



## Hunan University

### CHEM12: Introduction to Thermochemistry and Kinetics

**Professor:** To be announced

**Total contact hours:** 54 hours

**Credit:** 4

#### ***Course Description***

The course aims at giving students a contemporary and accurate overview of physical chemistry while focusing on basic principles that unite the sub-disciplines of the field. Besides that, it emphasizes fundamental concepts and presents cutting-edge research developments that demonstrate the vibrancy of physical chemistry today. You will find that this course focuses on topics of physical chemistry, presenting within a modern framework of applications. Extensive math derivations are provided, yet the course retains the significant chemical rigor needed in physical chemistry.

#### ***Textbook***

Textbook: *Thermodynamics, Statistical Thermodynamics, & Kinetics*

Author: Thomas Engel, Philip Reid

Edition: 3rd Edition

Publisher: Pearson

#### ***Supplementary Reading:***

Textbook: *Introduction to Organic Chemistry*

Author: William Henry Brown, Thomas Poon

Publisher: John Wiley & Sons Ltd; 4<sup>th</sup> International student edition (April 28, 2010)

#### ***Grading***

- Reports 20%
- Mid-terms 5 50%
- Final Exam 30%

A+ 96-100	A 90-95	A- 85-89
B+ 82-84	B 78-81	B- 75-77
C+ 71-74	C 66-70	C- 62-65
D 60-61	F < 60	



## ***Course Schedule***

The course has 24 class sessions in total. All sessions are 2 hours and 15 minutes in length.  
Note: the course outline and required readings are subject to change.

Class 1:

Introduction

1. Fundamental Concepts of Thermodynamics
2. Heat, Work, Internal Energy, Enthalpy, and the First Law of Thermodynamics

Class 2:

3. The Importance of State Functions: Internal Energy and Enthalpy

Class 3:

4. Thermochemistry

Report 1

Class 4:

Review of 1 to 4

Reading:

Chapter One: Covalent Bonding and Shapes of Molecules

Chapter Two: Acids and Bases

Chapter Three: Alkanes and Cycloalkanes

Chapter Four: Alkenes and Alkynes

Mid-term 1

Class 5:

5. Entropy and the Second and Third Laws of Thermodynamics

Class 6:

6. Chemical Equilibrium

Class 7:

7. The Properties of Real Gases

Class 8:

8. Phase Diagrams and the Relative Stability of Solids, Liquids, and Gases

Class 9:

Review of 5 to 8

Reading:

Chapter Five: Reactions of Alkanes and Alkynes

Chapter Six: Chirality: The Handedness of Molecules

Chapter Seven: Haloalkanes



## Chapter Eight: Alcohols, Ethers, and Thiols

### Mid-term 2

Class 10:

9. Ideal and Real Solutions

Class 11:

10. Electrolyte Solutions

Class 12:

11. Electrochemical Cells, Batteries, and Fuel Cells

Class 13:

Review of 9 to 11

Reading:

Chapter Nine: Benzene and its Derivatives

Chapter Ten: Amines

Chapter Eleven: Infrared Spectroscopy

Chapter Twelve: Nuclear Magnetic Resonance Spectroscopy

Mid-term 3

Class 14:

12. Probability

Class 15:

13. The Boltzmann Distribution

Class 16:

14. Ensemble and Molecular Partition Functions

Report 2

Class 17:

Review of 12 to 14

Reading:

Chapter Thirteen: Aldehydes and Ketones

Chapter Fourteen: Carboxylic Acids

Chapter Fifteen: Functional Derivatives of Carboxylic Acids

Chapter Sixteen: Enolate Anions

Chapter Seventeen: Organic Polymer Chemistry

Mid-term 4

Class 18:

15. Statistical Thermodynamics



Class 19:

16. Kinetic Theory of Gases

Class 20:

17. Transport Phenomena

Class 21:

Review of 15 to 17

Reading:

Chapter Eighteen: Carbohydrates

Chapter Nineteen: Amino Acids and Proteins

Chapter Twenty: Nucleic Acids

Chapter Twenty-One: Lipids

Chapter Twenty-Two: Organic Chemistry of Metabolism

Mid-term 5

Class 22:

18. Elementary Chemical Kinetics

Class 23:

19. Complex Reaction Mechanisms

Class 24:

Overall review

Final Exam

### ***Attending Policy***

Regular and prompt attendance is required. Under ordinary circumstances, you may miss two times without penalty. Each absence over this number will lower your course grade by a third of a letter and missing more than five classes may lead to a failing grade in the course. Arriving late and/or leaving before the end of the class period are equivalent to absences.

### ***Policy on "Late Withdrawals"***

In accordance with university policy, appeals for late withdrawal will be approved ONLY in case of medical emergency and similar crises.

### ***Academic Honesty***

Hunan University expects all students to do their own work. Instructors will fail assignments that show evidence of plagiarism or other forms of cheating, and will also report the student's name to the University administration. A student reported to the University for cheating is placed on disciplinary probation; a student reported twice is suspended or expelled.



### ***General Expectations:***

Students are expected to:

- Attend all classes and be responsible for all materials covered in class and otherwise assigned;
- Complete the day's required reading and assignments before class;
- Review the previous day's notes before class and make notes about questions you have about the previous class or the day's reading;
- Participate in class discussions and complete required written work on time;
- Refrain from texting, phoning or engaging in computer activities unrelated to class during the class period;
- While class participation is welcome, even required, you are expected to refrain from private conversations during the class period.

### ***Special Needs or Assistance***

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.