

## PRACTICAL PHYSICAL CHEMISTRY I

Program	BSc in Chemistry				
Module Name	Physical Chemistry I				
Module Number	06				
Module code	Chem-M2061				
Course Title	Practical physical chemistry I				
Course Code	Chem2064				
Pre-requisite	----				
Module coordinator name and address	TBA				
Instructor(s) name and address	TBA				
Lecture days, Hours & room	TBA				
Cr.Hrs/ECTS	1/2				
Work load	Lecture	Lab.	Home study	Assessment	Total
	6	42	29	3	80
Target group	2 <sup>nd</sup> year chemistry students				
Semester	Semester II				
Mode of delivery	Semester based				
Status of the course	Core Compulsory				

### Course Description

Solubility, viscosity, phase rule, partition coefficient, adsorption, surface tension, transition temperature and freezing point, kinetics of reaction thermochemistry.

### Learning Outcomes

Upon successful completion of the course students will be able to:

- determine physical properties of matter
- develop some techniques of determination of physical properties matter; and
- work with different instruments of analysis
- use some physico-chemical techniques for the determination of the physical properties of matter
- work with different instruments
- calibrate and apply these instruments for characterizing different compounds

### Course Outline and Schedule

Week	Contents	Method of teaching	Activities	Reading/ assignments
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1	<b>Experiment 1:</b> Enthalpy of Solution: Determine the enthalpy of solution $\Delta_s H$ of a salt (e.g. $\text{KNO}_3$ ).	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	-Lab. Manual and Practical
2&3	<b>Experiment 2:</b> Differential Scanning Calorimetry: Determine the molar heat of vaporisation $\Delta_{\text{vap}} H_m$ of a solute (e.g. Oxalic acid)	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	Physical Chemistry I, D. Ohms and T. --Solomon, AAU
<b>Lab. report 1 (10%)</b>				
4&5	<b>Experiment 3:</b> Boiling Point Diagram of Binary System: Draw a boiling point diagram of a binary system at ambient pressure (e.g. Chloroform and Ethanol).	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	-Lab. Manual and Practical Physical Chemistry I, D. Ohms and T. Solomon, AAU
6&7	<b>Experiment 4:</b> Partial Miscibility of a Binary System: Draw a phase diagram of a partially miscible system; and to determine the critical temperature $T_c$ (e.g. Phenol in Water).	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	-Lab. Manual and Practical Physical Chemistry I, D. Ohms and T Solomon, AAU.
<b>Lab. report 2 (10%)</b>				
8	<b>Experiment 5:</b> Phase Equilibria: Determine the enthalpy of solution $\Delta_s H$ of an organic acid (e.g. Benzoic acid).	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	-Lab. Manual and Practical Physical Chemistry I, D. Ohms and T. Solomon, AAU
9	<b>Experiment 6:</b> Elevation of Boiling Point: Determine the apparent molecular weight of a non volatile solute M2 (e.g. NaCl).	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	-Lab. Manual and Practical Physical Chemistry I, D. Ohms and T. Solomon, AAU
<b>Lab. report 3 (10%)</b>				

10 &11	<b>Experiment 7:</b> Ionic Equilibrium: Draw the titration curve (pH vs. base) and to determine the buffer capacity $\beta$ of a polyprotic acid (e.g. $\text{H}_3\text{PO}_4$ ).	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	-Lab. Manual and Practical Physical Chemistry I, D. Ohms and T. Solomon, AAU
12	<b>Experiment 8:</b> Hydrolysis reaction of a Solute with concentrated and diluted base solution: Determine the reaction orders $\nu$ and rate constants $k$ of the reactions (e.g. Crystal violet with NaOH).	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	-Lab. Manual and Practical Physical Chemistry I, D. Ohms and T. Solomon, AAU
<b>Lab. report 4 (10%)</b>				
13&14	<b>Experiment 9:</b> Thermodynamics of an Electrochemical Cell: Determine the cell potential $E$ ; and the free Gibbs energy $\Delta_r G$ , enthalpy $\Delta_r H$ and entropy $\Delta_r S$ of reaction of an electrochemical cell (e.g. Daniel Cell).	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	-Lab. Manual and Practical Physical Chemistry I, D. Ohms and T. Solomon, AAU
15	<b>Experiment 10:</b> Conductance of Strong and Weak Electrolytes: Determine the molar conductance $\Lambda_m$ of strong and weak electrolytes, and dissociation constant of weak electrolytes (e.g. HCl and $\text{CH}_3\text{COOH}$ )	Purely practical	-Ask questions on unclear step and procedures, -Active participation in the experiment group	-Lab. Manual and Practical Physical Chemistry I, D. Ohms and T. Solomon, AAU
<b>Lab. report 5 (10%)</b>				
16	<b>Final Exam (50%)</b>			

### Mode of Assessment

Type	Description	%	Assessment Date
Practical/Skills Evaluation	individual/group performance, and flow chart	10	Every Week
Individual laboratory performance	Practical examination	20	Week 10
Experiment reports	Written report after each lab	30	Every week
Written examinations	Exam at the end of the laboratory	40	At the end of the lab

## **Course Policy**

Beside the university's policy on course delivery and evaluation, students are expected to actively participate in learning process by obeying the following course policies:

- Keep all laboratory safety rules
- Keep good hygiene practices
- Submit laboratory report for every experiments on time
- Do not miss laboratory sessions unless you are forced due to health and other reasonable problems
- Be prepared to learn and actively participate in laboratory works
- Come with lab manual and flow chart
- Wear proper dress

## **Reference**

Practical Physical Chemistry I, D. Ohms and T. Solomon, AAU