هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Chemistry of Transition Elements**
Course Code:	**CHEM 322-4**
Program:	**Bachelor of Science in Chemistry**
Department:	**Chemistry**
College:	**College of Science**
Institution:	**Jazan University (JU)**

Table of Contents

A. Course Identification

1. Credit hours: 4 hrs Workload: 230.5 ECTS: 8.2
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: L 5 , Year 3
4. Pre-requisites for this course (if any)**:** **CHEM 221-4**
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& lab**	45 +30	100
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	45
2	**Laboratory/Studio**	30
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	75

B. Course Objectives and Learning Outcomes

1. Course Description

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre-requisite*
		Lec.	*Prac.*				
Chemistry of Transition Elements	CHEM 322-4	3	2	4	3rd	5th	CHEM 221-4

Course objectives: They are to identify the following.

1. Recognizing the transition elements.
2. Recognizing the properties of these elements.
3. Recognizing the bond theories of the complexes.
4. Using the molecular orbital theory.

Syllabus: A-Theoretical contents

Chemistry of transition elements – General properties of transition elements – Alloys – Molecular spectrum – Magnetic properties – Chemical equilibrium – Introduction to theories which describe the electronic bonding of the complexes.

Syllabus: B-Practical contents

Selected experiments related to preparing and studying of double salts and complexes.

*See attachment

2. Course Main Objective

This course aims to study the transition elements (d-block elements) and recognize their chemical and physical properties, and their various uses.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	*Demonstrate abroad knowledge and understanding on the properties, extraction and uses of the transition elements (d-block elements).* *(P)*	K.1
1.2	*Describe the theories dealing with the formation of transition element complexes, magnetic properties, color, …… etc.* *(P)*	K.2
2	**Skills :**	
2.1	*Demonstrate the knowledge and skills required to solve problems in interpreting the properties and measurements of transition elements compounds.* *(P)*	S.1
2.2	*Apply their experimental basics and skills to use laboratory equipment, modern instrumentation, and classical techniques for carrying out experiments to prepare and analyze of transition elements' compounds and to write a report representing the scientific data.* *(P)*	S.2
2.3	*Examine his material and lab safety background to follow proper procedures and regulations for safe handling and use of chemicals.* *(I)*	S.3
2.4	*Make effective use of communication, and online technology about transition elements topics in order to improve their basic knowledge in writing with a good verbal and clear scientific language.* *(I)*	S.4
3	**Values:**	
3.1	Work as a group member or a leader in cooperation with other colleagues. *(I)*	C.1

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to the Transition elements and their general properties.	12
2	Introduction to the different theories explaining the formation of complexes.	9
3	- Properties and uses of the scandium group's elements. - Properties, extraction and uses of the titanium group's elements.	3
4	Properties and uses of the chromium group's elements.	3
5	Properties and uses of the manganese group's elements.	3
6	Properties and uses of the Iron group's elements.	3
7	Properties and uses of the cobalt group's elements.	3
8	Properties and uses of the nickel group's elements.	3
9	Properties and uses of the copper group's elements.	3
10	Properties and uses of the zinc group's elements.	3
	Selected Experiments related to course topics.	30
Total		75

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	*Demonstrate abroad knowledge on the properties, extraction and uses of the transition elements (d-block elements). (P)*	Lecture Open discussion in class	MCQ Short answer Q Fill-in the Blank
1.2	*Describe the theories dealing with the formation of transition element complexes, magnetic properties, color , …… etc. (P)*	Lecture Open discussion in class	MCQ Short answer Q Fill-in the Blank
2.0	**Skills**		
2.1	*Demonstrate the knowledge and skills required to solve problems in interpreting the properties and measurements of transition elements compounds. (P)*	Lecture Open discussion in class Web-based work	MCQ Short answer Q Fill-in the Blank
2.2	*Apply their experimental basics and skills to use laboratory equipment, modern instrumentation, and classical techniques for carrying out experiments to prepare and analyze of transition elements' compounds and to write a report representing the scientific data. (P)*	Lab work Group work	MCQ Short answer Q Practical Exam
2.3	*Examine his material and lab safety background to follow proper procedures and regulations for safe handling and use of chemicals. (I)*	Group work Lab work	MCQ in safety
2.4	make effective use of communication, and online technology about transition elements topics in order to improve their basic knowledge in writing with	ppt. Presentations Group discussion	Presentation

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	a good verbal and clear scientific language. *(I)*		
3.0	**Values**		
3.1	Work as a group member or leader in cooperation with other colleagues. *(I)*	Lab work Group discussion Research group	Practical assignments Laboratory reports Web based research

2. Assessment Tasks for Students

#	Assessment task*		Week Due	Percentage of Total Assessment Score
1	**Lecture Quizzes**		**5, 8**	**3**
2	**Homework assignment**		**10**	**2**
3	**Mid-term exam**		**12**	**15**
4	**Quiz in safety**		**12**	0
5	**ppt. Presentation**		**12**	0
6	**Practical work**	**Lab report/Notebook**	**13**	**5**
7		**Sheet**	**14**	**10**
8		**Final Experiment**	**14**	**15**
9	**Final Exam**		**16**	**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:

The instructor will be available for academic counseling on daily basis for 2h/day during office hours.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1- *Concise Inorganic Chemistry, J. D. Lee, 5TH ED, Wiley India Pvt. Limited, 2008.* 2- العناصر الانتقالية الأساسية وكيمياء التناسق، د. حسين محمد عبدالفتاح، د. سمير أبو القاسم عبداللطيف، الطبعة الثانية، دار -النشر الدولى 2012
Essential References Materials	1- *Inorganic Chemistry: Principles of Structure and Reactivity, Okhil K. Medhi, James E. Huheey, Richard L. Keiter, Ellen A. Keiter, 4th Ed., Pearson Education Singapore Pte Ltd., 2006.* 2- *Advanced Inorganic Chemistry, Author: Cotton Wilkinson Murillo Bochmann, 6th Edition, Wiley India Pvt Ltd., 2012.*
Electronic Materials	1. https://www.chemguide.co.uk/inorganic/transition/features.html 2. https://www.britannica.com/science/transition-metal/Discovery-of-the-transition-metals#ref81115
Other Learning Materials	1. https://en.wikipedia.org/wiki/Transition_metal 2. https://chemistry1science.blogspot.com/p/blog-page_31.html

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	1 Lecture room for groups of 50 students. 1 Laboratory for group of 25 students
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, smart Board, ChemDraw, power point and ActivInspire.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	1. Porcelain crucibles 2. Goosh crucibles 3. Water Jet Pump 4. Magnetic susceptibility balance 5. UV-Vis Spectrophotometer

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and Assessment	Student	Likert-type Survey (CES) Indirect
Extent of achievement of course learning outcomes	Instructor & Course coordinator	Class room evaluation (direct & indirect)
Quality of learning resources	Program coordinator	Indirect
Exam Quality assessment	Assessment committee	Indirect

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	**Chemistry Department Council**
Reference No.	42 / 35 /102 112
Date	17 /09 /1442 Corresponding to 28 / 04 /2021

* **Practical contents**

No	*Title of Experiment*	*Tools, Chemicals, and equipment Needed in Experiments*	Remarks
1	General rules of safety		
2	Preparation of nickel ammonium sulphate	Glassware - Nickel(II)sulphate hexa-hydrate - Ammonium sulphate.	
3	Determination of nickel as the dimethylglyoximate	Glassware -1 % alcoholic solution of dimethylglyoxime - HCl (1:1) - Ammonia solution (1:1)	
4	Determination of sulphate as barium sulphate	Glassware - Barium chloride solution (5%) - Concentrated hydrochloric acid.	
5	Calculating of the empirical and the chemical formula of the double salt		
6	Preparation of copper ammonium sulphate	Glassware - Copper(II)sulphate penta-hydrate. Ammonium sulphate and Acetone.	
7	Determination of copper iodometrically	Glassware - (0.1 N) sodium thiosulphate. Potassium iodide (solid). Starch solution.	
8	Determination of sulphate as barium sulphate	Glassware -Barium chloride solution (5%) - Concentrated hydrochloric acid.	
9	Calculating of the empirical and the chemical formula of the double salt		
10-13	Synthesis and characterization of potassium trisoxalatochromate(III) trihydrate	Glassware -Potassium dichromate- Potassium oxalate monohydrate- Oxalic acid dehydrate- Sodium hydroxide- Sulphuric acid- Potassium permanganate- Silver nitrate- Oxalic acid- Ammonoium persulphate- Potassium iodide-Starch solution-Sodium thiosulphate	
14-	Preparation of cis and trans-dichloro bis (ethylenediamine) cobalt (III) chloride	Glassware -Cobalt(II) chloride hexahydrate Ethylenediamine-Hydrochloric acid- Ethylalcohol-Diethylether	
15	FINAL EXAM		