

WRHS Science Curriculum

Syllabus

Course Name: Chemistry

Grade Level: 11 & 12

Course Description:

Chemistry covers the basic principles of the makeup and transformation of substances. Emphasis is on the development of chemical concepts with the equations and calculations necessary for their understanding. Laboratory experiments are used in the development of the concepts and to illustrate proper techniques.

Links to Student Expectations:

- All students will develop skills to utilize technology to gather, to evaluate, to assimilate, and to present information.
- All students will utilize critical thinking skills to identify and to provide resources to solve a problem.
- All students will learn to communicate critically, persuasively, and personally in both oral and written expression.
- All students will be able to make decisions and solve problems using logical processes (e.g., scientific method, induction, deduction, syllogism, etc.).
- All students will develop skills to promote a sense of confidence in tackling the rigors of standardized tests such as the required MCAS and optional AP, SAT.

Interdisciplinary Connections:

Chemistry is a science that utilizes a variety of skills that have direct relationship to other sciences (biology and other life science, physics, environmental science) and to mathematics. Students must be able to discuss clearly theories or laboratory results both written and orally are directly using correct English. In order to understand the development of many theories and concepts, the historical background of the discovery is related to history.

I. Essential Questions for Course

- Is there a universal method for investigating that happens and what exists in nature?
- Is everything in life really composed of three basic units of matter?
- Is there a pattern that can be used to predict properties of materials yet unknown?
- How do atoms, so small in size, combine to form so many different things?
- Is it really true that you can not be created or destroyed matter?

- Why doesn't the volume occupied by a gas or the pressure exerted by a gas always remain constant?
- How do you know what is in a solution?
- Are acids and bases really important in our life and in our environment?
- Why do some reactions take place so fast and others so slowly, while others never seem to change?

II. Student Objectives

- To understand the Scientific Method process for performing investigations.
- To describe how physical and chemical properties can be used to classify and describe matter.
- To explain that the atom is a discrete particle and the model of the atom can be utilized to explain the interaction of elements and compounds that are observed in the real world.
- To understand how the periodic table provides information about the elements based upon their atomic structure.
- To describe the different types of bonding that can occur through the interaction of the valence electrons.
- To explain that since atoms (mass) can not be created or destroyed, the mass of your products must equal the mass of your reactants in a chemical reaction.
- To explain the relationship among the variables, pressure, temperature, volume and number of particles, in a gas sample using the kinetic molecular theory and use to solve simple problems.
- To explain the ideal gas law, define standard conditions and demonstrate its use to perform calculations.
- To determine what physical factors are involved in creating solutions.
- To calculate the concentration of solutions in terms of molarity and use to calculate concentrations due to dilution.
- To understand what an acid and base are, how they interact and how they are related to the pH scale.
- To understand that systems that are in equilibrium are really always changing, and that if a stress is imposed, the system will try to relieve it.
- To describe factors that effect the rate of a reaction.

III. Suggestions for Instruction

- Lectures
- Discussions
- Textbook readings (Name of text)
- Worksheets
- Individual or small group laboratory experiments
- Laboratory reports
- Teacher conducted demonstrations
- Utilization of the Cambridge Physics Atom game

- Interactive software packages.
- Videos
- Movies
- Internet sites

IV. Suggestion for Assessment

- Written assessments with variety of question type, including open response
- Laboratory experiments
- Laboratory reports that align with specific topics
- Laboratory reports that utilize the computer for data graphing and analysis
- Classroom presentations on specific questions, problems or concepts
- Reports on specific questions, problems or concepts
- Posters on specific questions, problems or concepts

V. Curriculum

- Scientific Method
- Properties of Matter, Energy and Change
- Atomic Structure
- Periodicity and The Periodic table
- Chemical Bonding
- Chemical Formulas and Nomenclature
- Chemical Equations and Reactions
- Stoichiometry
- Gases and Kinetic theory
- Solutions
- Acids and Bases
- Thermodynamics
- Kinetics
- Nuclear Chemistry

VI. Lesson Extensions

- Extend the calculations, data collection and analysis for various laboratory investigations.
- Concept of electron orbitals and 3-D configuration of molecular compounds
- Limiting reactant problems for chemical reactions
- Introduce and do calculations using the ideal gas law.
- Physical properties such as freezing point or boiling point and dependence on the concentration of the solution
- Calculation of pH for a given acid or base solution
- The role of indicators in relationship to the equivalence point.
- Calculate the value of the equilibrium constant for a reaction.

- Calculate heat of reactions using Hess's Law and through calorimetry
- Conduct and report on an independent research activity.