# Course Specification

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

## 1. Course Data:

<table>
<thead>
<tr>
<th>Course code:</th>
<th>Course title:</th>
<th>Academic year/level:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 302</td>
<td>Physical Chemistry 4</td>
<td>3rd year / 2nd term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2009-2010</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Specialization:</th>
<th>No. of instructional units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Chemistry</td>
<td>lecture 2, tutorial 1, practical 6</td>
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</tbody>
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## 2. Intended learning outcome

### Knowledge and understanding

At the end of this course the student should know and understand:
- Define The theory of quantum chemistry  
- Illustrate The photochemical reaction

### Intellectual skills

At the end of this course the student should be able to:
- Contrast the LCAO-MO treatment for the hydrogen molecule.  
- Compare between photochemical reaction

### Professional skills

At the end of this course the student should be able to:
- Mention approximate methods for solving the Schrödinger equation.  
- Give data related to photochemical reaction.

### a) General skills

At the end of this course the student should be able to:
- d1: analyze scientific data.

### course content

Quantum chemistry
• Introduction
• Fundamental postulates of quantum mechanics and its applications.
• Solutions of Schrödinger equation for some simple systems.
• Approximate methods for solving the Schrödinger equation
  • Independent particle method
    - Variation method
  • -Application to the helium atom.
  • -The electronic structure of molecules
  • -The Born-Oppenheimer approximation -The hydrogen molecule ion H2+
• The LCAO-MO treatment of the hydrogen molecule.
• The electronic structure of conjugated molecules
  • -The σ, π -approximation.
  • Application of Hückel theory to ethylene and butadiene molecules.

**Photochemistry**

• -Introduction
  • - Laws of photochemistry – quantum yields - Franck-principle
• Measurement of light intensity – primary process in photochemistry
• Fluorescence
• -Phosphorescence
  • Photochemical kinetics.
• -Photosensitisation.
• -Photochemical reaction in liquid phase – photochemical effect in solid
• Effect of temperature on photochemical reaction-photosynthesis – Chemiluminescence
  • -Photoelectric effect
• -Laser photochemistry.
• -Greenhouse effect
• -Photochemical smog
• -Troposphere and stratospheric ozone
| Teaching and learning methods | • Lecture  
• Contact hours  
• Problem-Based Learning  
• Encourage students to use online and library resources |
|-------------------------------|----------------------------------------------------------|
| Taching and learning methods for students with special needs | a. Computer hall to be used in visual labs and simulation experiments.  
b. Data show, overhead projector, Molecular models and chemistry computer programs.  
c. Changing to credit hours system, it is more effective. |
| Student Assessment | • Final-Term Examination to assess the student skill in presenting facts, applications, theories and calculations.  
• Class activities (reports, discussions, practical…etc) to assess the student intellectual, professional, practical, general and transferable skills |
| Procedures used: | |
| Schedule: | Assessment 1: Practical Examination  Week 12  
Assessment 2: Final-Term Examination  Week 16 |
| Weighing of Assessment: | Mid-Term Examination: 10  
Final-Term Examination: 100  
Practical Examination: 80  
Semester Work: 10  
Total: 200 |
| Course Notes | Lecture notes of physical chemistry for 3rd year students - faculty of science – Damanhour - Alexandria University. |
| Recommended Books | • The Physical Chemistry of the Metals, Friedrich Rudolf Schenck, Read Books (2008) |

**Course Instructor**  
**Dr. Medhat A. Shaker**

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

**Date:** 20 / 9 / 2008