

STATISTICAL THERMODYNAMICS AND SURFACE CHEMISTRY

Program	BSc in Chemistry					
Module Name	Physical chemistry II					
Module Number	10					
Module code	Chem-M3101					
Course Title	Statistical thermodynamics and surface chemistry					
Course Code	Chem3102					
Pre-requisite	Chem3101					
Module coordinator name and address	TBA					
Instructor(s) name and address	TBA					
Lecture days, Hours & room	TBA					
Cr.Hrs/ECTS	3/5					
Work load	Lecture	Tutorial	Lab.	Home study	Assessment	Total
	48	16	-----	66	5	135
Target group	3 rd year chemistry students					
Semester	Semester II					
Mode of delivery	Semester based					
Status of the course	Core Compulsory					

Course Description

Introduction to statistical thermodynamics, Terminology and basic concepts, Distribution function, Surface chemistry: Interfacial structure, Surface tension and surface free energy, Methods of surface tension measurement, Nature and thermodynamics of liquid-Gas interface, the surface tension of solution, the two dimensional ideal gas laws, adsorption at the solid solution interface.

Learning Outcomes

By the end of this course students should be able to:

- Describe the basic concepts in statistical thermodynamics;
- State the surface phenomena by applying their chemical knowledge;
- Explain about adsorption phenomena;
- Describe the solid solution interface
- Describe structure of solid surface and its application.
- Discuss the interaction of similar and different phases and its real application

Course Outline and Schedule

Week	Contents	Mode of delivery	Activities	Reading/ assignments
1	1. Statistical Thermodynamics <ul style="list-style-type: none"> • Introduction • Terminology and Basic Concepts 	<ul style="list-style-type: none"> • Lecture • Group discussion • Oral questions • Asking questions • Reading assignment 	<ul style="list-style-type: none"> • Listen to a lecture and take notes on the lesson treated, • Ask questions on unclear ideas, • Active participation in discussion 	R.P. Rastogi and R.R. Misra D.A. McQuarrie P.W. Atkins G.M. Barrow R.A. Alberty and R.J. Silbey
2	<ul style="list-style-type: none"> • Basic Statistics • Statistics of Particles 	<ul style="list-style-type: none"> • Lecture • Group discussion • Oral questions • Asking questions • Reading assignment 	<ul style="list-style-type: none"> • Listen to a lecture and take notes on the lesson treated, • Ask questions on unclear ideas, • Active participation in discussion 	R.P. Rastogi and R.R. Misra D.A. McQuarrie P.W. Atkins G.M. Barrow R.A. Alberty and R.J. Silbey
Quiz (5%)				
3-5	<ul style="list-style-type: none"> • Distribution Functions • Partition Function 	<ul style="list-style-type: none"> • Lecture • Group discussion • Oral questions • Asking questions • Reading assignment 	<ul style="list-style-type: none"> • Listen to a lecture and take notes on the lesson treated, • Ask questions on unclear ideas, • Active participation in discussion 	R.P. Rastogi and R.R. Misra D.A. McQuarrie P.W. Atkins G.M. Barrow R.A. Alberty and R.J. Silbey
Test 1 (10%)				
6&7	<ul style="list-style-type: none"> • Thermodynamic Functions • Statistical Mechanics of Ensembles 	<ul style="list-style-type: none"> • Lecture • Group discussion • Oral questions • Asking questions • Reading assignment 	<ul style="list-style-type: none"> • Listen to a lecture and take notes on the lesson treated, • Ask questions on unclear ideas, • Active participation in discussion 	R.P. Rastogi and R.R. Misra D.A. McQuarrie P.W. Atkins G.M. Barrow R.A. Alberty and R.J. Silbey
Individual Assignment (5 %)				

8-10	<ul style="list-style-type: none">Thermodynamic Properties of Ideal GasStatistical Derivation of the Equation of State for Non-ideal FluidsEquilibrium Constants for Gas Phase Reactions	<ul style="list-style-type: none">LectureGroup discussionOral questionsAsking questionsReading assignment	<ul style="list-style-type: none">Listen to a lecture and take notes on the lesson treated,Ask questions on unclear ideas,Active participation in discussion	R.P. Rastogi and R.R. Misra D.A. McQuarrie P.W. Atkins G.M. Barrow R.A. Alberty and R.J. Silbey
Test 2 (10%)				
11	2. Physical Chemistry of Surfaces <ul style="list-style-type: none">Interfacial StructureSurface Tension and Surface Free Energy	<ul style="list-style-type: none">LectureGroup discussionOral questionsAsking questionsReading assignment	<ul style="list-style-type: none">Listen to a lecture and take notes on the lesson treated,Ask questions on unclear ideas,Active participation in discussion	R.P. Rastogi and R.R. Misra D.A. McQuarrie P.W. Atkins G.M. Barrow R.A. Alberty and R.J. Silbey
12&13	<ul style="list-style-type: none">Methods of Surface Tension MeasurementNature and Thermodynamics of Liquid-Gas Interface	<ul style="list-style-type: none">LectureGroup discussionOral questionsAsking questionsReading assignment	<ul style="list-style-type: none">Listen to a lecture and take notes on the lesson treated,Ask questions on unclear ideas,Active participation in discussion	R.P. Rastogi and R.R. Misra D.A. McQuarrie P.W. Atkins G.M. Barrow R.A. Alberty and R.J. Silbey
Test 3 (10 %)				
14&15	<ul style="list-style-type: none">The Surface Tension of SolutionsSurfaces of SolidsAbsorption at the Solid Solution Interface	<ul style="list-style-type: none">LectureGroup discussionOral questionsAsking questionsReading assignment	<ul style="list-style-type: none">Listen to a lecture and take notes on the lesson treated,Ask questions on unclear ideas,Active participation in discussion	R.P. Rastogi and R.R. Misra D.A. McQuarrie P.W. Atkins G.M. Barrow R.A. Alberty and R.J. Silbey
	Group assignment (10%)			
Final Exam (50%)				

Mode of Assessment

Assessment Breakdown	%
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continuous assessment (not more than 10% for each)	50
End of Semester Examination	50

Course Policy

- Coming class on time (punctuality)
- Attend all class sessions
- Be prepared to learn and actively participate during class discussion
- Do all assignments, group works, project works, and presentations on time
- All students are expected to complete their own work to the best of their ability and cheating is strictly forbidden
- Do not miss quizzes, assignments, and exams unless you are forced due to health and other reasonable problems
- Cite all sources consulted to any extent (including material from the internet), whether or not assigned and whether or not quoted directly. It is strictly forbidden to take others work and present as own.
- Make-up class shall be conducted if classes are missed due to national holidays and/or when unpredicted conditions result in class dismissal

Reference

1. P.W. Atkins, Physical Chemistry, Oxford University Press, Oxford-New York, 2002.
2. G.M. Barrow, Physical chemistry, 5th Ed., TATA McGraw-Hill Edition, New Delhi, 1992.
3. R.A. Alberty and R.J. Silbey, Physical Chemistry, Willey and sons Inc., New York, 199