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. 301</td>
<td>Inorganic Chemistry</td>
<td>3rd year / 1st term</td>
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<tr>
<td></td>
<td></td>
<td>2009-2010</td>
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</tbody>
</table>

Specialization:
Special Chemistry

<table>
<thead>
<tr>
<th>No. of instructional units:</th>
</tr>
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<tbody>
<tr>
<td>lecture 4 tutorial 1 practical --</td>
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</tbody>
</table>

2. Course Aim

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

2. Intended learning outcome

Knowledge and understanding

At the end of this course the student should be able to:
- DEFINE the fundamentals and applications of the kinetic theory of gases
- list the basics of chemical kinetics
- write the value of quantum chemistry

Intellectual skills

At the end of this course the student should be able to:
- Deduce the different forms of classical quantum equations.
- Differentiate between the reactions of different order.
- Test the validity of kinetic gas equation.

Professional skills

At the end of this course the student should be able to:
- Solve problems related to the course specified.

a) General skills

At the end of this course the student should be able to:
- Problem-solving skills, relating to qualitative and quantitative
information, extending to situations where evaluations have to be made on the basis of limited information.

<table>
<thead>
<tr>
<th>course content</th>
<th>Molecular kinetic theory of gases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Introduction, Translational kinetic energy and temperature</td>
</tr>
<tr>
<td></td>
<td>Principle of equipartition of energy</td>
</tr>
<tr>
<td></td>
<td>Degrees of freedom and heat capacities of gases</td>
</tr>
<tr>
<td></td>
<td>Distribution of molecular velocities</td>
</tr>
<tr>
<td></td>
<td>Root mean square velocity, average velocity, and most probable velocities</td>
</tr>
<tr>
<td></td>
<td>Frequency of collision</td>
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<tr>
<td></td>
<td>Mean free path</td>
</tr>
<tr>
<td></td>
<td>Collision diameters</td>
</tr>
<tr>
<td></td>
<td>Viscosity of gases</td>
</tr>
<tr>
<td></td>
<td>Thermal conductivity of gases</td>
</tr>
<tr>
<td></td>
<td>Diffusion. Behaviour of real gases</td>
</tr>
<tr>
<td></td>
<td>Compressibility and its uses</td>
</tr>
<tr>
<td></td>
<td>Principle of continuity of state</td>
</tr>
<tr>
<td></td>
<td>Principle of corresponding state</td>
</tr>
</tbody>
</table>

Chemical kinetics (1)

- Rate of Chemical Reaction, Order of reaction, Molecularity of reaction, Reaction of the first order
- Pseudo unimolecular reaction, reaction of second order, reaction of \( n \)th order, zero order reaction
- Determination of reaction order
- Complex reactions
- Effect of temperature on reaction rates, the collision theory
- Transition state theory, potential energy surfaces
- Statistical mechanics of chemical equilibrium
- Derivation of the rate equation
- Kinetic isotope effects.
- Interpretation of the probability factor, thermodynamical formulation of reaction rates, Entropy of activation, Experimental activation energy
- Kinetic isotope effect, termolecular reaction, unimolecular reaction
- Chain reactions, Explosive reactions
- Reaction in solution
- Fast reactions (flash photolysis, relaxation methods, fast
Quantum chemistry (1)

- Introduction
- Classical mechanical treatment of the simple harmonic oscillator
- Propagating and standing waves.
- Black body radiation.
- Photoelectric effect
- Compton effect.
- De Broglie waves.
- Electron diffraction
- Schrödinger equation.
- Interpretation of the wave function. Particle in a box.
- Particle in a ring.
- The free electron theory for linear and cyclic systems
- The hydrogen atom.

Teaching and learning methods

- Lecture
- Contact hours
- Problem-Based Learning
- Encourage students to use online and library resources

Teaching 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.

Procedures used:

<table>
<thead>
<tr>
<th>Schedule:</th>
<th>Assessment 1: Final-Term Examination</th>
<th>Week 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighing of Assessment:</td>
<td>Mid-Term Examination: -</td>
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<tr>
<td>Final-Term Examination:</td>
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<tr>
<td>Oral Examination:</td>
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<tr>
<td>Practical Examination:</td>
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<td>------------------------</td>
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<tr>
<td>Semester Work:</td>
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<tr>
<td><strong>Total:</strong></td>
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**List of Textbooks and References:**

**Course Notes**
Lecture notes of physical chemistry for 3rd year students - faculty of science – Damanhour - Alexandria University.

**Required Books (Textbooks)**

**Recommended Books**
- Physical chemistry, Thomas engel and Philip Reid New York (2005)

**Periodicals, web sites, etc**

**Course Instructor**
Prof. Mohammed K. Awad &
Dr. Medhat A. Shaker

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

**Date:** 20 / 9 / 2008