

# CP Chemistry Syllabus

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## Q1 – The Nature of Chemistry

### I. Nature of Science

- the scientific method
- philosophy/nature of science
- history of chemistry
- types of chemistry
- experimental methods; best practices
- lab equipment

### II. Matter & Energy

- Law of Conservation of Mass/Matter
- physical vs. chemical changes
- mixtures vs. pure substances
- models of the atom, atomic structure
- the periodic table
- atomic spectra

### III. Naming Chemicals & Balancing Equations

- monatomic vs. polyatomic ions
- writing formulas of & naming ionic compounds
- writing formulas of & naming covalent/molecular compounds
- writing & balancing chemical equations
- identifying & predicting chemical reactions

### IV. Poster Presentation

- a famous chemist
- a famous chemistry experiment or discovery
- an element

## S1 – First Semester Exam

- 20% of semester grade
- 100 questions
- multiple choice

## Q2 – Chemical Quantities

### I. Scientific Measurement

- qualitative vs. quantitative measurements
- scientific notation
- accuracy, precision & error
- SI units (metric system), unit conversion
- density
- temperature ( $^{\circ}\text{C}$  &  $\text{K}$ )

### II. Chemical Quantities

- the mole & Avagadro's number
- molar mass & volume
- percent composition

### III. Stoichiometry

- coefficients in balanced equations
- mole ratios
- mole-to-mole conversions
- mass-to-mass conversions
- volume-to-volume conversions
- limiting reagents
- actual, theoretical & percent yield

### IV. PowerPoint Presentation

- a scientific unit of measurement
- a chemistry-related career
- a controversial topic related to chemistry

## Q3 – Kinetic Theory

- I. **States of Matter**
  - a. nature of solids, liquids, gases
  - b. changes of state
- II. **Thermochemistry**
  - a. Law of Conservation of Energy
  - b. heat & enthalpy vs. temperature
  - c. endothermic vs. exothermic change
  - d. specific heat capacity
  - e. thermochemical equations
  - f. molar heats of phase changes, reaction, solution & formation
- III. **The Behavior of Gases**
  - a. properties of gases; kinetic theory
  - b. the gas laws; combined gas law
  - c. ideal vs. real gas; ideal gas law
  - d. gas law calculations
- IV. **Nuclear Chemistry**
  - a. radioactivity, radiation & radioactive decay
  - b. alpha, beta & gamma decay
  - c. nuclear transformations
  - d. fission vs. fusion
  - e. nuclear power
  - f. the atomic bomb & its development
- V. **Website Creation & Sharing**
  - a. a historical or modern energy source
  - b. a specific topic in food chemistry
  - c. a historical or modern use of a gas or gasses

## Q4 – Chemistry & Society

- I. **Water, Aqueous Systems and Solutions**
  - a. properties of water
  - b. miscible vs. immiscible
  - c. solute vs. solvent
  - d. unsaturated, saturated & supersaturated
  - e. concentration: molarity vs. percent
  - f. colligative properties of solutions
- II. **Acids and Bases**
  - a. properties of acids vs. bases
  - b. hydrogen ion concentration & pH
  - c. acid-base theories: Arrhenius, Brønsted-Lowry, Lewis
  - d. strong vs. weak; dissociation
  - e. neutralization; titration
- III. **Organic Chemistry**
  - a. alkanes, alkenes, alkynes
  - b. cyclic hydrocarbons & aromatic rings
  - c. functional groups
  - d. alcohols, ethers, ketones, carboxylic acids, esters
- IV. **Environmental & Green Chemistry**
  - a. water quality & testing
  - b. greenhouse gases & global warming
  - c. energy conservation, alternative energy
  - d. recycling; plastics
- V. **Research Paper**
  - a. a chemical produced by industrial chemistry
  - b. a process of environmental/green chemistry
  - c. a biochemistry advancement in medicine

## S2 – Second Semester Exam

- a. 20% of semester grade
- b. 100 questions
- c. multiple choice