Course Specifications

Course Title:	**Solution Chemistry and Kinetic Theory of Gases**
Course Code:	**4024576-2**
Program:	**Chemistry**
Department:	**Chemistry**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours:	**2 (theoretical)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**7th level/4th year**
4. Pre-requisites for this course (if any)**:**	
5. Co-requisites for this course (if any)**: ---**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	√	100 %
2	**Blended**	---	---
3	**E-learning**	---	---
4	**Correspondence**	---	---
5	**Other**	---	---

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	--
3	**Tutorial**	--
4	**Others** (specify)	--
	Total	**30**
Other Learning Hours*		
1	**Study**	30
2	**Assignments**	8
3	**Library**	3
4	**Projects/Research Essays/Theses**	4
5	**Others** (specify)	20
	Total	**65**

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course deals with the basic principles of solution chemistry, conductivity and ionic strength of solutions as well as the basic concepts of chemistry of electrolytes and diffusion of gases.

2. Course Main Objective

By the end of this course the students will be able to describe and explain:

1. Fundamental principles of solution chemistry.

2. Different types of solutions.
3. Conductivity and ionic strength of solutions.
4. Vant Hoff factor and Debye theory and movement.
5. Basic concepts of chemistry of electrolytic solutions and diffusion of gases.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Define the principle concepts of solutions.	K3
1.2	Mention the colligative properties of solutions.	K1
1.3	Memorize the transport numbers, ionic strength and distribution of molecular velocities.	K3
1.4	Mention the appropriate methods of determination of ionization constant of week electrolyte.	K1
1.5	List the different ways to determine Vant Hoff factor.	K3
1.6	Recognize the deviation of gases.	K3
1.7	Describe the kinetic theory of gases and its applications.	K1
2	**Skills :**	
2.1	Explain the colligative properties of solutions	S2
2.2	Give some practical issues and assigning students to create a strategic plan for the solution.	S1
2.3	Explain the activity, activity coefficient and ionic strength.	S1
2.4	Apply the predicating skills, analysis and problem solving.	S2
2.5	Derivate the kinetic theory of gases.	S2
3	**Competence:**	
3.1	Evaluate results to discover the responsiveness of students to collective cooperation.	C2
3.2	Work effectively both in a team, and independently on solving the problems and to conduct some joint reports.	C1
3.3	Communicate results of work to classmate and participation in class or laboratory discussions.	C4
3.4	Communicate with his lecturer and colleagues.	C4

C. Course Content

No	List of Topics	Contact Hours
1	Basic concepts of solutions.	2
2	Colligative properties of solutions.	4
3	Electrolytic solutions, Faradays law, electrochemical equivalent.	2
4	Electrical conductance applications and Kolwrawsh Law.	2
5	Conductometirc titrations.	2
6	Transport numbers, ionic migration and Oswald Law.	2
7	First periodic exam	2
8	Activity, activity coefficient and ionic strength	2
9	Strong electrolytes theories.	2
10	Kinetic theory of gases and its applications	2
11	Collisions between gas molecules.	2

12	Molecular velocities, viscosity of gases, Van der Walls Equation	4
13	Second periodic exam.	2
Total		30

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**		
1.1	Define the principle concepts of solutions.	Lecture	Quiz
1.2	Mention the colligative properties of solutions.	Web-based study	Quiz
1.3	Memorize the transport numbers, ionic strength and distribution of molecular velocities.	Lecture	Quiz
1.4	Mention the appropriate methods of determination of ionization constant of week electrolyte.	Discussion	Exam
1.5	List the different ways to determine Vant Hoff factor.	Web-based study	Quiz
1.6	Recognize the deviation of gases.	Discussion	Quiz
1.7	Describe the kinetic theory of gases and its applications.	Lecture	Exam
2.0	**Skills**		
2.1	Explain the colligative properties of solutions	Discussion	Quiz
2.2	Give some practical issues and assigning students to create a strategic plan for the solution.	Lecture	Exam
2.3	Explain the activity, activity coefficient and ionic strength.	Library visits	Short essays
2.4	Apply the predicating skills, analysis and problem solving.	Web-based study	Exam
2.5	Derivate the kinetic theory of gases.	Lecture	Quiz
3.0	**Competence**		
3.1	Evaluate results to discover the responsiveness of students to collective cooperation.	Discussion	Short essays
3.2	Work effectively both in a team, and independently on solving the problems and to conduct some joint reports.	Lecture	Quiz
3.3	Communicate results of work to classmate and participation in class or laboratory discussions.	Library visits	Exam
3.5	Communicate with his lecturer and colleagues.	Discussion	Quiz

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework or activities.	--	10 %
2	First Periodic Exam.	7	20 %
3	Second Periodic Exam.	15	20 %
4	Final Exam.(2 hours 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 :

- Weekly office hours for discussion with the students.
- Academic advising for students.
- Availability of Staff members to provide counseling and advice.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Physical Chemistry, Amazon logo Silbey, R. R. Alberty, M. Bawendi, 4th ed., John Wiley & Sons, 2004. • Physical Chemistry, Peter Atkins & Julio de Paula, 10th ed., W. H. Freeman and Company, 2014. • Chemistry, Raymond Chang, 10th Edition, Publisher: Thoma D. Timp, 2014. • Solution Chemistry, P. Somasundaran and Dianzuo Wang, Mineral and Reagents, Elseiver, 2006.
Essential References Materials	Kinetic Theory of Gases, Walter Kauzmann, Dover Publications, 2014.
Electronic Materials	• http://www.chemweb.com • http://www.sciencedirect.com • http://www.rsc.org • Websites on the internet relevant to the topics of the course
Other Learning Materials	Not required

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration	Well-equipped lecture halls.

Item	Resources
rooms/labs, etc.)	
Technology Resources (AV, data show, Smart Board, software, etc.)	Computer and data show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	No other requirements.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resources	Students	Complete the questionnaire evaluation of the course periodically.
Effectiveness of teaching and assessment.	Program Leaders	Observation of students performing a task.
Extent of achievement of course learning outcomes.	Peer Reviewer	Checking selected exam papers, and student assignments.

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	
Reference No.	
Date	3/3/1441

Received by: Dr. Ismail Althagafi **Department Head**

Signature: **Date: 20/12/2019**