Course Description of Physical Chemistry III (Chemical Thermodynamics).

The program offered in this course is designed to help student-teachers achieve the following goals:

- Explain the nature of energy.
- Explain thermodynamic laws.
- Correlate thermodynamic potential and equilibrium states.
- Describes the thermodynamics properties of solutions.
- Explain thermal properties viscosity and thermal conductivity of gases on basis of heat flow.
- Define the conditions for phase equilibria.
- Describe the applications of phase rule on one, two, three component systems.

Basic Data

(1) Course Title: Physical Chemistry III (Chemical Thermodynamics).
(2) Course Code No.: 331 ch
(3) Credit Hours: Five credit hours
   Lectures: 3 credit hours
   Recitation: 2 credit hours
   Total hours: 5 credit hours

Professional Data

1) General goals of the course
   The course is designed to help student-teachers achieve the following goals:
   - Explain the nature of energy.
   - Explain thermodynamic laws.
   - Correlate thermodynamic potential and equilibrium states.
   - Describes the thermodynamics properties of solutions.
   - Explain thermal properties viscosity and thermal conductivity of gases on basis of heat flow.
   - Define the conditions for phase equilibria.
   - Describe the applications of phase rule on one, two, three component systems.

2) Operational learning objectives of the course
   By the end of this course, student teachers are expected to achieve the following objectives:
   A) Knowledge and Comprehension:
   - Recognize the thermodynamic laws on chemical reactions and calculations.
   - Describe the equilibrium states in chemical reactions.
   - Apply the partial molar quantities to solutions.
   - Recognize biological and engineering applications.
   - Identify different forms of energy.
- Apply first law of Thermodynamics.
- Explain the application of Thermo chemistry in calculations of bond energies, lattice energy … etc. Obtain heats of formation, ionization, etc.
- Explain performance of heat engines and pumps.
- Explain the concept of entropy.
- Describes concepts of spontaneity of chemical reactions.
- Calculate $G$, $K$
- Explain factors affecting equilibrium.
- Discuss partial molar quantities and activities to solution properties.

B) Cognitive Skills:

- Relate the concepts of physical chemistry to contemporary, historical, technological, and societal issues; in particular, relate concepts of physical chemistry to current controversies, such as those around energy uses and medical research, as well as other issues.
- Demonstrate competence in the practice of teaching as defined within the Entry-Level Standards.

C) Practical Skills:

- Locate resources, design and conduct inquiry-based open-ended investigations in physical chemistry, interpret findings, communicate results, and make judgments based on evidence.
- Demonstrate competence in the practice of teaching through investigative experiences and by demonstrating the application of the scientific process and assessing student learning through multiple processes.
- Acquire hands on practical skills (Biological and engineering applications)

D) Enabling Skills

- Construct new knowledge for themselves through research, reading and discussion, and reflect in an informed way on the role of science in human affairs.
- Create and maintain an educational environment in which conceptual understanding will occur for all science students.

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<th>Topic</th>
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<tr>
<td>First</td>
<td>Chemical Thermodynamics</td>
<td>3 2 5</td>
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<td></td>
<td>*Chemical thermodynamics: heat, energy.</td>
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<td>Second</td>
<td>Structure, work, intensive and extensive quantities.</td>
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<td>Third</td>
<td>* First law: reversible and irreversible processes</td>
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<td>Fourth</td>
<td>heat capacity, isothermal, adiabatic</td>
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<td>Fifth</td>
<td>Isobaric processes, J – T affect, thermo chemistry, Kirchoff’s law.</td>
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<td>Sixth</td>
<td>Second law: Carnot cycle, entropy, heat engines and pumps.</td>
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<td>Seventh</td>
<td>Third law.</td>
<td>3 2 5</td>
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<td>*Gibbs and Heimholtz Free energy: Partial derivatives and Maxwell relations.</td>
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<td>Eighth</td>
<td>chemical potential</td>
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<td>Ninth</td>
<td>Chemical equilibrium.</td>
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<td>Tenth</td>
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<td>Eleventh</td>
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<td>Twelfth</td>
<td>Activity.</td>
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<td>Thirteenth</td>
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<td>Debye – Huckle theory</td>
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<tr>
<td>fifteen</td>
<td>assement</td>
<td>3 2 5</td>
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Activities, tasks and assignments:

- Solves and discusses problem sets.
- Submission and class presentation of term papers.
- Computer aided and web based assignments and assessment.
- Visits to power solar and other plants.
- Molecular modeling to demonstrate kinetic behaviour of gases.

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Summative Evaluation table

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<th>Score</th>
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<tr>
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<td>1. امتحان نهاية الفصل الدراسي</td>
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<tr>
<td>2. Final oral exam</td>
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<td>2. الامتحان الشفوي</td>
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<td>3. Assignments</td>
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<td>3. أعمال السنة</td>
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<td>Total</td>
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<td>المجموع</td>
</tr>
</tbody>
</table>

References:

Students’ Textbooks


Lecturer’s References

1- Schaum’s Outline of Physical Chemistry (2nd Edi... by Clyde Metz
2- Cracking the GRE Chemistry Test, 3rd Edition... by Princeton Review
3- GRE Chemistry (REA) - The Best Test P by Staff of Research
4- Instant Notes in Physical Chemistry by Gavin Whittaker

Periodicals and websites

- WWW Virtual Library - Chemistry
- ChemDex-Sheffield List of Chemistry internet Sites
- www.carolina.com/product/physical+science/chemistry/che...
- www.ecampus.com/book/067352342X.
- Chemical Information Sources from Indiana University
- Internet Resources: Chemistry

Resources

- References
- Chemistry library
- Textbooks
- Handouts and problem sets.
- Electronic, web, and multimedia based resources.
- Lab work.

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Course coordinator:

Head of the Department:

Date: 2005/5/11