

Honors Chemistry (820) – Course Outline

Chemistry is the study of matter – what stuff is made of, and how stuff turns into other stuff. We will begin with an investigation of water – perhaps the most familiar and essential chemical compound on Earth. We will explore the nature of atoms and molecules in everything from the DNA in our bodies to the stars in the universe. Throughout the year we will explore how we use our knowledge of chemistry to improve our lives. As you learn the chemistry content you will also be building your study skills, which will help you in any class or independent study you choose to take. This course fulfills standard college preparatory requirements.

Textbook: Bell, Jerry, et al. Chemistry. New York: W.H.Freeman and Co., 2005.

Ch. 1. Water: A Natural Wonder

- Phases of matter
- Atomic models
- Molecular models
- Lewis structures
- 3-D models
- Polarity
- Intermolecular forces
- Energy diagrams
- Mole concept
- Specific heat

Ch. 2. Aqueous Solutions and Solubility

- Solution process
- Ionic compounds
- Precipitation reactions
- Reaction stoichiometry
- Auto-ionization of water and pH
- Acids and bases

Ch. 3 Origin of Atoms

- Spectroscopy
- Nuclear atom
- Nuclear reactions
- Nuclear reaction energies

Ch. 4 Structure of Atoms

- Periodicity
- Atomic emission
- Light as a wave
- Photoelectric effect
- Quantum model of atoms
- Wave model of electrons in atoms

Ch. 5 Structure of Molecules

- Isomers
- Molecular orbitals
- Delocalized orbitals
- Molecular geometry
- Stereoisomerism
- Functional groups

Ch. 6 Chemical Reactions

- Classifying chemical reactions
- Precipitation reactions
- Lewis acids and bases
- Bronsted-Lowry acid-base reactions
- Complex metal ions
- Formal charge
- Reduction-oxidation reactions

Ch. 7 Chemical Energetics

- Thermal energy transfer
- Calorimetry
- Enthalpy
- Pressure-volume work
- Internal energy

Ch. 8 Entropy and Molecular Organization

- Mixing and osmosis
- Entropy
- Gibbs free energy
- Colligative properties

Ch. 9 Chemical Equilibrium

- Nature of equilibrium
- Acid-base equilibrium
- Solubility equilibrium

Ch. 10 Reduction-oxidation: Electrochem.

- Electrochemical cells
- Cell potentials