



Course Syllabus  
Faculty of Arts and Science  
Chemistry Department

Academic Year 2021 / 2022 Semester: First

Course Title :	Physical Chemistry 2
Course No. :	1722310
Prerequisite :	1722210
Concurrent :	-
Department :	Chemistry
Coordinator :	Dima Khater
Mode of Instruction	<b>Blended Learning</b> - 2 hours in-class (Synonym) learning - 1 hour online asynchronous learning using Edu-Gate

\* Instructor:

Lecturer	Office Phone	Room No.	Office Hours	E-mail
Dima Khater	1283	224	S,M,T,W: 12: 30-2:00	d_khater@asu.edu.jo

**Course Description**

The course introduces the students to various subjects' including, the phases and solutions, electrochemistry and chemical kinetics, electrochemical reactions, composite reaction mechanisms, surface chemistry, and transport properties. Each of these subjects provides a distinct perspective on cutting-edge science and will be used to show fundamental chemical ideas that may be applied to other fields.

**Intended Learning Outcomes**

Upon the completion of the course, this module should lead to the following learning outcomes:



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### **A. Knowledge and Understanding (Student should):**

- Understand the fundamental principles of physical chemistry including
- A1 solution of electrolyte, electrochemical cell, kinetics of chemical reaction, surface chemistry, and transport properties.
  - A2 Clearly define equilibrium states in aqueous solution and electrochemical cell.

### **B. Cognitive and Intellectual Skills (Student should):**

- B1 Calculate parameters related to solution of electrolyte and solution.
- B2 Calculate parameters related to electrochemical cells and kinetics of reactions.
- B3 Demonstrate different situations and problems related to the studied topics.

### **C. Subject Specific Skills (Student should):**

- C1 Research on different topics in the studied topics.
- C2 Promote problem solving skills.
- C3 Promote critical thinking.

### **D. Transferable Skills (Student should):**

- D1 Perform online researching in different websites of the studied topics
- D2 Provide scientific proof and evidence.

### **Program Learning Outcomes (PLOs):**

- 1.1 Describe the fundamental of physical chemistry.
- 1.2 Construct essential facts, principle and theories across physical chemistry.
- 1.5 Recognize certain subject in biology, physics and math that serve the physical chemistry.
- 2.2 Explain concepts and determine the efficiency of chemical system by applying mathematical equation.
- 2.3 Analyze chemical and spectral data to identify and confirm chemical structure and composition.
- 2.4 Establish and conclude mechanism for physical and chemical proses.
- 2.5 Solve the scientific problems using different mechanism and procedure.
- 2.6 Present scientific material and arguments to a range of audience.
- 3.1 Demonstrate adequate life-long learning skills.
- 3.3 Select appropriate techniques and procedures for chemical analysis and synthesis
- 4.3 Interpret data derived from laboratory observation and measurements in terms

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of their importance and the theory underlying them.

Course Learning Outcomes Alignment Matrix										
	A1	A2	B 1	B2	B3	C1	C2	C3	D1	D2
PLO.1.1	√		√							
PLO 1.2		√								
PLO 1.5					√	√				
PLO 2.2							√			
PLO 2.3								√		
PLO 2.4				√						
PLO 2.5							√			
PLO 2.6				√	√					
PLO 3.1									√	
PLO 3.3										√
PLO 4.3										√

**Course Contents and Schedule**

Week	Day and Date	Topics to be covered	Method of instruction	CLOs	PLOs
1	Mon. 18-10-2021	<b>Revision Phase and Solutions:</b> vaporization vapor pressure	In-class lecture	A1, B1	1.1
	Wed. 20-10-2021		In-class lecture		
2	Mon. 25-10-2021	<b>Phases and Solutions:</b> Ideal solution, Henry's law	In-class lecture	A1,B1,B3, C3	1.1 1.5 2.3
	Wed. 27-10-2021		In-class lecture		
3	Mon. 1-11-2021	<b>Phases and Solutions:</b> Partial molar quantities, The Chemical Potential, Non ideal solution and activity coefficient	In-class lecture	A1,A2, B1,B3, C2	1.1 1.2 1.5
	Wed. 3-11-2021		In-class lecture		
4	Mon. 8-11-2021	<b>Phases and Solutions:</b> The colligative properties: Freezing point	In-class lecture	A1,A2, B1,B3, C1, C2, C3	1.1 1.2 1.5 2.3
	Wed. 10-11-2021		In-class lecture		



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		depression, Boiling point Elevation, Osmotic pressure			
5	Mon. 15-11-2021	<b>Phase equilibria:</b> Phase equilibria: Degree of Freedom, Diagram of One component, Phase Rule.	In-class lecture	A1, D1, D3	1.1 3.1 3.3 4.3
	Wed. 17-11-2021		In-class lecture		
6	Mon. 22-11-2021	<b>Solution of electrolyte:</b> Faraday's law of electrolysis, Molar conductivity, Arrhenius Theory: Ostwald's dilution law	In-class lecture	A1, B1,B3, C2, C3, D2	1.1 1.2 1.5
	Wed. 24-11-2021		In-class lecture		
7	Mon. 29-11-2021	<b>Solution of electrolyte:</b> Strong electrolytes: Deby-Huckel Theory, Strong electrolytes: The ionic atmosphere	In-class lecture	A1, B1,B3, C2, C3, D2	1.1 1.2 1.5 2.3 3.3 4.3
	Wed.1-12-2021		In-class lecture		
8.	MID Term Exam				
9	Mon. 13-12-2021	<b>Solution of electrolyte:</b> mechanism of conductivity, Independent migration of ions, ionic mobility, Transport numbers, Activity coefficient	In-class lecture	A1, B1,B3, C2, C3, D2	1.1 1.2 1.5 1.7 2.2 2.3 4.3
	Wed.15-12-2021		Assignment (Asynchronous)		
10	Mon. 20-12-2021	<b>Electrochemical cells:</b> Daniel Cell, standard electrode Other standard electrode, Thermodynamic of electrochemical cells	In-class lecture	A1, A2,B2, B3, C1, C2, C3, D1, D2	1.1 1.2 2.6 1.5 2.4 2.2 2.3 4.3 3.3 3.1
	Wed. 22-12-2021		Assignment (Asynchronous)		
11	Mon. 27-12-2021	<b>Electrochemical cells:</b> Nernst equation	In-class lecture	A1, A2,B2, B3, C1, C2, C3, D1, D2	1.1 1.2 2.6
	Wed. 29-12-2021		Assignment (Asynchronous)		



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		and potential, Application of emf measurement.			1.5 2.4 2.2 2.3 4.3 3.3 3.1
12	Mon. 3-1-2021	<b>Chemical Kinetics 2:</b> Composite reaction, evidence for composite mechanism, types of composite mechanism	In-class lecture	A1, B2, C1, C2, D1, D2	1.1 1.2 1.5 2.2 2.3 3.3 4.3
	Wed. 5-1-2021		Assignment (Asynchronous)		
13	Mon. 10-1-2021	<b>Chemical Kinetics 2:</b> Rate equation for composite Mechanism, Rate equation for composite Mechanism	In-class lecture	A1, B2, C1, C2, D1, D2	1.1 1.2 1.5 2.2 4.3 3.3
	Wed. 12-1-2021		Assignment (Asynchronous)		
14	Mon. 17-1-2021	<b>Transport properties:</b> Viscosity, Diffusion, Sedimentation	In-class lecture	A1, B3, C2, D1, D3	1.1 1.5 2.2 3.3 4.3
	Wed. 19-1-2021		Problem Solving (Asynchronous)		
15	Mon. 24-1-2021	Revision	Assignment (Asynchronous)		
	Wed. 26-1-2021		Problem Solving (Asynchronous)		
16.	Final Exam				

**Grading Plan and Assessment Tools**

Assessment Tools	Weights	Due date
Mid-term	30	
Assignments	5	
Quizzes	5	
Inter active lectures	5	
Group Work	5	
Presentation	-	-
Reports	-	-
Project	-	-
Final Exam	50	



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### Supplementary Reading

#### Textbook:

- 1- K. J. Laidler, J. H. Meiser, and B. C. Sanctuary, Physical Chemistry, 4th ed., Houghton Mifflin Company, 2003.

#### References:

- 1-P. W. Atkins, and J. de Paula, Atkins' Physical Chemistry, 10th ed., OUP, 2014.
2. G. Barrow, Physical Chemistry, 6th ed., McGraw-Hill College, 1996.
3. T. Engel, and P. Reid, Physical Chemistry, 3rd ed., Pearson Education, Inc., 2013.
- 3-I. N Levine, Physical Chemistry, 6th ed., the McGraw-Hill Companies, 2009.
- 4-R. Silbey, R. Alberty, and M. Bawendi, Physical Chemistry, 4th ed., John Wiley, 2004.
- 5-I. N Levine, Physical Chemistry, 6th ed., the McGraw-Hill Companies, 2009.



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Head of Curriculum Committee	-----	Signature:	-----
Department Head	-----	Signature:	-----
Faculty Dean	-----	Signature:	-----

### Copy to:

- Department Head.
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