Department of Chemistry

CHEM3335 Physical Chemsitry Laboratory 1

General Information

Credit and Contact Hours: 2 credits; 60 contact hours

Prerequisite: CHEM-3333

Core-requisite: None

Semester offered: Fall and Spring Semesters.

Keywords: Thermodynamics, Kinetics, Phase equilibria, Adsorption Equilibrium, Conductance, and Electrochemistry,

Textbook and References: Supplementary Handouts (Internally Prepared Manual).

Assessment: Reports (60%);
Final Theoretical Test (30%);
Instructor Evaluation during lab sessions (10%)

Description

This is the first of two courses in physical chemistry laboratory intended for training students to individually perform experiments, interpret and discuss the collected database on the physical chemistry theories and write up reports in journal format.
The course introduces students to fundamental physical chemistry concepts such as basic thermodynamics (equilibrium constant, enthalpy of protonation, heat transfer and phase transition), kinetics and rate of reactions, phase diagrams (binary and ternary systems), thermo-chemistry, electrochemistry and adsorption equilibrium.

Objectives

The principal objectives of this course are

- Acquaint the students with a variety of phenomena that are the contents of this subject,
- Familiarize them with a number of techniques in use,
- Develop a facility in the making and interpretation of measurements,
- Give them some basis for judging the reliability of data,
- Manipulate and interpret scientific data involving simple physical measurements,
- Operate and fix the correct experimental conditions of available instruments,
- Conclude the concepts of kinetics, thermodynamics and their applications to real life situations,
- Acquire a good computer literacy (word processing and spreadsheet processes),
- Discuss the results of each experiment in the view of physical chemistry theories and write reports in journal format.
- Integrate theoretical concepts with practicalities of measurement.
- Represent their results against literature values.
- Provide students with a better practical skill for the advanced physical chemistry lab II.

Learning Outcomes

Knowledge

On successful completion of this course, students will be able to:

- Manipulate and interpret scientific data involving simple physical measurements
- Capability to operate and fix the correct experimental conditions of available instruments
- Prepare standard solutions of specific concentrations
- Understand the concepts of kinetics, thermodynamics and their applications to real life situations
- Acquire a good computer literacy (word processing and spreadsheet processes)
- Discuss the results of each experiment in the view of physical chemistry theories and write reports in journal format

Skills and Attitudes

At the end of the course, students will be expected to

- Think independently and logically
- Manage their time and organize their work properly
- Apply chemical concepts and principles to unfamiliar situations (problem–solving)
- Use the available laboratory equipment and other glassware
- Analyze the experimental data in terms of plotting curves
- Conclude the results

Topics

The course includes experiments purely related to a wide range of physical chemistry topics such as thermodynamics, kinetics, electrochemistry, phase equilibria, thermochemistry and surface adsorption.

The following experiments are covering the above-mentioned objectives:

(1) Determination of the Acid Dissociation Constant of an Indicator **(p*Ka*)**.

(2) Enthalpy of Protonation of Glycine **(Glycine)**.

(3) Determination of a Rate Law ***(Kinetics)***.

(4) Electrolytic Conductance ***(Cond 1 &2)***:

Part (1): Measurement of conductivity and molar conductivity of a strong electrolyte.

Part (2): Determination of the Dissociation constant of a weak acid.

(5) Thermodynamic Properties of Water ***(Thermodyn.)***

(6) Phase Diagram of Three Liquids ***(Ternary)***.

(7) Adsorption of an organic acid by activated carbon in aqueous medium ***(Adsorption)***.

(8) Electrochemical Analysis of Potassium Iodide ***(Electrochem.)***.

(9) Phase Diagram of Partially Miscible Two Liquids ***(Binary)***.