Course specification

University/Academy: Damanhour University
Faculty/Institute: Science
Department: Chemistry

1. course Data:

<table>
<thead>
<tr>
<th>Course code:</th>
<th>Course title:</th>
<th>Academic year/level:</th>
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<tbody>
<tr>
<td>Chem.326</td>
<td>Physical Chemistry 3</td>
<td>2009/2010 Third year /2nd term</td>
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Specialization:
Zoology and chemistry

<table>
<thead>
<tr>
<th>No. of instructional units:</th>
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<tbody>
<tr>
<td>lecture 3hr/week</td>
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<tr>
<td>Tutorial 1 hrs/week</td>
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<tr>
<td>practical</td>
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2. course Aim

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

- This course is designed to give a basic understanding of the principal ideas in electrochemistry, chemical kinetics and quantum chemistry that may be required by chemists in the course of their careers.

3. Intended learning outcome

a) Knowledge and understanding

At the end of this course the students will be able to:

a1- Identify the different order of reactions,
a2- lists the different theories of the reaction rate
a3- List the different types of electrodes and electrochemical cells.
a4 – write the classical and quantum mechanical treatment of the simple harmonic oscillator.
### Intellectual skills

At the end of this course the students will be able to:

- **b1:** Analyze the kinetic data to predict the mechanism of reaction.
- **b2:** Compare between the order and Molecularity.
- **b3:** Deduce the relation between activity and the EMF (Nernst equation).
- **b4:** Apply Schrodinger equation to describe the motion of a particle in a box and on a ring.

### Professional skills

At the end of this course students will have the ability to:

- **c1:** Examine problems related to the course content.

### General skills

- **D1:** IT and web search engines for collecting information.
- **D2:** Work effectively in a team, and independently on solving.
- **D3:** Exchange ideas, principles and information by oral, written and visual means.
- **D4:** Communicate effectively with his lecturer and colleagues.

### 4. Course content

- **Introduction**
- **Types of Electrochemical cells**
- **Galvanic cells**
- **Types of electrodes.**
- **Electrochemical cells**
- **EMF and cell reactions.**
- **Free-energy changes for cell reactions - Standard EMF’s and electrode potentials.**
- **The concentration and activity dependence of the EMF (Nernst equation)**

Thermodynamic data from EMF measurements
- Measurement of EMF
- Applications on EMF
- Types of batteries

Introduction, factors that affect reaction rate, and different types of reaction rate

Rate laws and its experimental determination and derivation of concentration-time relation

Rate laws and its experimental determination and derivation of concentration-time relation (continued)

- Determination of reaction order.

Complex reactions
- Reaction mechanisms

- Theories of reaction rates
- Transition state theory in thermodynamic terms
- Molecular and trimolecular reactions
- Chain reaction
- Reaction in solution

Introduction
- Classical mechanical treatment of the simple harmonic oscillator

Classical mechanical treatment of the simple harmonic oscillator (continued)

- Molecular vibrations
- Propagating and standing waves.

Black body radiation.
- Photoelectric effect, De Broglie waves
- Schrödinger equation

- Interpretation of the wave function.
- Particle in a box.
- Particle on a ring.
- The free electron theory for linear and cyclic systems

Quantum Mechanical treatment of Simple Harmonic Oscillator
- Hydrogen like atoms
5. Teaching and learning methods

<table>
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<tr>
<th></th>
<th>5.1. Lectures and seminars using data show and board.</th>
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<tr>
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<td>5.2. Problem classes and group tutorial.</td>
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<td>5.3. Reports and discussion groups</td>
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<td><strong>5.4. Encourage students to use online and library resources</strong></td>
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**Student Assessment**

- Problems.
- Assignments.
- Written exam.

**Procedures used:**

**Schedule:**

- Assessment 1: Final written

**Weighing of Assessment:**

<table>
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<th>Final-Term Examination: 150</th>
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**6. List of Textbooks and Reference:**

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<thead>
<tr>
<th>6.1. Course Notes</th>
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<tbody>
<tr>
<td>Lecture notes of physical chemistry for 3rd year students - faculty of science – Damanhour - Alexandria University.</td>
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<tr>
<th>6.2. Essential Books (Text Books)</th>
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<tr>
<th>6.3. Recommended Books</th>
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<tbody>
<tr>
<td>Thomas Engel, Philip Reid , Physical Chemistry Publisher Jun Smith, New York (2006)</td>
</tr>
<tr>
<td>6.4. Periodicals, Web Sites, ... etc</td>
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<tr>
<td>--------------------------------------</td>
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</tbody>
</table>
| **a) Required Books**  
(Textbooks) | Thomas Engel, Philip Reid, Physical Chemistry  
Publisher Jun Smith, New York (2006)  
-Margret Robson Wright "An Introduction to aqueous  
| **Recommended Books** | -------- |
| **b) Periodicals, web  
sites,...,etc** | --------[www.Elsevier.com]--- |

**Course Instructor:**  
Dr. Medhat A. Shaker  
**Date:** 20 / 9 / 2009

**Head of Department:** Dr. Medhat A. Shaker  
Dr. Medhat A. Shaker