Chemistry Honors Course Overview

Content Area: **Science**
Course(s): **CHEMISTRY H**
Time Period:
Length: **N/A**
Status: **Published**

Cover

EAST BRUNSWICK PUBLIC SCHOOLS

East Brunswick New Jersey

Superintendent of Schools

Dr. Victor P. Valeski

Science

Honors Chemistry

Course Number: 1121

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Course Adoption: 4/21/1986

Curriculum Adoption: 9/21/1995

Date of Last Revision Adoption: 9/1/2021

Course Overview

Honors Chemistry is a full-year course that includes a rigorous, quantitative approach to the study of the basic concepts of chemistry. It is an honors-level course that has prerequisites in both science and math content areas. This course meets for seven periods each week, which includes two double-period lab sessions. Therefore, laboratory experiences are an integral part of this course, where students develop their skills in lab techniques and working with lab equipment. In addition, students are frequently asked to design their own laboratory to answer a question or solve a problem. Critical thinking, analysis of data and error, and problem solving are major components of this course.

This course is a dual-enrollment course with Middlesex County College, where students can earn 8 credits for General Chemistry I and II with labs (CHM-121, 125, 122, 126).

Modifications

Each teacher, each student, each classroom is unique and adaptations are specific to each situation. Differentiating instruction and providing multiple ways to assess allows more flexibility for students to meet the standards and requirements of the class. Below are samples of the types of adaptations/modifications that may occur for students based on need including ELLs, students with a 504 Plan, Special Education, Basic Skills and Gifted and Talented students.

Adaptations/Modifications:

Input Adapt the way instruction is delivered to the learner. ***For example:*** • Use different visual aids, • Plan more concrete examples, • Provide hands-on activities, • Place students in cooperative groups.	**Output** Adapt how the learner can respond to instruction. ***For example:*** • Allow a verbal vs. written response, • Use a communication book for students, • Allow students to show knowledge with hands-on materials.	**Time** Adapt the time allotted and allowed for learning, task completion or testing. ***For example:*** • Individualize a timeline for completing a task, • Pace learning differently (increase or decrease) for some learners.
Difficulty Adapt the skill level, problem type, or the rules on how the learner may approach the work. ***For example:***	**Level of Support** Increase the amount of personal assistance with specific learner. ***For example:***	**Size** Adapt the number of items that the learner is expected to learn or complete. ***For example:***

• Simplify task directions. • Use of calculator.	• Assign peer buddies, teaching assistants, peer tutors or cross-age tutors.	• Reduce the number of vocabulary words a learner must learn at any one time.
Degree of Participation Adapt the extent to which a learner is actively involved in the task. ***For example:*** • Allow for small group/individual presentations vs. presentations to the whole class.	**Alternate Goals** Adapt the goals or outcome expectations while using the same materials. ***For example:*** • Students in the same class are expected to either write a paragraph, write a bulleted response, or meet with the teacher to provide a verbal response.	**Substitute Curriculum** Provide differentiated instruction and materials to meet a learner's individual goals. ***For example:*** • Individualize a timeline for completing a task, pace learning differently (increase or decrease) for some learners, • Use of Learning Ally.

Materials and Resources

General Chemistry: The Essential Concepts

Publisher: McGraw Hill

Auth: Chang & Goldby

Content Specific Standards

SCI.HS-PS1	Matter and Its Interactions
SCI.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.
SCI.HS.PS2.B	Types of Interactions
SCI.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.
	Constructing Explanations and Designing Solutions
SCI.HS.PS1.A	Structure and Properties of Matter
SCI.HS.PS1.B	Chemical Reactions
	Patterns
SCI.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.
	Planning and Carrying Out Investigations
SCI.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.
SCI.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.
SCI.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.
	Stability and Change
SCI.HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
	Using Mathematics and Computational Thinking
SCI.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.
	Developing and Using Models
SCI.HS.PS1.C	Nuclear Processes
	Energy and Matter
SCI.HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
	Structure and Function
SCI.HS-PS3-2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
SCI.HS.PS3.A	Definitions of Energy
SCI.HS-PS3-4	Plan and conduct 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).
SCI.HS.PS3.B	Conservation of Energy and Energy Transfer
SCI.HS.PS3.D	Energy in Chemical Processes
SCI.HS-PS4	Waves and Their Applications in Technologies for Information Transfer
SCI.HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
SCI.HS.PS4.A	Wave Properties
	Cause and Effect
SCI.HS-PS4-3	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
	Engaging in Argument from Evidence
SCI.HS.PS4.B	Electromagnetic Radiation
	Systems and System Models
SCI.HS-PS4-4	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
	Obtaining, Evaluating, and Communicating Information

SCI.HS-ESS1	Earth's Place in the Universe
SCI.HS-ESS1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
SCI.HS.PS3.D	Energy in Chemical Processes and Everyday Life
	Scale, Proportion, and Quantity
SCI.HS-ESS1-2	Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
SCI.HS.ESS1.A	The Universe and Its Stars
SCI.HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
SCI.HS-ESS2-3	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
SCI.HS.ESS2.A	Earth Materials and Systems
SCI.HS.ESS2.B	Plate Tectonics and Large-Scale System Interactions
SCI.HS-ESS2-5	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
SCI.HS.ESS2.C	The Roles of Water in Earth's Surface Processes
SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
SCI.HS.ESS3.B	Natural Hazards
SCI.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
SCI.HS.ESS3.A	Natural Resources
SCI.HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
SCI.HS.ESS3.C	Human Impacts on Earth Systems
SCI.HS-ETS1	Engineering Design
SCI.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
	Asking Questions and Defining Problems
SCI.HS.ETS1.A	Delimiting Engineering Problems
SCI.HS.ETS1.C	Optimizing the Design Solution
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS.ETS1.B	Developing Possible Solutions

Interdisciplinary Standards

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
LA.WHST.9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence.
LA.WHST.9-10.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.9-10.3	(See note; not applicable as a separate requirement)
LA.WHST.9-10.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.WHST.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.WHST.9-10.6	Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
LA.WHST.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
LA.WHST.9-10.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.9-10.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

21st Century Life and Career Ready Practice Standards

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP3.1	Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial well-being, understanding that personal financial security provides the peace of mind required to contribute more fully to

	their own career success.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Technology Standards

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Pacing Guide

Marking Period 1		
Topic	**Pacing (blocks)**	**Assessment Examples**
Periodic Table and Atomic Theory	3-4	Summer Assignment Assessment

		Unit 1 Assessment Formative assessment: isotopes
Matter and Nomenclature	4	Unit 2 Assessment Nomenclature Quiz Metal, nonmetal, metalloid Lab Quiz
Chemical Reactions	5	Unit 3 Assessment Net Ionic Lab Practical
Measurement & Problem Solving	5	Unit 1 Assessment Measurement & Lab equipment practical Density Data Analysis Quiz

Marking Period 2		
Topic	**Pacing (block)**	**Assessment Examples**
Chemical Quantities	6	Unit 5 Assessment Mole Quiz Empirical Formula of a Hydrate Lab Quiz
Stoichiometry	5	Unit 6 Assessment Silver and copper nitrate Lab Quiz
Gases & Properties	8	Unit 7 Assessment Gas Laws quiz Gas Lab Data Quiz
Atomic and Electronic Structure	5	Unit 8 Assessment Photoelectric Effect Quiz
Periodicity	4	Unit 9 Assessment

Marking Period 3		
Topic	**Pacing (blocks)**	**Assessment Examples**
Bonding & Structure	9	Unit 10 Assessment Bonding Quiz Molecular Geometry Lab Practical
Intermolecular Forces, and Condensed States of Matter	6	Unit 11 Assessment IMF Quiz

Solutions	7	Unit 12 Assessment
Thermodynamics	6	Unit 13 Assessment Concepts & Calculations of Work quiz Specific heat of a metal Lab quiz

Marking Period 4		
Topic	**Pacing (blocks)**	**Assessment Examples**
Organic Chemistry	3	Unit 14 Assessment
Chemical Equilibrium	8	Unit 15 Assessment Equilibrium Quiz Equilibrium and Chemical reactions
Acids/Bases	7 - 8	Unit 16 Assessment Acid/Bases Quiz Titration Lab Quiz- Percent of Acetic Acid in Vinegar Lab Practical
Electrochemistry	5	Unit 17 Assessment
Kinetics	5	Unit 18 Assessment
Nuclear	3	Unit 18 Assessment

Formative and Summative Assessment

Teachers ultilize a variety of methods for assesment including:

	Unit Tests and Quizzes	**Labs, Projects & Classwork**	**Lab Assessments**	**Homework**
Category Criteria	Individual assessments based on specific or general content knowledge.	Any group work primarily completed in class to be checked and/or graded for completion.	Individual assessments based on group lab work. Lab data and other notes may sometimes be used.	Any work assigned to be completed outside of the classroom.

All students take a common Midterm and Final Exam.

Grading Procedures and Evaluation

Marking period grades for Honors Chemistry will be determined using the following weighting:

- Tests, quizzes: 60%
- Labs: 30%
- Assignments (homework and classwork): 10%

A point system is used within each grading category so that assessments with a higher point value make a more significant contribution to that category's grade.

The final grade for the course is a weighted average of the four marking period grades and exams (midterm and final). The following weightings are used in this calculation:

- Marking period 1: 20%
- Marking period 2: 20%
- Midterm exam: 10%
- Marking period 3: 20%
- Marking period 4: 20%
- Final exam: 10%

The content, teaching strategies, common assessments, and student results for this course are evaluated annually.

Other Details

Course number: 1121

School where class is offered: East Brunswick High School

Grade Level: 10-12

SCED: 03102 Chemistry—Advanced Studies (Honors)

Usually taken after a comprehensive initial study of chemistry, Chemistry—Advanced Studies courses cover chemical properties and interactions in more detail. Advanced chemistry topics include organic chemistry, thermodynamics, electrochemistry, macromolecules, kinetic theory, and nuclear chemistry.