

화공물리화학

Physical Chemistry for Chemical Engineering

Department of Chemical Engineering, Sungkyunkwan University

Instructor: Dr. Seokhyun Choung

Semester: Fall 2027

Credits: 3

Course Description. This course covers the core principles of physical chemistry that underpin chemical engineering: thermodynamics, quantum mechanics, spectroscopy, statistical mechanics, and chemical kinetics. A distinctive feature is the integration of interactive computational simulations that allow students to manipulate molecular parameters in real time and observe macroscopic consequences. Students develop both analytical problem-solving skills and physical intuition through visualization of microscopic phenomena. The course follows Atkins' Physical Chemistry with supplementary interactive modules developed by the instructor.

16-Week Schedule

Week	Topic	Week	Topic
1	Properties of Gases: Kinetic Model and Real Gas Equations	9	Atomic and Molecular Orbital Theory
2	First Law: Enthalpy, Heat Capacity, and the Joule–Thomson Effect	10	Molecular Symmetry and Group Theory
3	Second and Third Laws: Entropy and Spontaneity	11	Rotational, Vibrational, and NMR Spectroscopy
4	Phase Equilibria and Phase Diagrams	12	Statistical Thermodynamics and Partition Functions
5	Simple Mixtures: Raoult's Law, Henry's Law, and Colligative Properties	13	Molecular Interactions and Solid-State Structures
6	Chemical Equilibrium and Electrochemistry	14	Chemical Kinetics: Rate Laws and Reaction Mechanisms
7	Introduction to Quantum Mechanics: Wave Functions and Tunneling	15	Reaction Dynamics and Surface Chemistry
8	Midterm Examination	16	Final Examination

Assessment

Component	Weight
Final Examination	30%
Midterm Examination	25%
Problem Sets	20%
Interactive Simulation Exercises	15%
Class Participation	10%

References

- [1] Atkins, de Paula, Keeler. *Atkins' Physical Chemistry*, 11th ed. Oxford, 2018.
- [2] Choung. *Interactive Textbook: Physical Chemistry*. <https://s-choung.github.io/interactive-textbook/physical-chemistry/>
- [3] Engel, Reid. *Physical Chemistry*, 3rd ed. Pearson, 2012.