

Chemistry

Textbook:

Malone, Leo J., and Theodore O. Dolter. Basic Concepts of Chemistry. 8th Edition. Hoboken: John Wiley & Sons, 2010.

Prerequisites:

Algebra I and Geometry.

Course Description:

Junior Chemistry is an introductory course that will give students a general overview of the composition, structure, properties and change of matter and cultivate students' appreciation of the everyday chemical processes. The course is designed to serve as a firm foundation for science classes students will take in college and prepare the students for Advanced Placement college level chemistry course offered at Covington Latin School during senior year. This course meets four times per week for a single period for lecture and problem solving sessions, and additional (fifth day) for a double period for practical lab work. Junior chemistry class will introduce the basics of the following six big ideas as described in the AP Chemistry curriculum framework by College Board:

Big Ideas (BI)	
BI-1	The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms . These atoms retain their identity in chemical reactions.
BI-2	Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.
BI-3	Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons
BI-4	Rates of chemical reactions are determined by details of the molecular collisions
BI-5	The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter
BI-6	Any bond or intermolecular attraction that can be formed can also be broken. These two processes are in a dynamic competition, and are sensitive to initial conditions and external perturbations.

At the end of this course students will:

1. Learn the inquiry process through laboratory investigations.
2. Apply mathematical and scientific knowledge and skills to solve quantitative, qualitative, spatial, and analytic problems.
3. Apply basic arithmetic, algebraic, and geometric concepts.
4. Formulate strategies for the development and testing of hypotheses.
5. Use basic statistical concepts to draw both inferences and conclusions from data.
6. Identify implications and consequences of drawn conclusions.
7. Use manipulative and technological tools including the Texas Instruments Nspire CAS CX Handhelds, Vernier LabQuests, Vernier Probes, and Vernier's LoggerPro software.
8. Measure, compare, order, scale, locate, and code accurately.
9. Do scientific research and report and display the results of this research.
10. Learn to think critically in order to solve problems.

Course Sequence:

Semester 1/Quarter 1

1. **Measurements in Chemistry**
 - Classifications of matter
 - Properties of matter
 - Significant figures
 - Units of measurement
2. **Elements and Compounds**
 - The elements and their composition
 - Compounds and their composition
3. **Matter and Energy**
 - The properties of matter
 - The properties of energy
4. **Periodic Table and Chemical Nomenclature**
 - Relationships among the elements and the periodic table
 - The formulas and names of compounds
5. **Chemical Reactions**
 - The representation of chemical changes and three types of changes
 - Ions in water and how they react
6. **Quantities in Chemistry**
 - Measurement of masses of elements and compounds
 - Component elements of compounds

Quarter 2

7. **Stoichiometry**
 - Mass relationships in chemical reactions

- Energy relationships in chemical reactions
- Chemical reactivity
- Avogadro's number
- Empirical formulas
- Limiting reactants
- 8. Atomic Theory**
 - The energy of the electron in the atom
 - Electron configuration
- 9. The Chemical Bond**
 - Chemical bonds and the nature of ionic compounds
 - Chemical bonds and the nature of molecular compounds
 - Distribution of charge in chemical bonds
- 10. The Gaseous State**
 - The nature of the gaseous state and the effects of conditions
 - Relationships among quantities of gases, conditions, and chemical reactions
- 11. Aqueous Solutions**
 - Solutions and the quantities involved
 - The effects of solutes on the properties of water

Semester 2/Quarter 3

- 12. Acids, Bases, and Salts**
 - Acids, bases, and the formation of salts
 - The measurement of acid strength
 - Salts and oxides as acids and bases
- 13. Oxidation-Reduction Reactions**
 - Redox reactions-the exchange of electrons
 - Spontaneous and nonspontaneous redox reactions
- 14. Reaction Rates and Equilibrium**
 - Collisions of molecules and reactions at equilibrium
 - The quantitative aspects of reactions at equilibrium
- 15. Nuclear Chemistry**
 - Naturally occurring radioactivity
 - Induced nuclear changes and their uses
- 16. The Solid and Liquid States**
 - The properties of condensed states and the forces involved
 - The liquid state and changes in state

Quarter 4

- 17. Organic Chemistry**
 - Hydrocarbons
 - Other classes of organic compounds
- 18. Biochemistry**
 - The building blocks of life
 - Amino acids
 - Proteins and Enzymes
 - Carbohydrates

- Lipids
- Nucleic acids (DNA, RNA, etc.)
- Catalytic RNA

Evaluation:

Homework, Laboratory Reports, Quizzes, Tests, Exams