# *AP Chemistry (#4250)

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| **Description** | This course is designed to be the equivalent of the introductory General Chemistry and Chemistry Lab class taken at the college level. A strong laboratory component provides students with opportunities to experience advanced lab techniques, and to develop strong critical thinking skills. Course topics include mole concepts and stoichiometry, oxidation/reduction reactions, bonding, energy, kinetics, and equilibrium concepts. This course will prepare students for the Advanced Placement Chemistry Test. |
| **Credits** | **1** |
| **Prerequisites** | Biology or Biophysical Science; Chemistry 4200 (or success in General Chemistry 4190); Algebra 2 for PreCalculus |
| **Textbooks/Resources** | Zumdahl, Steven S., Zumdahl, Susan A., and DeCoste, Donald J., *Chemistry* 10th ed., Cengage Learning, 2018<br>ISBN: 978-1-305-95774-9 |
| **Required Assessments** | Standards-based district-wide assessment |
| **Board Approved** | April 1997 |
| **Revised** | June 2008; June 2017 |

## AASD Science Goals for K-12 Students

- Students will demonstrate understanding of key science concepts and apply them to their world.
- Students will demonstrate knowledge and understanding that scientific knowledge is continually undergoing revision and refinement based on new experiments and data.
- Students will demonstrate knowledge and understanding that the process of science is based on questioning and providing empirical evidence to support claims.
- Students will apply scientific concepts and processes to evaluate consequences and make informed, responsible choices (regarding self, others, environment).
- Students will demonstrate understanding that science and technology are critical in order to provide and evaluate alternative solutions to problems in our world.
- Students will engage in STEM experiences as both scientists and engineers in order to prepare for postsecondary and career readiness .

# AASD Science Standards for Students in AP Chemistry (4250)

## Science & Engineering Practices

1. Asking Questions and Defining Problems
2. Developing and Using Models
3. Planning and Carrying Out Investigations
4. Analyzing and Interpreting Data
5. Using Mathematics, Information and Computer Technology, and Computational Thinking
6. Constructing Explanations and Designing Solutions
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating, and Communicating Information

## AP Chemistry Content Power Standards:

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.
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.
3. Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.
4. Rates of chemical reactions are determined by details of the molecular collisions.
5. The laws of thermodynamics describes the essential role of energy and explain and predict the direction of changes in matter.
6. Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.

## AASD Next Generation Science Standards

### High School Physical Sciences (HS-PS)

**Matter and Its Interactions**
By the end of **grade twelve**, students will:

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-PS1-2 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-PS1-3 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
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-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing temperature or concentration of the reacting particles on the rate at which a reaction occurs.
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
HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction
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

**Motion and Stability: Forces and Interactions**
By the end of **grade twelve**, students will:
HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration
HS-PS2-2 Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system
HS-PS2-3 Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision
HS-PS2-4 Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects
HS-PS2-5 Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current
HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials

**Energy**
By the end of **grade twelve**, students will:
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-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 motion of particles (objects) and energy associated with the relative position of particles (objects)
HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy in another form of energy
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)
HS-PS3-5 Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction

**Waves and Their Applications in Technologies for Information Transfer**
By the end of **grade twelve**, students will:

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-PS4-2 Evaluate questions about the advantages of using a digital transmission and storage of information
HS-PS4-3 Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be describe either by a wave model or a particle model, and that for some situations one model is more useful than the other
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
HS-PS4-5 Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy

## High School Life Sciences (HS-LS)

**From Molecules to Organisms: Structures and Processes**
By the end of **grade twelve**, students will:

HS-LS1-1 Construct and explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells
HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis
HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms
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-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

**Ecosystems: Interactions, Energy, and Dynamics**
By the end of **grade twelve**, students will:
HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales
HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales
HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic an anaerobic conditions
HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem
HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere
HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem
HS-L2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity

HS-LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce

**Heredity: Inheritance and Variation of Traits**
By the end of **grade twelve**, students will:

HS- HS-LS3-1 Ask questions to clarify relationship about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring
HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may results from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors
HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population

**Biological Evolution: Unity and Diversity**
By the end of **grade twelve**, students will:
HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical Evidence
HS-LS4-2 Construct and explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment
HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait
HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations
HS-LS4-5 Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species
HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity

## High School Earth Sciences (HS-ES)

**Earth's Place in the Universe**
By the end of **grade twelve**, students will:
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
HS-ESS1-2 Construct and explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe
HS-ESS1-3 Communicate scientific ideas about the way stars, over their life cycle, produce elements
HS-ESS1-4 Use mathematical or computation representations to predict the motion of orbiting objects in the solar system
HS-ESS1-5 Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks
HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history

**Earth's Systems**

By the end of **grade twelve**, students will:

HS- HS-ESS2-1 Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features
HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems
HS-ESS2-3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection
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
HS-ESS2-5 Plan and conduct an investigation of the properties of water and its effect on Earth materials and surface processes
HS-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere
HS-ESS2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth

**Earth and Human Activity**

By the end of **grade twelve**, students will:

HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, ad changes in climate have influenced human activity
HS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios
HS-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity
HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems
HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems
HS-ESS3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity

## High School Engineering Design (HS-ET)

**Engineering Design**

By the end of **grade twelve**, students will:

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
HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering
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
HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|---|---|---|
| **1. Student develops a deep understanding of science by engaging in age-appropriate science and engineering habits.** | **Performance will be satisfactory when the student:**<br>a. asks questions and defines problems.<br>b. develops and uses models.<br>c. plans and carries out investigations.<br>d. analyzes and interprets data.<br>e. uses mathematics, information and computer technology, and computational thinking.<br>f. constructs explanations and designs solutions.<br>g. engages in argument from evidence.<br>h. obtains, evaluates, and communicates information. | • Quizzes and tests<br>• Projects<br>• Research<br>• Performance assessment<br>. |
| **Above objective aligned with AASD Next Generation Science Standards**<br>AASD Science & Engineering Practices | | |
| **2. Student demonstrates understanding of how 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.** | **Performance will be satisfactory when the student:**<br>a. Understands the differences between Ionic, Covalent, and Metallic Bonding.<br>b. Understand the Valence Shell Electron Pair Repulsion Model and can predict the shape and properties of matter<br>c. Understand the Kinetic Molecular Theory of Gases and can solve Gas Law related problems.<br>d. Understand how Intermolecular Forces affects the properties of matter. | • Practice problems from book<br>• Performance assessment<br><br><u>AP Chemistry Inquiry Labs</u><br>• Lab: Silver Alloy and/or Lab: Waters of Hydration of a compound. |
| **Objectives are linked to the following AASD Next Generation Science Standards:**<br>HS-PS1-1, HS-PS1-7, HS-PS1-8 | | |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|---|---|---|
| **3. Student demonstrates understanding of how chemical and physical properties of materials can be explained by the structure and** | **Performance will be satisfactory when the student:**<br>a. Understands the differences between Ionic, Covalent, and Metallic Bonding.<br>b. Understand the Valence Shell Electron Pair Repulsion Model and can predict the shape and properties of matter<br>c. Understand the Kinetic Molecular Theory of Gases and can solve Gas Law related problems. | • Practice Problems from book<br>• Performance assessment<br>• Molecular Modeling Activity<br><br><u>AP Chemistry Labs</u> |

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| **the arrangement of atoms, ions, or molecules and the forces between them.** | d. Understand how Intermolecular Forces affects the properties of matter. | • Lab: Ideal Gas Law<br>• Lab: Intermolecular Forces |
| **Objectives are linked to the following AASD Next Generation Science Standards:**<br>HS-PS1-1, HS-PS1-2, HS-PS1-3, HS-PS1-4, HS-PS1-5, HS-PS2-6, HS-PS3-1, HS-PS3-2 | | |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|---|---|---|
| **4. Student demonstrates and understanding of how changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.** | **Performance will be satisfactory when the student:**<br>a. Can explain, predict, and write precipitation reactions<br>b. Can explain, predict, and solve acid/base reactions.<br>c. Can solve solution stoichiometry problems.<br>d. Can balance oxidation-reduction reactions. | • Practice Problems from book.<br>• Performance assessment<br><br><u>AP Chemistry Labs</u><br>• Lab: Stoichiometry Ratios<br>• Lab: Titration |
| **Objectives are linked to the following AASD Next Generation Science Standards:**<br>HS-PS1-7, HS-PS3-5 | | |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|---|---|---|
| **5. Student demonstrates an understanding of how the rates of chemical reactions are determined by details of the molecular collisions.** | **Performance will be satisfactory when the student:**<br>a. Can solve for the Rate Law Equation<br>b. Can determine a valid reaction mechanism | • Practice Problems from book.<br>• Performance assessment<br><br><u>AP Chemistry Inquiry Labs</u><br>• Lab: Determine the rate of a reaction. |
| **Objectives are linked to the following AASD Next Generation Science Standards:**<br>HS-PS1-5 | | |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|---|---|---|
| **6. Student demonstrates an understanding of how the laws of thermodynamics describes the essential role of energy and explain and predict the direction of changes in matter.** | **Performance will be satisfactory when the student:**<br>a. Explains the fundamentals of heating curves and phase changes and can solve relevant calculations<br>b. Can solve Hess's Law problems<br>c. Can solve Enthalpy of Formation problems<br>d. Can predict spontaneity using Gibbs Free Energy and Entropy | • Practice problems from book<br>• Performance assessment<br><br><u>AP Chemistry Labs</u><br>• Lab: Determining Specific Heat<br>• Lab: Hess's Law |
| **Objectives are linked to the following AASD Next Generation Science Standards:**<br>HS-PS1-4, HS-PS3-1, HS-PS3-3, HS-PS3-4 | | |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|---|---|---|
| **7. Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.** | **Performance will be satisfactory when the student:**<br>a. Explains the concepts underlying equilibrium using LeChatelier's Principles<br>b. Can solve for equilibrium conditions<br>c. Can solve acid/base equilibrium problems<br>d. Can solve solubility equilibrium problems | • Practice questions from book<br>• Performance assessment<br><br><u>AP Chemistry Labs</u><br>• Lab: LeChatelier's Principle<br>• Lab: Weak Acid / Strong Base Titration<br>• Lab: Solubility Equilibrium |
| **Objectives are linked to the following AASD Next Generation Science Standards:**<br>HS-PS1-5, HS-PS1-6 | | |

# College Board AP Chemistry Curriculum Framework

**http://media.collegeboard.com/digitalServices/pdf/ap/ap-chemistry-course-and-exam-description.pdf**

# CCSS-ELA: Literacy in Science
# Grade 12

| | Essential Learning Objectives | Performance Indicators |
|---|---|---|
| **Reading** | **1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account** (RST.11-12.1) | **Performance will be satisfactory when the student:**<br>a. Can analyze science and technical texts.<br>b. Can employ techniques for selecting textual evidence to support analysis<br>c. Can employ techniques such as graphic organizers, two column notes, etc…to identify the important distinctions made by the author. |
| | **2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.** (RST.11-12.2) | **Performance will be satisfactory when the student:**<br>a. Can employ techniques to determine the central ideas or conclusions from a science/technical text<br>b. Can produce a summary of a science/technical source |
| | **3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.** (RST.11-12-3) | **Performance will be satisfactory when the student:**<br>a. Can analyze features of text that describe a complex multistep procedure<br>b. Can employ graphic organizers to understand texts that describe a complex multistep procedure<br>c. Can employ techniques for locating textual information related to the outcome of a procedure or process<br>d. Can analyze specific results based on explanations in the text |

| | Essential Learning Objectives | Performance Indicators |
|---|---|---|
| Reading | **4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.** (RST.11-12.4) | **Performance will be satisfactory when the student:**<br>a. Can employ several strategies for determining the meaning of unknown words (science content-specific vocabulary). Methods may include using sentence clues, or a dictionary. |
| | **5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.** (RST.11-12.5) | **Performance will be satisfactory when the student:**<br>a. Can analyze how a text structures information or ideas into categories or hierarchies<br>b. Can determine how a text organizations information or ideas into categories or hierarchies |
| | **6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved** (RST.11-12.6) | **Performance will be satisfactory when the student:**<br>a. Can evaluate one claim by employing two sources<br>b. Can determine an author's purpose<br>c. Can provide textual details to support thinking about author's purpose<br>d. Demonstrates an understanding that authors' differing points of view are dependent upon their claims, reasoning, and evidence presented |
| | **7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.** (RST.11-12.7) | **Performance will be satisfactory when the student:**<br>a. Can utilize techniques to evaluate material presented in multiple formats and what is being taught<br>b. Can manipulate data and extract relevant information pertaining to the subject at hand<br>c. Can relate visual material to pertinent case studies<br>d. Can raise probing questions and utilize problem solving techniques. |

| | Essential Learning Objectives | Performance Indicators |
|---|---|---|
| Reading | **8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.** (RST.11-12.8) | **Performance will be satisfactory when the student:**<br>a. Can analyze an author's hypotheses, data, analysis, and conclusions in a science or technical text in light of other information presented.<br>b. Can utilize techniques for verifying data, corroborating, and challenging conclusions with other sources of information |
| | **9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.** (RST.11-12.9) | **Performance will be satisfactory when the student:**<br>a. Can employ a variety of techniques for gathering information from a range of sources.<br>b. Can synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept.<br>c. Can evaluate textual sources to resolve conflicting information. |
| | **10. By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.** (RST.11-12.10) | **Performance will be satisfactory when the student:**<br>a. Can employ techniques to discern meaning from appropriately difficult text sources.<br>b. Can employ techniques to engage with and appreciate appropriately difficult text.<br>c. Can select engaging, interesting, and motivating texts that are appropriate to who they are as readers. |

| | Essential Learning Objectives | Performance Indicators |
|---|---|---|
| **Writing** | **11. Write arguments focused on *discipline-specific content*.** (W.11-12.1) | **Performance will be satisfactory when the student:**<br>a. identifies qualities of arguments,<br>b. writes an argument to support a claim,<br>c. acknowledges and distinguishes claims from alternate or opposing claims,<br>d. uses logical reasoning and relevant evidence (credible sources) to support a claim,<br>e. uses words, phrases, clauses, and syntax to clarify relationships and create cohesion,<br>f. writes with a formal style,<br>g. writes with a predictable structure (introduction with statement of claim, clearly organized evidence, and conclusion that supports argument), and<br>h. anticipates and recognizes audiences' values and bias. |
| | **12. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.** (W.11-12.2) | **Performance will be satisfactory when the student:**<br>a. introduces a topic; organizes complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; includes formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aid in comprehension,<br>b. develops the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic,<br>c. uses appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts,<br>d. uses precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic,<br>e. establishes and maintains a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing, and<br>f. provides a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). |
| | **13. Not applicable as a separate requirement** (W.11-12.3) | |

| | Essential Learning Objectives | Performance Indicators |
|---|---|---|
| **Writing** | **14. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.** (W.11-12.4) | **Performance will be satisfactory when the student:**<br>a. identifies audience, purpose, and task (expectations),<br>b. demonstrates techniques for organizing writing,<br>c. uses style appropriate to purpose and task (audience opinion, informative, explanatory, and narrative),<br>d. designs consistent, appropriate style for writing, and<br>e. produces clear and coherent writing. |
| | **15. 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.** (W.11-12.5) | **Performance will be satisfactory when the student:**<br>a. uses planning, revision, editing, rewriting, or a new approach to strengthen writing,<br>b. explains techniques used to make writing appropriate for purpose and audience, and<br>c. produces writing that is well-developed and strong. |
| | **16. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.** (W.11-12.6) | **Performance will be satisfactory when the student:**<br>a. uses technology (including Internet) to produce, publish, and update individual or shared writing,<br>b. uses technology to link to and display information,<br>c. uses technology to interact and collaborate with others, and<br>d. updates information in response to feedback. |

| | Essential Learning Objectives | Performance Indicators |
|---|---|---|
| Writing | **17. 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.** (W.11-12.7) | **Performance will be satisfactory when the student:**<br>a. uses research to answer a self-generated question or solve a problem,<br>b. narrows or broadens research when appropriate,<br>c. synthesizes multiple sources, and<br>d. demonstrates understanding of the subject through research. |
| | **18. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.** (W.11-12.8) | **Performance will be satisfactory when the student:**<br>a. gathers relevant information from multiple authoritative print and digital sources, using advanced searches effectively,<br>b. assesses the strengths and limitations of each source in terms of the task, purpose, and audience,<br>c. integrates information into the text selectively to maintain the flow of ideas,<br>d. avoids plagiarism and overreliance on any one source, and<br>e. follows a standard format for citation. |

| | Essential Learning Objectives | Performance Indicators |
|---|---|---|
| Writing | **19. Draw evidence from informational texts to support analysis, reflection, and research.** (W.11-12.9) | **Performance will be satisfactory when the student:**<br>a. critically reads informational texts,<br>b. identifies argument/claim/message in text and then analyzes credibility of source: author, timeliness, publisher, purpose, etc.,<br>c. assesses whether reasoning is valid and the evidence is relevant,<br>d. identifies false statements and fallacious reasoning, and<br>e. cites evidence from informational text to strengthen their research. |
| | **20. 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.** (W.11-12.10) | **Performance will be satisfactory when the student:**<br>a. completes various pieces of writing over extended and shorter time frames,<br>b. organizes clear and coherent pieces of writing for a variety of reasons and in a variety of settings, and<br>c. understands that writing pieces are organized and developed based on task, audience and purpose. |