

## AP Chemistry Course and Exam Description

### AP Chemistry Course Overview

The AP Chemistry course provides students with a college-level foundation to support future advanced coursework in chemistry. Students cultivate their understanding of chemistry through inquiry-based investigations, as they explore content such as: atomic structure, intermolecular forces and bonding, chemical reactions, kinetics, thermodynamics, and equilibrium.

The AP Chemistry course is designed to be the equivalent of the general chemistry course usually taken during the first college year.

### PREREQUISITES

Students should have successfully completed a general high school chemistry course and Algebra II.

### LABORATORY REQUIREMENT

This course requires that 25 percent of instructional time engages students in lab investigations. This includes a minimum of 16 hands-on labs (at least six of which are guided inquiry). It is required that students keep a lab notebook throughout.

### AP Chemistry Course Content

- Unit 1: Atomic Structure and Properties
- Unit 2: Molecular and Ionic Compound Structure and Properties
- Unit 3: Intermolecular Forces and Properties
- Unit 4: Chemical Reactions
- Unit 5: Kinetics
- Unit 6: Thermodynamics
- Unit 7: Equilibrium
- Unit 8: Acids and Bases
- Unit 9: Applications of Thermodynamics

### Big Ideas

Scale, Proportion, and Quantity: Quantities in chemistry are expressed at both the macroscopic and atomic scales, and relationships exist both within and between these two scales.

- Structure and Properties: Properties of substances observable at the macroscopic scale emerge from the structures of atoms and molecules and the interactions between them.
- Transformations: Chemistry is about the rearrangement of matter, both macroscopically and sub-microscopically.

- Energy: Energy plays important roles in characterizing and controlling chemical systems.

#### AP Chemistry Science Practices

The following science practices describe what skills students should develop during the course:

- Models and Representations: Describe models and representations, including across scales.
- Question and Method: Determine scientific questions and methods.
- Representing Data and Phenomena: Create representations or models of chemical phenomena.
- Model Analysis: Analyze and interpret models and representations on a single scale or across multiple scales.
- Mathematical Routines: Solve problems using mathematical relationships.
- Argumentation: Develop an explanation or scientific argument.

AP Chemistry course and exam	
<b>UNIT 1 ATOMIC STRUCTURE AND PROPERTIES</b>	
1.1	Moles and Molar Mass
1.2	Mass Spectroscopy of Elements
1.3	Elemental Composition of Pure Substances
1.4	Composition of Mixtures
1.5	Atomic Structure and Electron Configuration
1.6	Photoelectron Spectroscopy
1.7	Periodic Trends
1.8	Valence Electrons and Ionic Compounds
<b>UNIT 2 MOLECULAR AND IONIC COMPOUND STRUCTURE AND PROPERTIES</b>	
2.1	Types of Chemical Bonds
2.2	Intramolecular Force and Potential Energy
2.3	Structure of Ionic Solids
2.4	Structure of Metals and Alloys

2.5	Lewis Diagrams
2.6	Resonance and Formal Charge
2.7	VSEPR and Bond Hybridization
<b>UNIT 3 INTERMOLECULAR FORCES AND PROPERTIES</b>	
3.1	Intermolecular Forces
3.2	Properties of Solids
3.3	Solids, Liquids, and Gases
3.4	Ideal Gas Law
3.5	Kinetic Molecular Theory
3.6	Deviation from Ideal Gas Law
3.7	Solutions and Mixtures
3.8	Representations of Solutions
3.9	Separation of Solutions and Mixtures Chromatography
3.10	Solubility
3.11	Spectroscopy and the Electromagnetic Spectrum
3.12	Photoelectric Effect
3.13	Beer-Lambert Law
<b>UNIT 4 CHEMICAL REACTIONS</b>	
4.1	Introduction for Reactions
4.2	Net Ionic Equations
4.3	Representations of Reactions

4.4	Physical and Chemical Changes
4.5	Stoichiometry
4.6	Introduction to Titration
4.7	Types of Chemical Reactions
4.8	Introduction to Acid-Base Reactions
4.9	Oxidation-Reduction (Redox) Reactions
<b>UNIT 5 KINETICS</b>	
5.1	Reaction Rates
5.2	Introduction to Rate Law
5.3	Concentration Changes Over Time
5.4	Elementary Reactions
5.5	Collision Model
5.6	Reaction Energy Profile
5.7	Introduction to Reaction
5.8	Reaction Mechanism and Rate Law
5.9	Steady-State Approximation
5.10	Multistep Reaction Energy Profile
5.11	Catalysis
<b>UNIT 6 THERMODYNAMICS</b>	
6.1	Endothermic and Exothermic Processes
6.2	Energy Diagrams

6.3	Heat Transfer and Thermal Equilibrium
6.4	Heat Capacity and Calorimetry
6.5	Energy of Phase Changes
6.6	Introduction to Enthalpy of Reaction
6.7	Bond Enthalpies
6.8	Enthalpy of Formation
6.9	Hess's Law
<b>UNIT 7 EQUILIBRIUM</b>	
7.1	Introduction to Equilibrium
7.2	Direction of Reversible Reactions
7.3	Reaction Quotient and Equilibrium Constant
7.4	Calculating the Equilibrium Constant
7.5	Magnitude of the Equilibrium Constant
7.6	Properties of the Equilibrium Constant
7.7	Calculating Equilibrium
7.8	Representations of Equilibrium
7.9	Introduction to Le Chatelier's Principle
7.10	Reaction Quotient and Le Chatelier's Principle
7.11	Introduction to Solubility Equilibria
7.12	Common-Ion Effect
7.13	pH and Solubility
7.14	Free Energy of Dissolution

## **UNIT 8 ACID AND BASES**

8.1 Introduction to Acids and Bases

8.2 pH and pOH of Strong Acids and Bases

8.3 Weak Acid and Base Equilibria

8.4 Acid-Base Reactions and Buffers

8.5 Acid-Base Titrations

8.6 Molecular Structure of Acids and Bases

8.7 pH and  $pK_a$

8.8 Properties of Buffers

8.9 Henderson-Hasselbalch Equation

8.10 Buffer Capacity

## **UNIT 9 APPLICATIONS OF THERMODYNAMICS**

9.1 Introduction to Entropy

9.2 Absolute Entropy and Entropy Change

9.3 Gibbs Free Energy and Thermodynamic Favorability

9.4 Thermodynamic and Kinetic Control

9.5 Free Energy and Equilibrium

9.6 Coupled Reactions

9.7 Galvanic (voltaic) and Electrolytic Cells

9.8 Cell Potential and Free Energy

9.9	Cell Potential Under Nonstandard Conditions
9.10	Electrolysis and Faraday's Law

### **AP Chemistry EXAM: 3 Hours 15 min**

The AP Chemistry Exam assesses student understanding of the science practices and learning objectives outlined in the course framework. The exam is 3 hours and 15 minutes long and includes 60 multiple-choice questions and 7 free-response questions. A scientific or graphing calculator is recommended for use on Section II of the exam. No calculators are permitted for use on Section I. Students are provided with the periodic table and a formula sheet that lists specific and relevant formulas for use on the exam.

### **Další informace:**

#### **AP Chemistry Course Overview – 2 stránky**

<https://apcentral.collegeboard.org/pdf/ap-chemistry-course-overview.pdf?course=ap-chemistry>

#### **AP Chemistry Course at a glance – 4 strany**

<https://apcentral.collegeboard.org/pdf/ap-chemistry-course-a-glance.pdf?course=ap-chemistry>

#### **AP Chemistry Course and Exam Description – 248 stran**

<https://apcentral.collegeboard.org/pdf/ap-chemistry-course-and-exam-description.pdf?course=ap-chemistry>

#### **Příklady zkuškových otázek**

<https://apcentral.collegeboard.org/pdf/ap21-frq-chemistry.pdf?course=ap-chemistry>