Course Specification
(Bachelor)

Course Title:	Chemistry of Transition Elements
Course Code:	CHEM 322-4
Program:	Bachelor of Science in Chemistry
Department:	Physical Sciences
College:	College of Science
Institution:	Jazan University (JU)
Version:	TP 153 2024
Last Revision Date:	5/5/2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (4hrs)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered:	***(Level 5 Year 3)***				

4. Course general Description:

4. Course general 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*

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

Course objectives: They are to identify the following.

- ***Recognizing the transition elements.***
- ***Recognizing the properties of these elements.***
- ***Recognizing the bond theories of the complexes.***
- ***Using the molecular orbital theory.***

Syllabus: A-Theoretical contents

a) ***The scientific content of the theoretical part:***

- ***Definition of the transition elements - their location in the periodic table and their electronic structure - the general properties of their compounds – the double salts and coordination compounds – Werner's work - the effective atomic number rule - the valence bond theory - the crystal field theory– Tetragonal distortion of octahedral complexes (Jahn- Teller distortion) – Square planar complexes - Tetrahedral complexes- The properties, extraction and uses of the ten groups of the transition elements.***

b) ***The scientific content of the practical part:***

- ***Selected experiments for the preparation and identification of compounds and complexes of transitional elements and the study of their properties and their composition by the various physiochemical methods.***

Syllabus: A-Practical contents

Experimental work illustrating selected parts of the theoretical content.

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

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6. Co-requisites for this course (if any)**:**

None

7. Course Main Objective(s):

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

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		75

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 on the properties, extraction and uses of the transition elements (d-block elements). (P)	K(1.1)	*Lecture / Open discussion in class*	*Objective Questions*
1.2	Describe the theories dealing with the formation of transition element complexes, magnetic properties, color , …… etc. (P)	K(1.2)	*Lecture / Open discussion in class*	*Objective questions, Essay questions*

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
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 interpreting the properties and measurements of transition elements compounds. (P)	S(2.1)	lecture / Open discussion in class	Essay questions, Solving problems
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)	Lab work, group work	Objective question, Essay question, Practical Exam, lab report rubric
2.3	Examine his material and lab safety background to follow proper procedures and regulations for safe handling and use of chemicals. (I)	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 a group leader in cooperation with other colleagues. (P)	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 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
11.	Selected Experiments related to course topics.	30
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	***Lecture Quizzes***	***3-8***	***3 %***
2.	***Homework assignment***	***8***	***2 %***
3.	***Mid-term exam***	***9-12***	***15 %***
4.	***LAB Sheet***	***15***	***5 %***
5.	***Quiz in Safety***	***15***	***3%***
6.	***Final practical exam***	***15***	***9 %***
7.	***Lab report***	***2-14***	***10 %***
8.	***Group work evaluation***	***2-14***	***3%***
9.	***Final Exam***	***16-17***	***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-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**
Supportive References	**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	**Some course contents and materials are posted on Black board sites**
Other Learning Materials	**http://www.chemguide.co.uk/inorganic/transition/features.html** **http://www.chem.iitb.ac.in/~rmv/ch102/ic3.pdf**

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		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physical Sciences Department Council
REFERENCE NO.	Psci2415
DATE	28/03/1446 Corresponding to 1 / 10 /2024

H. Attachments

1- Practical Work

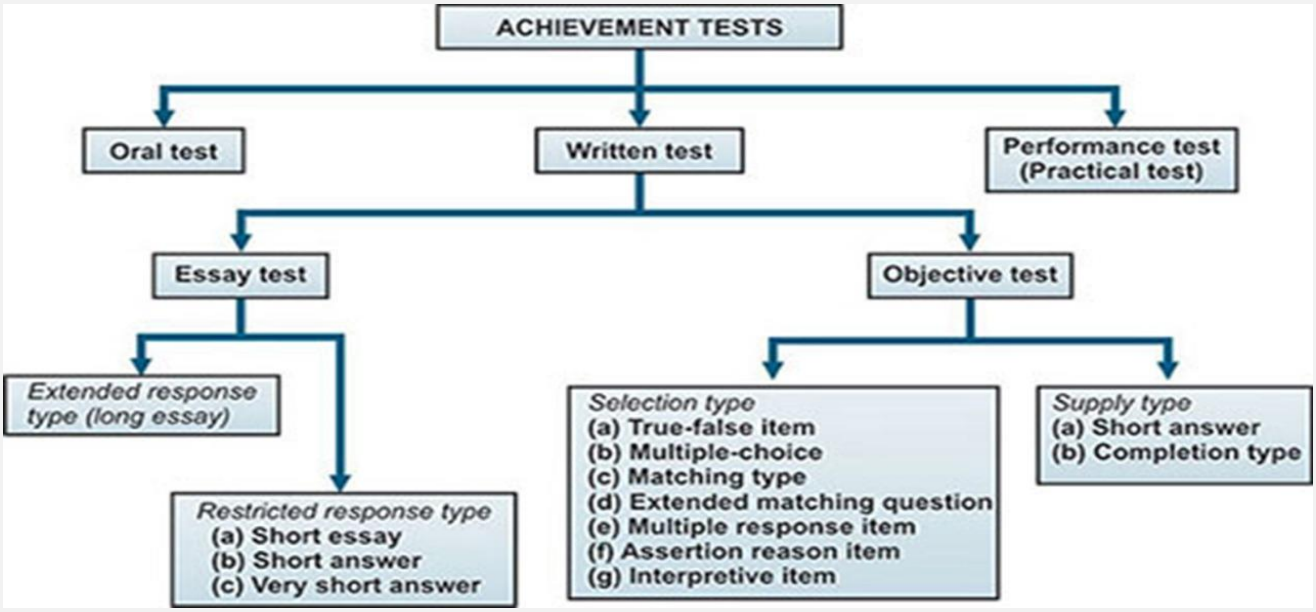
Week	EXPERMENTAL TITLE	Chemicals and Apparatus used	Remarks
1	Safety and regulations		
2	Preparation of nickel ammonium sulphate	Glassware - Nickel(II)sulphate hexa-hydrate - Ammonium sulphate.	None
3	Determination of nickel as the dimethylglyoximate	Glassware -1 % alcoholic solution of dimethylglyoxime - HCl (1:1) - Ammonia solution (1:1)	None
4	Determination of sulphate as barium sulphate	Glassware - Barium chloride solution (5%) - Concentrated hydrochloric acid.	None
5	Calculating of the empirical and the chemical formula of the double salt		None
6	Preparation of copper ammonium sulphate	Glassware - Copper(II)sulphate penta-hydrate. Ammonium sulphate and Acetone.	None
7	Determination of copper iodometrically	Glassware - (0.1 N) sodium thiosulphate. Potassium iodide (solid). Starch solution.	None
8	Determination of sulphate as barium sulphate	Glassware -Barium chloride solution (5%) - Concentrated hydrochloric acid.	None
9	Calculating of the empirical and the chemical formula of the double salt		None
10	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	None
11			
12	Preparation of cis and trans-dichloro bis (ethylenediamine) cobalt (III) chloride	Glassware -Cobalt(II) chloride hexahydrate Ethylenediamine-Hydrochloric acid- Ethylalcohol-Diethylether	None
13			

2- Blue Print

Course Name	Chemistry of Transition Elements
Course Code	CHEM 322-4

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	16	20	34	24	3	--	3	---

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (16M)	Quiz	Objective Q*	10	10	1
			Mid term	Objective Q	1	6	3
			Final Exam	Objective Q	1	12	12
	K2	1.2 (20M)	Quiz	Objective Q	10	10	2
			Mid term	Objective Q Essay Q**	1	10	5
			Final Exam	Objective Q Essay Q	1	13	13
Skills	S1	2.1 (34M)	H.W	Essay Q Solving Problems	4	10	2
			Mid term	Essay Q Solving Problems	2	14	7
			Final Exam	Essay Q Solving Problems	3	25	25
	S2	2.2 (24M)	Practical Sheet	Objective Q	2	10	5
			Lab Report	10 EXP.	10	10	10
			Final Lab Exam	Practical Exam	1	9	9
	S3	2.3 (3M)	Safety EXAM	Objective Q	9	9	3
Value	V1	3.1 (3)	Continuous assessment	Practical group work Rubric	-	3	3
	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