: A-Theoretical contents

a) *The scientific content of the theoretical part*:
- *Debye – Hückel theory, Concentration and activity, Electrolytic conductance, Ionic association, Properties of electrolytic conductance, diffusion theory, Transport numbers, Theories of ion association, Bjerrum theory, Brönsted theory, Fuoss theory, Different methods for measurements of ion association*.

b) *The scientific content of the practical part*:
- *Some selected experiments in the field of chemical kinetics, thermo chemistry and solution chemistry.*

Syllabus: A-Practical contents

Experimental work illustrating selected parts of the theoretical content.

5. Pre-requirements for this course (if any): ***322CHEM***

6. Co- requirements for this course (if any): ***None***

7. Course Main Objective(s)

The course aims to give the students basic information about the Solution chemistry, Debye Hückel theory, conductivity measurements and its application, Transport numbers and Ion association

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	22
2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	44

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding; (Upon completion of the course, student will be able to)			
1.1	*Demonstrate abroad knowledge and understanding on the properties, occurrence, separation and uses of lanthanides and actinides*	K(1.1)	***lecture / discussion Seminars /presentation***	***Objective question***
1.2	*Describe the radioactivity of unstable isotopes, fission and*	K(1.2)	***lecture / discussion /***	Essay question

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	fusion reactions and their applications. *(M)*		***Seminars /Individual presentation***	
2.0	Skills: (Upon completion of the course, student will be able to)			
2.1	*Demonstrate the knowledge and skills required to solve problems in the nuclear equation, radioactivity half-life, decay series, fission and fusion.*	S(2.1)	***lecture / discussion / Seminars /Individual presentation***	Solving Problems
2.2	Practice the experimental skills and to write a report in laboratory representing the obtained results. *(M)*	S(2.2)	***Lab work, group work***	***Objective question, Essay question,*** ***lab report rubric***
2.3	Follow proper procedures and regulations for safe handling and use of chemicals.	S(2.3)	***lab demonstrations / hands-on student learning activities***	***Safety exam***
3.0	Values, autonomy, and responsibility; (Upon completion of the course, student will be able to)			
3.1	*Working as group leader and as a member of a team in Lab. (M)*	V(3.1)	***lab demonstrations / whole group and small group discussion***	***Practical group work Rubric***

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction Electronic structure, oxidation states, abundance, extraction and uses of lanthanides.	***2***
2.	Separation of the lanthanide elements.	***2***

3.	Chemical properties of (+iii), (+iv) and (+ii) lanthanides compounds.	2
4.	Colour and spectra of lanthanides.	1
5.	Magnetic properties, lanthanide contraction and complexes.	2
6.	Electronic structure, oxidation states and occurrence of actinides.	2
7.	Preparation of actinides.	1
8.	General properties of actinides.	1
9.	Occurrence, extraction and chemical properties of thorium and uranium.	2
10.	Structure, forces and stability of the nucleus.	1
11.	Modes of decay, half-life period, binding energy and nuclear stability	2
12.	Nuclear fission, nuclear power stations, moderators and types of reactors.	2
13.	Nuclear fusion and some applications of radioactive isotopes.	2
14.	Selected Experiments related to course topics.	22
Total		44

D. Students Assessment Activities

No	Assessment Activities *		Assessment timing (in week no)	Percentage of Total Assessment Score
1.	*Homework assignment*		*2-6*	*2 %*
2.	*Lecture Quizzes*		*4-6*	*3 %*
3.	*Mid-term exam*		*6-8*	*15 %*
4.	*Practical work*	*LAB Sheet*	*10*	*5 %*
5.		*Quiz in Safety*	*10-11*	*4%*
6.		*Final practical exam*	*11*	*7 %*
7.		*Lab report*	*2-10*	*8 %*
8.		*Group work evaluation*	*2-10*	*6%*
9.	*Final Exam*		*12-14*	*50 %*
	Total			*100 %*

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	1. Lee, J. D. (2009) Concise Inorganic Chemistry, 5 th Edition Authorized Reprint Published by Blackwell Science Limited, France. 2. F. Albert Cotton, Geoffrey Wilkinson, Paul L. Gaus. Basic Inorganic Chemistry, 3rd Edition ISBN: 978-0-471-50532-7 January 1995,
Supportive References	1. Simon A. Cotton, (2013) Lanthanide and Actinide Chemistry, Macmillan Education, 204p.

	2. Walter D. Loveland, David J. Morrissey, Glenn T. Seaborg (2017) Modern Nuclear Chemistry, John Wiley & Sons.
Electronic Materials	• https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry • https://www.britannica.com/science/lanthanum https://byjus.com/jee/f-block-elements/
Other Learning Materials	• https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Book%3A_Introductory_Chemistry_(CK-12)/06%3A_The_Periodic_Table/6.14%3A_Lanthanides_and_Actinides https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=Lanhanides+and+actinides&type=wiki

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students
Technology equipment (Projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (Depending on the nature of the specialty)	none

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect
Effectiveness of students' assessment	Instructor & Course coordinator	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	Indirect
The extent to which CLOs have been achieved	Assessment committee	Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Chemistry Department Council **CHEMS2301**
REFERENCE NO.	**CHEMS230104**
DATE	**11/1/2023G – 18/06/1444H**

H. Attachments

1- Practical Work

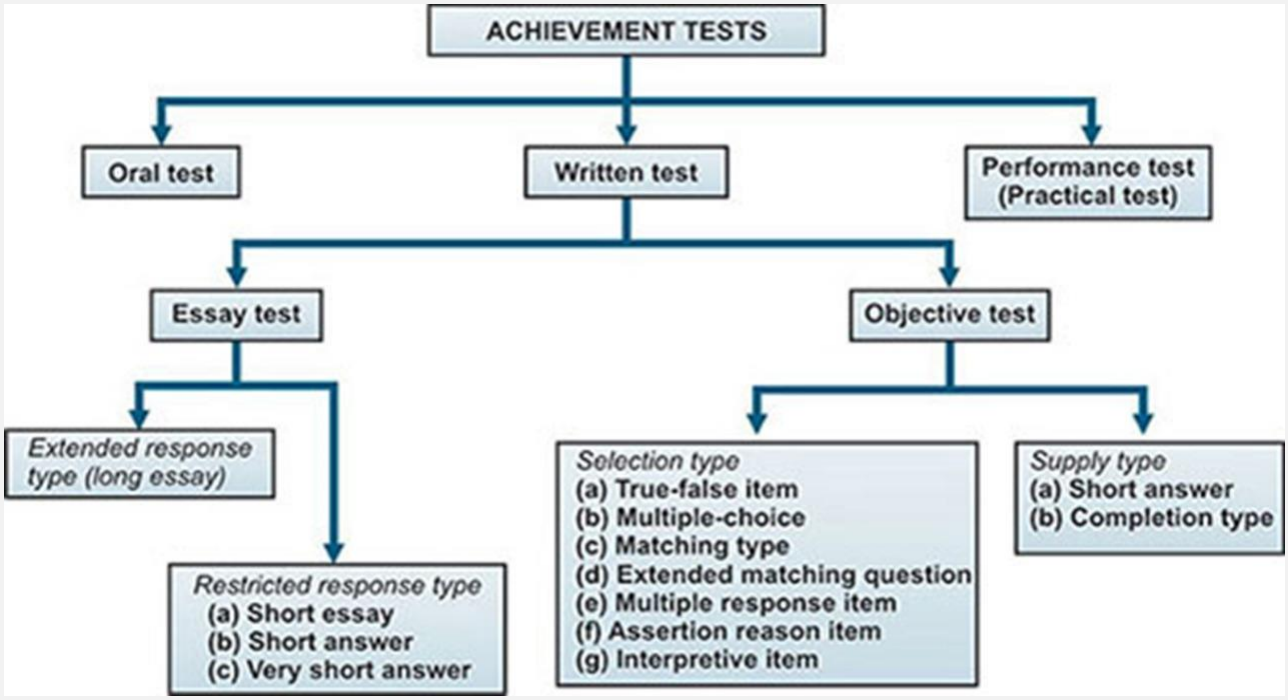
#	EXPERMENTS	Equipment, Chemicals and Tools.	No of weeks for each experiment
1	Introduction and lab safety		One week
2	The Structure of Atoms	Theoretical calculation	One weeks
3	Chemical Periodicity	Theoretical calculation	One weeks
4	Chemical Bonding	Theoretical calculation	Two weeks
5	Exam	Theoretical calculation	One week
6	Molecular Structure and Covalent Bonding Theories	Theoretical calculation	Two weeks
7	Coordination Compounds	Theoretical calculation	Two weeks
8	Revision		One week
9	Final Exam		One week

2- Blue Print

Course Name	Lanthanides & Actinides
Course Code	424CHEM -3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	**1.1**	**1.2**	**2.1**	**2.2**	**2.3**	**2.4**	**3.1**	**3.2**
Marks	**10**	**18**	**42**	**20**	**4**	**--**	**6**	**--**

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	**1.1 (10 M)**	Quiz	MCQ	**2**	**2**	**1**
			Mid term	MCQ	**8**	**4**	**2**
			Final Exam	MCQ	**14**	**7**	**7**
	K2	**1.2 (18 M)**	Quiz	Q&A	**2**	**2**	**1**
			Mid term	Q&A	**4**	**4**	**4**
			Final Exam	Q&A	**7**	**13**	**13**
Skills	S1	**2.1 (42 M)**	H.W	Solving Problems	**2**	**2**	**2**
			Quiz	Solving Problems	**2**	**2**	**1**
			Mid term	Compare Solving problems	**2** **3**	**3** **6**	**9**
			Final Exam	Compare Solving problems	**4** **6**	**12** **18**	**30**
	S2	**2.2 (20 M)**	Practical Sheet	MCQ	**2**	**2**	**2**
				Q&A	**3**	**3**	**3**
			Lab Report	Lab Rubric	**5**	**5**	**8**
			Final Lab Exam	I Task experiment	**7**	**7**	**7**
	S3	**2.3 (4 M)**	Safety Exam	MCQ	**8**	**4**	**4**
Value	V1	**3.1 (6 M)**	Continuous assessment	Group evaluation rubric	**1**	**6**	**6**
TOTAL		**100**					100


ACHIEVEMENT TESTS
Oral test
Written test
Performance test (Practical test)
Essay test
Objective test
Extended response type (long essay)
Restricted response type
(a) Short essay
(b) Short answer
(c) Very short answer
Selection type
(a) True-false item
(b) Multiple-choice
(c) Matching type
(d) Extended matching question
(e) Multiple response item
(f) Assertion reason item
(g) Interpretive item
Supply type
(a) Short answer
(b) Completion type