

Chemistry Syllabus

2020-2021

Overview

Chemistry is a required science course offered to students as part of a sequence of college preparatory sciences. The course objectives are aligned to the Next Generation Science Standards and the NJ model curriculum for science. In chemistry, students study the principals of matter and energy, how both matter and energy are quantified (measured) and qualified (observed) in a variety of contexts. Emphasis is put on a lab-based/ inquiry structure so that students may actively engage in scientific and engineering practices while applying crosscutting concepts to deepen their understanding of the core ideas for chemistry. Interdisciplinary math and literacy skills are integrated throughout this course. Students are encouraged to strengthen their skill sets in the field of physical science by engaging in discovery, problem solving, inquiry, research, and project design. In completing this course, students will have a better understanding of how chemical knowledge can be used to better understand the natural world and make decisions about scientific and technological issues.

Course Outline and Objectives

Chemistry covers 5 major units of study. Each unit covers specific core ideas while incorporating scientific and engineering practices aligned to broader cross cutting concepts. Real world applications of chemistry and connections to biological science are integrated throughout the course.

Unit 1 Matter, Atomic Structure and Bonding (Tri-semester 1)

Unit 1 introduces the science of chemistry, its value to society and safety in the laboratory. Core ideas include defining matter, understanding atom structure and the atom as the building block of matter, and using the Periodic Table to predict the properties of elements. Using the cross cutting concepts of identifying patterns and understanding stability and change, this unit will provide students the opportunity to apply those core ideas to develop and use models, design and carry out investigations, use mathematical thinking, and construct explanations and design solutions. The historical significance of alchemy will be the theme for this unit.

Student learning objectives for Unit 1

HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS1-3 Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

Unit 2 Molecular Structure and Properties (Tri-semester 1)

Unit 2 provides an understanding of how atoms form molecules, the relationship between molecular structure and the properties of molecular compounds, and the formation of organic molecules. Core ideas include the structure and properties of matter, chemical reactions, and types of interactions. The cross cutting concepts identifying patterns and understanding stability and change are applied to the movement of molecules. Using models, designing and carrying out investigations, constructing explanations, and designing solutions will be applied to the theme of smells (movement of molecules).

Student learning objectives for Unit 2

HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Unit 3 Phase Changes and Behavior of Gases (Tri-semester 2)

Unit 3 uses the theme of weather to explain the physical changes that occur in matter including density, phase, temperature, volume, and pressure. Weather is used to introduce the importance of proportional relationships, temperature scales, understanding gas laws, and reading weather maps to predict weather. The topics of meteorology and the impact of pollution on the atmosphere and climate are explored. Core ideas include the structure of matter, chemical reactions, definition of energy, energy in chemical processes, developing possible solutions, and optimizing the design solution. Science and engineering skills include using models, planning and conducting investigations, using mathematics and computational thinking, constructing explanations and designing solutions.

Student learning objectives for Unit 3

HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

HS-PS3-4. Plan and conducting an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

Unit 4 Stoichiometry, Solutions, Acids and Bases (Tri-semester 2)

Unit 4 provides a deeper understanding of the relationship between the activity of atoms, changes in matter and the importance of chemical reactions. Core ideas include types of structure and property of matter, chemical reactions, types of interactions, and nuclear processes. The law of conservation of mass, balancing equations, the importance of accurate measurement of mass, the formation of solutions, and characteristics of acids and bases are included in this unit. The crosscutting concepts of patterns, energy and matter, and stability and change are the organizing concepts for these disciplinary core ideas. Students are expected to demonstrate proficiency in developing and using models, planning and conducting investigations, using mathematical thinking, and constructing explanations and designing solutions. The theme of toxicity and the impact of chemical change on nature and the human body provides a backdrop for these important topics.

Student learning objectives for Unit 4

HS-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

Unit 5 Energy, Thermodynamics and Oxidation-Reduction (Tri-semester 3)

Unit 5 applies the core ideas learned in the prior units and includes the definition of energy, nuclear processes, light energy, conservation of energy, and energy transfer. Energy, thermodynamics, and oxidation-reduction reactions are explored using a variety of applications with the theme - fire. The transfer of energy in living organisms is introduced using the chemical reactions of photosynthesis and respiration. Science skills in building models, planning and conducting experiments, applying mathematical thinking, and constructing explanations and designing solutions will be used in a variety of lab based/ inquiry type investigations.

Student learning objectives for Unit 5

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

Grading Policy

Grades for this course will be based on the assessment of student progress with quizzes, projects and tests. Students are expected to successfully complete all assignments including homework, class work, activities and labs to properly prepare for the graded assessments. These include:

Work	Percentage
Assessments	50%
Assignments	40%
Progress Assessments	10%

Expectations for success

- Be present in class - be it in person or virtual
- Participate actively and ask questions as soon as you need help
- Keep detailed notes about the demonstrations and examples presented in class
- Keep up with your assignments

- Be open to the experience of chemistry
- Be willing to help others and receive help from your peers

Materials needed for chemistry

- 3 - ring binder
- Note paper
- Something to write with
- Computer

Academic Honesty

It is expected that students will use genuine, sincere, and fair means for the accomplishment of the tests, tasks, or projects from which evaluations of progress shall be determined. Students are expected to follow the Greater Egg Harbor Regional School District Policy for Academic Integrity.

This year is going to be a different one. Things are always subject to change, and we can only promise to do the best we can to help make this as doable as possible. I can't guarantee that things will be the same a few months, a few weeks, or even a few days from now. The best thing you can do is communicate with your teachers when you're confused, put in a genuine effort, and be patient. Not just with us, but with yourself, your family, your friends, and your community. See you in class.