Course Specification
(Bachelor)

Course Title:	Chemistry of Gravimetric Analysis
Course Code:	212 CHEM-3
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 May 2024

Table of Contents

A. General information about the course:

1. 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: (L 4 / 2 Y)

4. Course general Description:

Course Title	*Course Number*	*Contact Hours (CH)*		*Credit unit (CU)*	*Year*	*Level*	*Pre- requisite*
		Lec.	*Prac.*				
Chemistry of Gravimetric Analysis	***212CHEM-3***	***2***	***2***	***3***	2	4	***211CHEM-3***

Course objectives: **They are to identify the following: -**
- Basic principles, definitions, and classifications of gravimetric methods
– Theories, mechanisms, steps, and applications of precipitation gravimetry
- Gravimetric, solubility and solubility products calculations
- Types of impurities in precipitates and their minimization.
- Determination of different cations and anions using precipitation gravimetry.

Syllabus: A-Theoretical contents.
Basic principles, definitions, and classifications of gravimetric methods. Theories, mechanisms, steps, advantages, disadvantages, and applications of precipitation gravimetry. Different calculations such as gravimetric calculations, solubility, solubility products, amount of precipitating agent and pH at which precipitation start and complete. Impurities in precipitates and their minimization. Precipitation from homogeneous solutions. Evaluating Precipitation Gravimetry, Scale of operation, Accuracy, Sensitivity, and specificity of gravimetric analysis.

Syllabus: B-Practical contents.
Selected experiments related to gravimetric analysis.

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):

The course is designed to study the basic principles and experimental applications of some gravimetric especially precipitation gravimetry.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	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**	30
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		60

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 a broad understanding and critical view of the principles, classificationand application of precipitation gravimetry. (I)	K(1.1)	Lecture/ discussion	Written examinations and quizzes (Objective Questions)
1.2	Describecorrectlythe essential facts, principles and theories dealing with precipitation gravimetry	K(1.2)	Lecture/ discussion	Written examinations and quizzes (Objective Questions
2.0	**Skills**; (Upon completion of the course, student will be able to)			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	Demonstrate ability in critical thinking, numeracy, analytical reasoning, use graphs, charts for solving problems related to precipitation gravimetry(I)	S(2.1)	Lecture/ discussion	Written examinations, HWand quizzes (Problem-solving exercises& Essay question)
2.2	Apply their experimental basics and skills to use laboratory equipment, and classical techniques for carrying out experiments in various fields of precipitation gravimetry and to write a report representing the scientific data.(I)	S(2.2)	Lab Work/ group Work	Practical Sheet (Objective Questions, essay Question) lab report rubric& Final Lab Exam
2.3	Examine 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 (Objective Questions)

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction, Types of gravimetric methods, Precipitation gravimetry, Theory and Practice Steps of precipitation, gravimetry, Calculations in precipitation gravimetry, solubility and solubility products constant.	6
2.	Saturation and Super saturation, Controlling Particle Size, Relative Supper Saturation (Von Weimarn's Ratio) Mechanism of precipitants formation, Homogeneous Nucleation, , Heterogeneous Nucleation	6
3.	Precipitation methods from Homogeneous solutions, precipitates improvement factors affecting solubility of precipitates	4
4.	Types of precipitants, Colloidal state, Colloidal Suspension Mechanism, Controlling Colloidal state, Precipitants	4
5.	Organic Precipitants, Advantages and disadvantages of Organic Precipitants, Inorganic Precipitants	1

6.	Evaluating Precipitation Gravimetry, Scale of operation, Accuracy, Sensitivity and specificity of gravimetric analysis	**2**
7.	Volatilization Gravimetry, principal of Volatilization Gravimetry, Thermogravimetry, Particulate gravimetry, Separation methods, Filtration, Extraction, direct method and indirect method	**5**
8.	Revision	**2**
9.	Selected Experiments related to course topics	**30**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework	3-12	2%
2.	Quiz	4-6	3%
3.	Midterm Exam	6-8	15%
4.	Lab Sheet	15	7%
5.	Lab Report	3-13	10%
6.	Final Practical Exam	15	10%
7.	Safety Exam	13-14	3%
8.	Final Exam	16-17	50%
9.	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	Analytical chemistry, Christian, Gary D., Purnendu K. (Sandy), Kevin A. Schug, 7th edition (2014)
Supportive References	Quantitative Chemical Analysis & Solutions manual by Daniel C. Harris, 2006.
Electronic Materials	• https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/08%3A_Gravimetric_Methods • https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/08%3A_Gravimetric_Methods/8.2%3A_Precipitation_Gravimetry • https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/08%3A_Gravimetric_Methods/8.3%3A_Volatilization_Gravimetry

	https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/08%3A_Gravimetric_Methods/8.4%3A_Particulate_Gravimetry
Other Learning Materials	Tutorial videos and pictures. Some course contents and materials are posted on Black board sites

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1 Lecture room(s) for groups of 50 students 1 Lab room(s) for groups of 25 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	Laboratory glassware and equipment such as Erlenmeyer flasks watch glass, graduated cylinder, volumetric flask, graduated pipette, volumetric burette and beakers, water bath, magnetic stirrer, Electronic balance and hot plate

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	Class room 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

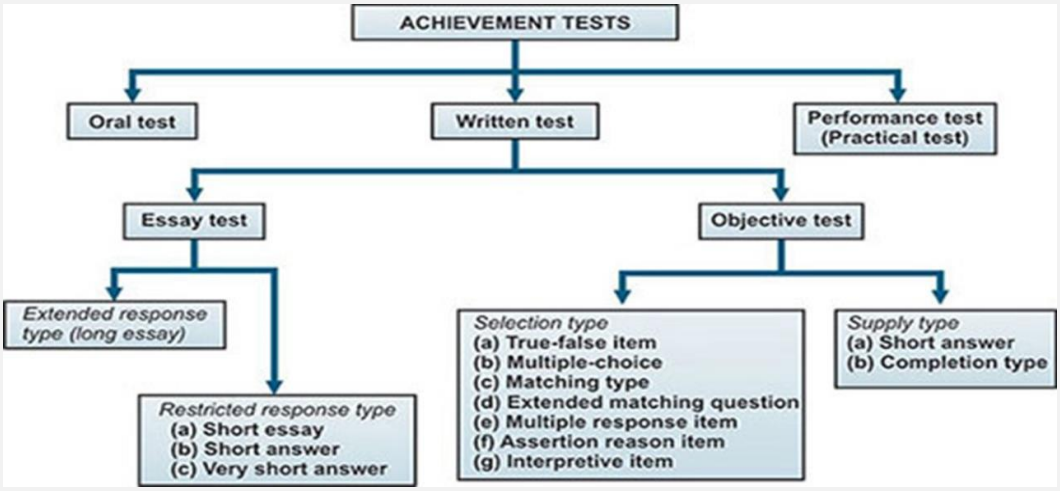
No	*Title of Experiment*	*Tools, Chemicals, and equipment Needed in Experiments*	# of **Weeks**
1	**Laboratory safety, glassware and tools used in gravimetric analysis.**	Drying oven, Muffle Furnaces, crucible burette , graduated cylinders, Volumetric flasks, pipettes and conical flasks, water bath, Hot plates , Crucibles, Balances, Water distillation, water deionizer equipments and pH meters	1
2	**Basic concepts, terminology and gravimetric calculations**	-	1
3	**Determination of the number of water of crystallization in barium chloride dihydrate**	Glassware, Oven, filtration system, Barium chloride dihydrate	1
4	**Gravimetric analysis of sulphate as $BaSO_4$**	Glassware, Oven, filtration system, sodium sulphate, hydrochloric acid, barium chloride	1
5,6	**Gravimetric determination of calcium as calcium oxalate**	Glassware, Oven, filtration system, hydrochloric acid, calcium salt, ammonia solution, ammonium oxalate	2
7	**Gravimetric determination of nickel as nickel dimethylglyoxime**	Glassware, Oven, filtration system, hydrochloric acid, nickel chloride, dimethylglyoxime and ammonia solution	1
8	**Gravimetric determination of lead as lead chromate**	Glassware, Oven, filtration system, hydrochloric acid, lead nitrate, potassium chromate, acetic acid,and sodium acetate	1
9,10	**Gravimetric determination of iron as ferric oxide**	Glassware, Oven, filtration system, hydrochloric acid, ferrous sulphate, nitric acid, ammonium hydroxide and ammonium nitrate	2
11	**Gravimetric determination of copper as copper oxide**	Glassware, Oven, filtration system, hydrochloric acid, copper sulphate, phenolphthalein indicator and sodium hydroxide	1
12,13	**Gravimetric determination of chloride as silver chloride**	Glassware, Oven, filtration system, sodium chloride, nitric acid, silver nitrate	2
14	**Revision**	-	1
15	**FINAL EXAM**		1

2- Blue Print

Course Name	Chemistry of Gravimetric Analysis
Course Code	212CHEM-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	30	24	16	27	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 (30M)	Quiz	Objective test	2	1	1
			Mid term	Objective test	14	7	7
			Final Exam	Objective test	22	22	22
	K2	1.2 (24M)	Quiz	Essay Test	1	1	1
			Mid term	Essay Test	2	5	5
			Final Exam	Essay Test	3	18	18
Skills	S1	2.1 (16M)	H.W	Solving Problems	4	2	2
			Quiz	Solving Problems	1	1	1
			Mid term	Solving Problems & Essay question	2	3	3
			Final Exam	Solving Problems & Essay question	4	10	10
	S2	2.2 (27M)	Practical Sheet	Objective test	8	4	4
				Essay question	3	3	3
			Lab Report	Lab report rubrics	10	10	10
			Final Lab Exam	I Task experiment	1	10	10
	S3	2.3 (3M)	Safety Exam	Objective test	6	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