CONNECTICUT STATE DEPARTMENT OF EDUCATION

Agricultural Science and Technology Education Standards

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INTRODUCTION

Agriculture is a highly technical and ever-changing industry upon which everyone is dependent. Agricultural Science and Technology Education programs are designed to instill in students the importance of the different agrisciences, of marketing strategies, of safe food production and the need for continuous research to improve agriculture. Strong, relevant, rigorous agriscience programs are necessary to make students career and college ready in the field of agriculture.

The Connecticut Agriscience and Technology Education Standards were developed to provide state agricultural education teachers with a forward-thinking guide for what students should know and be able to do through the study of agriculture in grades 9 through 14.

The Connecticut Agriscience and Technology Education Standards should be used as a guide to develop well-planned curriculum in agriscience education to be delivered to students through the three-circle model; Classroom/Laboratory Instruction; Supervised Agriculture Experience; Leadership through FFA.

Just as agriculture varies throughout our state, so will our agricultural education programs. Local Education Agencies (LEA) should use these standards in conjunction with local advisory committees to determine what is most relevant and appropriate for their students in providing that all-important link between the school and the agriculture community. The standards, performance elements, performance indicators and measurements should be used by educators to guide agricultural education curriculum development at the local level.

The *Connecticut Agricultural Science and Technology Education Standards* provides teachers with knowledge that will allow them to design and conduct curriculum which engages students in agriculture instruction that integrates academic and technical preparation and focuses on college and career readiness.

The *Connecticut Agricultural Science and Technology Education Standards* are organized as follows:

> ***Agriculture, Food and Natural Resources Foundation Skills (CT-FS)***—foundational to study in any of the five pathways. They involve underlying concepts needed for success regardless of the pathway pursued. The standards cover such fundamental concepts as safety, marketing, information-based technologies, first aid, and team work.
>
> ***Leadership Skills (CT-LS)*** - foundational to study in any of the five pathways. They involve underlying concepts needed for success regardless of the pathway pursued. These skills are sometimes referred as the soft skills, public speaking, professional organization, personal development and growth, social interactions, career success, thinking, reasoning and writing skills.

Beyond the coverage of these foundational skills, the pathway content standards are further organized into five pathways of study. The pathway content standards cover technical content required for future success within each respective pathway.

The five pathways in the *Connecticut Agricultural Science and Technology Education Standards* are:

> ***Animal Systems (CT-AS)***—the study of animal systems, including life processes, health, nutrition, genetics, management and processing, through the study of small animals, livestock, dairy, horses and/or poultry
>
> ***Aquaculture (CT-AQ)***-the study of aquatic organisms, including life processes, health, culture, management and processing including both fresh and salt water species. Marine technology skills and knowledge with be explored and studied.
>
> ***Natural Resource Systems (CT-NRS)***—the study of the management of soil, water, wildlife, forests and air as natural resources

Plant Systems (CT-PS)—the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices, through the study of crops, turf grass, trees and shrubs and/or ornamental plants

Power, Structural and Technical Systems (CT-PST)—the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding and project planning for agricultural structures

Within each pathway, the standards are organized as follows:

Pathway Content Standard—This is a general statement indicating the broad area of knowledge covered in each pathway.

Performance Elements—These represent the major topical areas within each pathway. Generally, each pathway has 4 to 13 Performance Elements.

Performance Indicators—These are more precise statements that serve as an indication of the knowledge/ability the student should possess.

Measurements—These are sample measurable activities that students might carry out to indicate attainment of each Performance Indicator. The measurements are broken into three levels as follows:

– Level I—These are fundamental activities/abilities students possess at roughly the 9th- and 10th-grade levels upon which all other activities are built.

– Level II—These are activities/abilities that will build on the first-level knowledge and are skills that students possess at roughly the 11th- and 12th-grade levels.

– Level III—These are activities/abilities that will build in complexity from the first two levels and are skills students possess at roughly the 13th- and 14th-grade levels. These skills may be obtained at the end of the high school level in more focused programs, in which case articulation agreements with postsecondary institutions are encouraged.

The development of the *Connecticut Agricultural Science and Technology Education Standards* began with a review of the National Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards originally developed in 2009. The Committee began with these because the statements had been reviewed by hundreds of educators and industry representatives as they were developed. The comments of these reviewers guided the work in the development of the accompanying standards.

Throughout the process, the *Connecticut Agricultural Science and Technology Education Standards* Committee stressed rigor and relevance both in the agricultural content covered and in the alignment of the *Connecticut Agricultural Science and Technology Education Standards* to national academic standards. Thus, the accompanying document includes not only the *Connecticut Agricultural Science and Technology Education Standards* but also the alignment of the Performance Indicators to national academic standards; CT-Common Core Standards in English/Language Arts; CT-Common Core Standards in Mathematics; National Science Standards. Further, these academic standards are fully stated in the Appendix that accompanies the *Connecticut Agricultural Science and Technology Education Standards*. The standards also include the Connecticut Career Assessment Standards (CCAS) *in Animal Science (AS), Agriculture Mechanics (AM), Aquaculture (AQ), Plant Science (PS) and Natural Resources and Environment* (NRE) The CCAS standards are identified with an asterisk and a statement indicating the appropriate CCAS standard.

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Agriculture, Food and Natural Resources Foundation Skills

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and practices to all areas of agriculture.

Level 1	Level 2	Level 3
CT-FS.01. Performance Element: Examine the importance of health, s management systems in organizations and their importance to performance and regulatory safety, and environmental compliance.		
CT-FS.01.01. Performance Indicator: Safety with Contaminants and Equipment: Understand the concepts and procedures of handling contaminants, chemicals and related equipment in an agricultural setting.		
CT-FS.01.01.01.a. Interpret labels	CT-FS.01.01.01.b. Read and interpret Material Safety Data Sheets (MSDS)	
CT-FS.01.01.02.a. Identify the following from the label of an agricultural chemical container: appropriate use, warning signs, signal words, precautionary statements, EPA Registration Number, directions for use, storage, and disposal.* CTE Assessment Standard, AM, B16; AS, B25; Aqua, B18; NRE, B17; PS, B19	CT-FS.01.01.02.b. Identify the following from a Safety Data Sheets (SDS): first aid measures, firefighting measures, handling and storage, and personal protection equipment (PPE).* CTE Assessment Standard, AM, B17; AS, B26; Aqua, B19; NRE, B18; PS, B20	
CT-FS.01.01.03.a.Understand safety precautions used when handling, measuring, mixing, disposing and cleaning of chemicals and related equipment.	CT-FS.01.01.03.b. Explain proper use of safety equipment in agriculture.	
CT-FS.01.01.04.a.Understand environmental protection laws and policy.		
CT-FS.02. Performance Element: Career Success: Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career.		
CT-FS.02.01. Performance Indicator: Understand the use and application of information-based technologies necessary for career success in agriculture.		
CT-FS.02.01.01.a. Describe basic computer and software systems as they apply to agriculture.	CT-FS.02.01.01.b. Use career multimedia technology and software as it relates to agriculture.	
CT-FS.03. Performance Element: Utilize economic principles to establish and manage an AFNR enterprise.		
CT-FS.03.01. Performance Indicator: Understand the sequence of the channels of distribution and marketing including their impact on the agriculture industry.		
CT-FS.03.01.01.a.Understand supply and demand principles in Agriculture, Food, and Natural Resource systems.	CT-FS.03.01.01.b. Identify strategies frequently employed in agricultural marketing programs.	
CT-FS.03.01.02.a. Define the concept of profit and loss in agricultural business.	CT-FS.03.01.02.b. Understand the impact of advertising media on	
CT-FS.03.01.03.a. Explain the impact of positive customer/client relations.		

CT-FS.04. Performance Element: Apply principles of environment science.		
CT-FS.04.01. Performance Indicator: Observe required regulations to maintain/improve safety, health and environmental management systems.		
CT-FS.04.01.01.a. Examine major health, safety, and environmental management system components in AFNR organizations.	CT-FS.04.01.01.b. Identify the benefits of improved health, safety, and environmental performance to AFNR organizations in current geographical area.	CT-FS.04.01.01.c. Assess how AFNR organizations promote improved health, safety, and environmental performance and suggest plans for improvement.
CT-FS.04.02. Performance Indicator: Develop a plan to maintain and improve health, safety and environmental compliance and performance.		
CT-FS.04.02.01.a. Use proper safety practices/personal protective equipment.	CT-FS.04.02.01.b. Develop plans to improve health, safety and environmental performance.	CT-FS.04.02.01.c. Educate other workers to improve health, safety, and environmental performance in a safe manner.
CT-FS.04.03 Performance Indicator: Provide health, safety, and environmental operating guidelines.		
CT-FS.04.03.01.a. Demonstrate the importance of safety, health, and environmental practices in the workplace.	CT-FS.04.03.01.b. Develop a pollution/waste prevention plan to enhance safety, health, and environmental practices in the workplace.	CT-FS.04.03.01.c. Establish a set of health, safety, and environmental principles to ensure a high level of performance.
CT-FS.04.04. Performance Indicator: Examine health risks associated with a particular skill to better develop personnel safety guidelines.		
CT-FS.04.04.01.a. Determine the level of contamination or injury that would be considered a risk as associated with a specific job or activity.	CT-FS.04.04.01.b. Assess the safety priorities for the level of contamination or injury.	CT-FS.04.04.01.c. Implement a plan to mitigate the level of contamination or injury identified in the workplace.
CT-FS.05. Performance Element: Apply safety/health practices to AFNR worksites.		
CT-FS.05.01. Performance Indicator: Apply safety/health practices to AFNR worksites.		
CT-FS.05.01.01.a. Implement the health and safety policies and procedures relevant to AFNR careers.	CT-FS.05.01.01.b. Use appropriate personal protective equipment for a given task.	CT-FS.05.01.01.c. Orient a group on safety measures based on the prescribed safety guidelines.
CT-FS.05.02. Performance Indicator: Demonstrate recognized first aid knowledge and procedures to show how they are used by AFNR industries.		
CT-FS.05.02.01.a. Inform others how to avoid placing oneself in hazardous work situations.	CT-FS.05.02.01.b. Use first aid knowledge and procedures relevant to a particular situation.	CT-FS.05.02.01.c. Complete a recognized industry-level first aid training program.
CT-FS.05.03. Performance Indicator: Follow appropriate procedures in case of an emergency.		
CT-FS.05.03.01.a. Evaluate the emergency response procedures for a natural disaster.	CT-FS.05.03.01.b. Develop various emergency response plan requirements for a facility.	CT-FS.05.03.01.c. Communicate the appropriate responses for medical emergencies by following the approved procedures.
CT-FS.05.04. Performance Indicator: Assess workplace safety.		
CT-FS.05.04.01.a. Research applicable regulatory and safety standards (e.g., MSDS, bioterrorism).	CT-FS.05.04.01.b. Use safety procedures to comply with regulatory and safety standards.	CT-FS.05.04.01.c. Apply general workplace safety precautions/procedures.
CT-FS.05.04.02.a. Handle chemicals and equipment in a safe and appropriate manner.	CT-FS.05.04.02.b. Maintain AFNR facilities to promote health and safety.	CT-FS.05.04.02.c. Evaluate general workplace safety precautions/procedures for compliance with regulations.

CT-FS.06. Performance Element: Utilize and maintain tools used in AFNR.		
CT-FS.06.01. Performance Indicator: Evaluate and select the appropriate tool to perform a given task.		
CT-FS.06.01.01.a. Identify standard tools, equipment, and safety procedures related to a specific task.	CT-FS.06.01.01.b. Set up/adjust tools and equipment related to complete a specific task.	CT-FS.06.01.01.c.Use tools and equipment appropriately to complete a specific task.
CT-FS.06.01.02.a. Follow operating instructions related to specific tools and equipment needed to complete a task.	CT-FS.06.01.02.b. Demonstrate appropriate operation, storage, and maintenance techniques for tools and equipment.	CT-FS.06.01.02.c. Devise a maintenance plan or schedules for tools and equipment.
CT-FS.06.02. Performance Indicator: Use appropriate protective equipment and handle AFNR tools and equipment to demonstrate safe and proper use of the tools and equipment.		
CT-FS.06.02.01.a. Use the appropriate procedures for the use and operation of specific tools and equipment.	CT-FS.06.02.01.b. Demonstrate safety precautions when using tools for a specific task around bystanders.	CT-FS.06.02.01.c. Operate applicable AFNR equipment and vehicles safely.
CT-FS.06.03. Performance Indicator: Maintain tools for efficient use.		
CT-FS.06.03.01.a. Describe the conditions that cause the need for tool maintenance.	CT-FS.06.03.01.b. Demonstrate how to replace tool parts and components as needed.	CT-FS.06.03.01.c. Develop and update a preventive maintenance schedule.
CT-FS.07. Performance Element: Utilize appropriate management planning principles in AFNR business enterprises.		
CT-FS.07.01. Performance Indicator: Apply economic principles to AFNR systems (e.g., supply, demand and profit).		
CT-FS.07.01.01.a. Calculate the effect of compound interest on AFNR investments.	CT-FS.07.01.01.b. Describe the economic impacts of natural resource preservation vs. use of the resource.	CT-FS.07.01.01.c. Describe the impacts of AFNR decisions on global markets and environmental health.
CT-FS.07.02. Performance Indicator: Apply skills with computer software to accomplish a variety of business activities.		
CT-FS.07.02.01.a. Demonstrate basic computer and software systems skills.	CT-FS.07.02.01.b. Use basic software systems such as spreadsheet and word processing to complete a task.	CT-FS.07.02.01.c. Use diagnostic software.
CT-FS.07.03. Performance Indicator: Use technology to demonstrate the ability to network and interface with technology.		
CT-FS.07.03.01.a. Use the technological systems to acquire information related to AFNR.	CT-FS.07.03.01.b. Show technical competence for efficient workplace communications.	CT-FS.07.03.01.c. Demonstrate the use of technology in linking information from various sources.
CT-FS.08.0. Performance Element: Utilize technology within AFNR.		
CT-FS.08.01. Performance Indicator: Examine new technologies to project their impact in the global market of AFNR.		
CT-FS.08.01.01.a. Apply the use of various scientific measurement and conversions to AFNR systems.	CT-FS.08.01.01.b. Discuss the use of mechatronic-FS (such as lasers and robotics and their impact on AFNR systems.	CT-FS.08.01.01.c. Evaluate the importance of new and emerging communication systems and how they impact AFNR systems.
CT-FS.08.02. Performance Indicator: Relate technology advancements to the need for Continuing Education/Career Development.		
CT-FS.08.02.01.a. Utilize historical data, technology and career training to predict market trends.	CT-FS.08.02.01.b. Apply emerging technology and career training to meet market demands.	CT-FS.0802.01.c. Research emerging technologies and the opportunities they may create within the AFNR systems.
CT-FS.09. Performance Element: Scientific Inquiry: Utilize scientific inquiry as an investigative method.		
CT-FS.09.01. Performance Indicator: Recognize the questions and theory needed to guide scientific investigations.		
CT-FS.09.01.01.a. Formulate a testable hypothesis.	CT-FS.09.01.01.b. Design an experiment to test a hypothesis.	CT-FS.09.01.01.c. Demonstrate procedures and a conceptual understanding of scientific investigation.

CT-FS.09.02. Performance Indicator: Design and conduct a scientific investigation.		
CT-FS.09.02.01.a. Design an experiment or scientific inquiry for a specific project.	CT-FS.09.02.01.b. Implement an experimental design to test a formulated hypothesis.	CT-FS.09.02.01.c. Propose additional studies based on the results of an experiment.
CT-FS.10. Performance Element: Technical Skills: Compare and contrast issues affecting the AFNR industry.		
CT-FS.10.01. Performance Indicator: Apply economic principles to AFNR systems (e.g., supply, demand and profit).		
CT-FS.10.01.01.a. Calculate the effect of compound interest on AFNR investments.	CT-FS.10.01.01.b. Describe the economic impacts of natural resource preservation vs. use of the resource.	CT-FS.10.01.01.c. Describe the impacts of AFNR decisions on global markets and environmental health.
CT-FS.10.02. Performance Indicator: Apply skills with computer software to accomplish a variety of business activities.		
CT-FS.10.02.01.a. Demonstrate basic computer and software systems skills.	CT-FS.10.02.01.b. Use basic software systems such as spreadsheet and word processing to complete a task.	CT-FS.10.02.01.c. Use diagnostic software.
CT-FS.10.03. Performance Indicator: Flexibility / Adaptability: Describe traits that enable one to be capable and willing to accept change.		
CT-FS.10.03.01.a. Research current and emerging technologies in AFNR.	CT-FS.10.03.01.b. Analyze the advantages and disadvantages of current and emerging technologies in AFNR activities.	CT-FS.10.03.01.c. Conduct a workplace study to assess the benefits to adapting emerging technologies.
CT-FS.10.03.02.a. Select the appropriate process to initiate effective change for a given situation.	CT-FS.10.03.02.b. Assess the benefits of using the change process.	CT-FS.10.03.02.c. Evaluate strategies that can be used to manage change within the workplace.
CT-FS.10.03.03.a. Assess to the value of providing feedback.	CT-FS.10.03.03.b. Differentiate between positive and negative constructive feedback and realize the importance of both.	CT-FS.10.03.03.c. Respond to feedback to improve a situation, skill or performance.
CT-FS.11. Performance Element: Systems: Examine roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.		
CT-FS.11.01. Performance Indicator: Examine performance and goals to appreciate organizations and industries within AFNR.		
CT-FS.11.01.01.a. Examine performance and goals to appreciate professional organizations and industries within AFNR.	CT-FS.11.01.01.b. Explain the major guidelines used by AFNR professional organizations to manage and improve performance.	CT-FS.11.01.01.c. Examine economic, social and technological changes and spotlights their impact on AFNR professional organizations and the industry.
CT-FS.12. Performance Element: Systems: Identify how key organizational structures and processes affect organizational performance and the quality of products and services.		
CT-FS.12.01. Performance Indicator: Manage organizational structures and processes to better serve customers.		
CT-FS.12.01.01.a. List ways an organization can be evaluated based on its customer satisfaction and service operations.	CT-FS.12.01.01.b. Explain how organization performance including customer satisfaction and service/ operations performance can be improved.	CT-FS.12.01.01.c. Implement a plan to manage relationships with both internal and external customers.
CT-FS.12.02. Performance Indicator: Examine the components of the AFNR systems and address their maintenance requirements.		
CT-FS.12.02.01.a. Develop goals and objectives for each system to manage organizational activities more effectively.	CT-FS.12.02.01.b. Operate technical tools to access, manage, integrate, evaluate and create information.	CT-FS.12.02.01.c. Implement management plans to improve the AFNR systems.

CT-FS.12.03. Performance Indicator: Research geographical data related to AFNR systems.		
CT-FS.12.03.01.a. Present resource data in graphic format.	CT-FS.12.03.01.b. Interpret resource data in graphic format.	CT-FS.12.03.01.c. Use computer systems to present trends in resource data.
CT-FS.12.03.02.a. Utilize the different types of AFNR systems related to various geographical areas.	CT-FS.12.03.02.b. Explore how AFNR systems differ across geographical areas.	CT-FS.12.03.02.c. Evaluate the effects of implementing an AFNR system in a different geographical area.

Leadership Skills

Pathway Content Standard: The student will demonstrate competence in the application of leadership, personal growth and career success skills necessary for a chosen profession while effectively contributing to society.

Level 1	Level 2	Level 3
CT-LS.01.01. Performance Indicator: Action: Exhibit the skills and competencies needed to achieve a desired result.		
CT-LS.01.01.01.a. Work productively with a group or independently.	CT-LS.01.01.01.b. Demonstrate the ability to complete a task without assistance.	CT-LS.01.01.01.c. Work independently and in group settings to accomplish a task.
CT-LS.01.01.02.a. Create a task analysis.	CT-LS.01.01.02.b. Create measurable objectives for a given situation.	CT-LS.01.01.02.c. Assess outcomes to determine success for a task.
CT-LS.01.01.03.a. Exhibit good planning skills for a specific task or situation.	CT-LS.01.01.03.b. Assess individual strengths and weaknesses in planning.	CT-LS.01.01.03.c. Implement an effective project plan.
CT-LS.01.01.04.a. Explore available resources to assist in meeting project needs.	CT-LS.01.01.04.b. Use appropriate and reliable resources to complete an action or project.	CT-LS.01.01.04.c. Create resources to complete an action or project.
CT-LS.01.01.05.a. Assess the physical, financial and professional risks associated with a particular task.	CT-LS.01.01.05.b. Create a plan for performing a job that will minimize physical, financial and professional risks.	CT-LS.01.01.05.c. Implement a plan that minimizes physical, financial, and professional risks and analyzes results.
CT-LS.01.01.06.a. Identify the strengths/talents of team members needed to achieve a desired task.	CT-LS.01.01.06.b. Assign project parts equitably amongst team members to achieve a given task.	CT-LS.01.01.06.c. Develop strengths and talents of team members so that all can achieve success.
CT-LS.01.01.07.a. Set personal goals using the SMART goals method (Specific, Measurable, Approved by you, Realistic, Time-stamped).	CT-LS.01.01.07.b. Use a variety of strategies to evaluate goals (e.g., observes, apply, and demonstrate).	CT-LS.01.01.07.c. Evaluate actions taken and make appropriate modifications to personal goals.
CT-LS.01.02. Performance Indicator: Relationships: Build a constituency through listening, coaching, understanding and appreciating others.		
CT-LS.01.02.01.a. Explain human relation skills such as compassion, empathy, unselfishness, trustworthiness, reliability and being friendly.	CT-LS.01.02.01.b. Determine human relation skills characteristic CT-LS of people who exhibit compassion, empathy, unselfishness, trustworthiness, reliability and being friendly.	CT-LS.01.02.01.c. Demonstrate human relation skills including compassion, empathy, unselfishness, trustworthiness, reliability and being friendly to co-workers.
CT-LS.01.02.02.a. Engage in a conversation with others to identify their interests and aspirations.	CT-LS.01.02.02.b. Utilize communication skills to collaborate in a group setting.	CT-LS.01.02.02.c. Engage others in conversations to respond to an obstacle when completing a task.
CT-LS.01.02.03.a. Identify the steps/strategies to successfully coach/mentor others.	CT-LS.01.02.03.b. Perform the steps/strategies to successfully coach/mentor others.	CT-LS.01.02.03.c. Manage a coaching/mentoring program.
CT-LS.01.02.04.a. Identify characteristics CT-LS of effective teams.	CT-LS.01.02.04.b. Establish team ground rules for expected individual behaviors on the team.	CT-LS.01.02.04.c. Evaluate the effectiveness of team members.
CT-LS.01.03. Performance Indicator: Vision: Establish a clear image of what the future should look like.		
CT-LS.01.03.01.a. Identify the benefits of developing vision.	CT-LS.01.03.01.b. Utilize visioning skills to develop a plan.	CT-LS.01.03.01.c. Develop vision statements and plans for an organization.
CT-LS.01.03.02.a. Use various conceptualizing tools.	CT-LS.01.03.02.b. Compare conceptualizing tools to use in a given situation.	CT-LS.01.03.02.c. Create a plan of action to complete a task based on a conceptualized idea.

CT-LS.01.03.03.a. Analyze the risks and rewards of new experiences.	CT-LS.01.03.03.b. Analyze a case study involving a new experience for risk and rewards.	CT-LS.01.03.03.c. Conduct a self-evaluation for personal reactions to new experiences.
CT-LS.01.03.04.a. Describe techniques used to build consensus.	CT-LS.01.03.04.b. Demonstrate consensus building.	CT-LS.01.04.05.c. Lead a meeting or activity that engages all participants in the process.
CT-LS.01.04. Performance Indicator: Character: Conduct professional and personal activities based on virtues.		
CT-LS.01.04.01.a. Analyze a case study where integrity was demonstrated.	CT-LS.01.04.01.b. Explain a personal decision where integrity played a role in the decision.	CT-LS.01.04.01.c. Perform tasks with integrity.
CT-LS.01.04.02.a. Describe personal values.	CT-LS.01.04.02.b. Demonstrate the benefits of living by positive values.	CT-LS.01.04.02.c. Assess personal values.
CT-LS.01.04.03.a. Identify the consequences of personal actions.	CT-LS.01.04.03.b. Assess the alternative outcome of specific actions.	CT-LS.01.04.03.c. Analyze the causes for team members to accept or reject responsibility.
CT-LS.01.04.04.a. Explain the benefits of mutual respect.	CT-LS.01.04.04.b. Analyze how respect is given.	CT-LS.01.04.04.c. Demonstrate respect for others.
CT-LS.01.04.05.a. Practice self-discipline.	CT-LS.01.04.05.b. Differentiate between habits, practices and behaviors consistent with principles of self-discipline.	CT-LS.01.04.05.c. Analyze one's level of self-discipline and causes for lack of self- discipline.
CT-LS.01.04.06.a. Describe the benefits of serving others.	CT-LS.01.04.06.b. Develop personal goals that include service to others.	CT-LS.01.04.06.c. Evaluate professional and personal values and how they are applied in the service to others.
CT-LS.01.05. Performance Indicator: Awareness: Desire purposeful understanding related to professional and personal activities.		
CT-LS.01.05.01.a. Discuss trends and issues important to the community.	CT-LS.01.05.01.b. Analyze the impact of trends and issues on the community.	CT-LS.01.05.01.c. Articulate current issues those are important to the local, state, national and global communities.
CT-LS.01.05.02.a. Identify civic leadership role opportunities.	CT-LS.01.05.02.b. Demonstrate responsible citizenship.	CT-LS.01.05.02.c. Perform leadership tasks associated with citizenship.
CT-LS.01.05.03.a. Explain benefits and challenges of working in a diverse group.	CT-LS.01.05.03.b. Engage in activities to help develop personal awareness of diversity.	CT-LS.01.05.03.c. Plan an activity that promotes appreciation of diversity.
CT-LS.01.06. Performance Indicator: Continuous Improvement: Pursue learning and growth opportunities related to professional and personal aspirations.		
CT-LS.01.06.01.a. Explain the reasons for having a leadership/personal growth plan.	CT-LS.01.06.01.b. Develop a plan that includes specific goals for leadership and personal growth.	CT-LS.01.06.01.c. Implement a leadership and personal growth plan.
CT-LS.01.06.02.a. Describe the role and purpose of a personal mentor.	CT-LS.01.06.02.b. Identify areas where a personal mentor could be helpful.	CT-LS.01.06.02.c. Serve as a mentor for others.
CT-LS.01.06.03.a. Identify the different types of problem solving models and their applicability to specific situations.	CT-LS.01.06.03.b. Utilize a problem-solving model to solve a given problem.	CT-LS.01.06.03.c. Use problem solving strategies to solve a professional or personal issue.
CT-LS.01.06.04.a. Use various emerging technologies to enhance a program or project.	CT-LS.01.06.04.b. Evaluate the effectiveness of current technologies.	CT-LS.01.06.04.c. Make recommendations to adopt new emerging technologies.
CT-LS.01.06.05.a. Describe the value of being a life-long learner and the need for continuous development.	CT-LS.01.06.05.b. Assess personal motivations and their impact on acquiring new knowledge and skills.	CT-LS.01.06.05.c. Implement a plan to develop new knowledge and skills related to professional and personal aspirations.

CT-LS.02. Performance Element: Personal Growth: Develop a skill set to enhance the positive evolution of the whole person.		
CT-LS.02.01. Performance Indicator: Physical Growth: Address personal health by understanding, respecting and managing your body's needs.		
CT-LS.02.01.01.a. Identify how healthy and unhealthy food affects one's body.	CT-LS.02.01.01.b. Create a balanced menu to ensure appropriate proportions of desired nutritional elements.	CT-LS.02.01.01.c. Practice healthy eating habits.
CT-LS.02.01.02.a. Describe the benefits, risks and opportunities associated with being physically fit.	CT-LS.02.01.02.b. Implement a plan for respecting one's body.	CT-LS.02.01.02.c. Make recommendations or changes to a personal fitness program regiment.
CT-LS.02.01.03.a. Describe practices that must be maintained to achieve long-term health.	CT-LS.02.01.03.b. Implement a plan to achieve long-term health.	CT-LS.02.01.03.c. Evaluate personal lifestyle as related to long-term health.
CT-LS.02.02. Performance Indicator: Social Growth: Interact with others in a manner that respects the differences of a diverse and changing society.		
CT-LS.02.02.01.a. Discover the different cultures that exist in one's community.	CT-LS.02.02.01.b. Compare and contrast the customs of different cultures.	CT-LS.02.02.01.c. Engage in a project that educates others about different cultures from within the community.
CT-LS.02.02.02.a. Demonstrate proper conduct and appearances for various settings.	CT-LS.02.02.02.b. Apply the skills required to present one appropriately in various settings.	CT-LS.02.02.02.c. Present one appropriately in various settings.
CT-LS.02.02.03.a. Identify the skills needed to develop a professional relationship.	CT-LS.02.02.03.b. Exhibit the behaviors needed for developing and maintaining a professional relationship.	CT-LS.02.02.03.c. Identify ways to develop and maintain professional relationships to enhance career success.
CT-LS.02.03. Performance Indicator: Professional Growth: Develop awareness and apply skills necessary for achieving career success.		
CT.02.03.01.a. Identify 21st century skills required for all careers in agriculture.* CTE Assessment Standard, AM, C18; AS, C27; Aqua, C20; NRE, C19; PS, C21		
CT-LS.02.03.02.a. Demonstrate the essential skills that are part of a job search, including preparing the cover letter, resume, application, and participating in the interview process.* CTE Assessment Standard, AM, C19; AS, C28; Aqua, C21; NRE, C120; PS, C22		
CT-LS.02.03.03.a. Explain the purpose and types of Supervised Agriculture Experience programs (SAE) .* CTE Assessment Standard, AM, C20; AS, C29; Aqua, C22; NRE, C21; PS, C23		
CT.02.03.04.a. Explore various career interests/options.	CT-LS.02.03.04.b. Make decisions to plan for a personal career.	CT-LS.02.03.04.c. Implement a plan to achieve career goals and priorities.
CT-LS.02.03.05.a. Chart the components to creating a balanced work/life plan.	CT-LS.02.03.05.b. Determine the level of non-essential actions/tasks related to personal and work life.	CT-LS.02.03.05.c. Balance personal and work responsibilities.
CT-LS.02.03.06.a. Identify the employability skills required for various careers in agriculture.	CT-LS.02.03.06.b. Develop skills required for a specific career.	CT-LS.02.03.06.c. Demonstrate employability skills for a specific career.

CT-LS.02.04. Performance Indicator: Professional Growth: Create resumes and cover letters for employment opportunities.		
CT-LS.02.04.03.a. Describe the purpose of a resume and cover letter.	CT-LS.02.04.03.b. Analyze the steps in a job search including preparing the cover letter, resume and application, and participating in the interview process.	CT-LS.02.04.01.c. Create a resume and cover letter for employment.
CT-LS.02.04. Performance Indicator: Mental Growth: Demonstrate the effective application of reasoning, thinking, and coping skills.		
CT-LS.02.04.01.a. Describe the skills necessary to think critically and creatively.	CT-LS.02.04.01.b. Discuss the benefits thinking critically and creatively.	CT-LS.02.04.01.c. Demonstrate critical and creative thinking skills while completing a task.
CT-LS.02.04.02.a. Explore tools used in creative problem-solving.	CT-LS.02.04.02.b. Analyze problems that were solved well and problems that were not solved well.	CT-LS.02.04.02.c. Implement effective problem solving strategies.
CT-LS.02.04.03.a. Discuss the skills and techniques needed to negotiate effectively.	CT-LS.02.04.03.b. Analyze case studies where negotiation techniques are used.	CT-LS.02.04.03.c. Demonstrate the skills needed to negotiate with others.
CT-LS.02.05. Performance Indicator: Emotional Growth: Demonstrate healthy responses to one's feelings.		
CT-LS.02.05.01.a. Describe skills used to cope with different situations.	CT-LS.02.05.01.b. Determine the coping process that best fits one's situation.	CT-LS.02.05.01.c. Demonstrate one's ability to cope with life's trials.
CT-LS.02.05.02.a. Discover the characteristics of selfless and compassionate individuals.	CT-LS.02.05.02.b. Determine opportunities to demonstrate selflessness and compassion towards others.	CT-LS.02.05.02.c. Practice the skills needed to live a compassionate and selfless life.
CT-LS.02.05.03.a. Describe the factors needed to build self-confidence.	CT-LS.02.05.03.b. Analyze an individual's personal level of self-confidence.	CT-LS.02.05.03.c. Exhibit self-confidence while in the workplace.
CT-LS.02.05.04.a. Analyze the benefits of emotional development.	CT-LS.02.05.04.b. Practice habits that positively affect emotional well-being.	CT-LS.02.05.04.c. Develop emotional well-being in other team members.
CT-LS.02.05.05.a. Describe situations where seeking counsel would be appropriate (e.g., personal, legal, financial, etc.).	CT-LS.02.05.05.b. Analyze the positive outcomes of seeking counsel through an appropriate source.	CT-LS.02.05.05.c. Seek appropriate counsel for specific situations (e.g., personal, legal, financial, etc.).
CT-LS.02.06. Performance Indicator: Spiritual Growth: Reflect inner strength to allow one to define personal beliefs, values, principles and sense of balance.		
CT-LS.02.06.01.a. Define the terms: value, beliefs, and belief system.	CT-LS.02.06.01.b. Create a personal belief statement.	CT-LS.02.06.01.c. Develop and nurture a personal belief system.
CT-LS.02.06.02.a. Describe respectful, sensitive behaviors that can influence others.	CT-LS.02.06.02.b. Explain how respectful, sensitive behaviors lead to increased influence.	CT-LS.02.06.02.c. Demonstrate respect and sensitivity to others' beliefs.
CT-LS.03. Performance Element: Career Success: Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career while effectively contributing to society.		
CT-LS.03.01. Performance Indicator: Communication: Demonstrate oral, written and verbal skills.		
CT-LS.03.01.01.a. Use basic technical and business writing skills.	CT-LS.03.01.01.b. Select the appropriate form of technical and business writing or communication for a specific situation.	CT-LS.03.01.01.c. Demonstrate technical and business writing skills to communicate effectively with co-workers and supervisors.
CT-LS.03.01.02.a. Describe the various types and uses of resumes.	CT-LS.03.01.02.b. Prepare a resume.	CT-LS.03.01.02.c. Demonstrate effective use of a resume as part of an effort to obtain a job.

CT-LS.03.01.03.a. Develop an outline or plan for a business presentation.	CT-LS.03.01.03.b. Deliver a business presentation for a peer group (e.g., class presentation).	CT-LS.03.01.03.c. Make effective business presentations.
CT-LS.03.02. Performance Indicator: Decision Making – Analyze situations and execute an appropriate course of action.		
CT-LS.03.02.01.a. Analyze the steps in the decision-making process.	CT-LS.03.02.01.b. Utilize the process used to reach a conclusion for a decision.	CT-LS.03.02.01.c. Make decisions for a given situation by applying the decision-making process.
CT-LS.03.02.02.a. Select resources to help in the problem-solving process.	CT-LS.03.02.02.b. Determine information that is critical to solving problems.	CT-LS.03.02.02.c. Use problem-solving skills
CT-LS.03.02.03.a. Differentiate between ethical andunethical behavior.	CT-LS.03.02.03.b. Practice ethical behaviors.	CT-LS.03.02.03.c. Examine an ethical dilemma and prepare an argument for a position.
CT-LS.03.02.04.a. Use an interest inventory to determine goals appropriate to personal passions, abilities and aptitudes.	CT-LS.03.02.04.b. Assess personal skills to set goals for success in a career.	CT-LS.03.02.04.c. Implement appropriate preparation plans for a career path based on passion, abilities, aptitude, opportunities.
CT-LS.03.03. Career Exploration and Development: Understand the diversity of careers related to the agricultural industry and strategies to acquire and advance in an agricultural career.		
CT-LS.03.03.01.a. Identify and demonstrate appropriate conduct at FFA meetings.	CT-LS.03.03.01.b. Explain effective implementation of parliamentary procedure.	
CT-LS.03.01.02.a. Explain effective communication skills.	CT-LS.03.01.02.b. Describe the qualities and characteristics of an effective leader.	CT-LS.03.01.02.c. Identify and apply the various roles and responsibilities of a leader within an organization.
CT-LS.04 Performance Element. Leadership, Personal Growth, and Career Success		
CT-LS.04.01Understand the concepts, strategies, and tools needed, which contribute to premier leadership, personal growth, and career success through the participation in FFA.		
CT-LS.04.01.01.a. Identify FFA opportunities, including individual and chapter awards, career development events, leadership skills development, and FFA service engagement. .* CTE Assessment Standard, AM, D21; AS, D30; Aqua, D23; NRE, D22; PS, D24		
CT-LS.04.01.02.a. Explain the purpose of using parliamentary procedure in FFA meetings .* CTE Assessment Standard, AM, D22; AS, D31; Aqua, D24; NRE, D23; PS, D25		
CT-LS.04.01.03.a. Demonstrate knowledge of parliamentary procedures such as use of the gavel, making and amending main motions, debating, and voting.* CTE Assessment Standard, AM, D23; AS, D32; Aqua, D25; NRE, D24; PS, D26		
CT-LS.04.01.04. Exhibit the skills needed to lead a meeting or activity that engages all participants in the process.* CTE Assessment Standard, AM, D24; AS, D33; Aqua, D26; NRE, D25; PS, D27		

Animal Science

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and practices to the production and management of animals.

Level 1	Level 2	Level 3
CT-AS.01. Performance Element: Examine domestic animal origins.		
CT-AS.01.01. Performance Indicator: Evaluate the development and implications of animal origin, domestication and distribution.		
CT-AS.01.01.01.a. Identify the origin, significance, distribution and domestication of animal species.	CT-AS.01.01.01.b. Evaluate and describe characteristics of animals that developed in response to the animals' environment and led to their domestication.	CT-AS.01.01.01.c. Predict adaptations of animals to production practices and environments.
CT-AS.01.01.02.a. Identify the products, services and careers within the companion, production and/or lab animal industry.	CT-AS.01.01.02.b. Outline the development of the animal industry and the resulting products, services and careers.	CT-AS.01.01.02.c. Predict trends and implications of future development of the animal systems industry.
CT-AS.01.02. Performance Indicator: Classify animals according to hierarchical taxonomy and agricultural use.		
CT-AS.01.02.01.a. Explain the importance of the binomial system of nomenclature.	CT-AS.01.01.02.b. Explain how animals are classified using Linnaeus's taxonomical classification system.	CT-AS.01.01.02.c. Classify animals according to the taxonomical classification system.
CT-AS.01.02.02.a.Explain how companion, production and/or lab animals are scientifically classified (A4).	CT-AS.01.02.02.b. Compare and contrast the hierarchical classification of the major agricultural animal species.	CT-AS.01.02.02.c. Appraise and evaluate the economic value of animals for various applications in the agriculture industry.
CT-AS.01.03. Performance Indicator: Identify breeds and types of companion, production and/or lab animals.		
CT-AS.01.03.01.a. Identify the following breeds of dogs: Labrador Retriever, Golden Retriever, German Shepherd, Yorkshire Terrier, Beagle, Boxer, Poodle, Rottweiler, Greyhound, Dachshund, Bulldog, and Doberman Pinscher. * CTE Assessment Standard, AS, A1		
CT-AS.01.03.02.a. Identify the following breeds of cats: Maine Coon, Bengal, Russian Blue, Abyssinian, Ragdoll, American Shorthair, Siamese, Manx, Persian, and Himalayan.* CTE Assessment Standard, AS, A2		
CT-AS.01.03.03.a. Identify the following breeds of pocket pets: Sugar Glider, Gerbil, Hamster, Guinea Pig, Ferret, Chinchilla, white mice, and rats. * CTE Assessment Standard, AS, A3		
CT-AS.01.03.04.a. Identify the following breeds of rabbits: Netherland Dwarf, Dutch, Flemish Giant, French Lop, American Chinchilla, Holland Lop, Satin, English Angora, Mini Rex, and Himalayan .* CTE Assessment Standard, AS, A4		

CT-AS.01.03.05.a. Identify the following breeds of birds: Cockatiel, Cockatoos, Parakeets, African Grey, and Blue and Gold Macaw .* CTE Assessment Standard, AS, A5		
CT-AS.01.03.06.a. Identify the following breeds of reptiles and amphibians: Bearded Dragons, Iguana, Chameleon, Gecko, Boa Constrictor, Corn Snake, Red Ear Slider, Box Turtle, Tree Frog, and Toad .* CTE Assessment Standard, AS, A6		
CT-AS.01.03.07.a. Identify the following breeds of domestic livestock used for dairy: Holstein- Friesian, Jersey, Guernsey, Brown Swiss, Ayrshire, and Milking Shorthorn .* CTE Assessment Standard, AS, A7		
CT-AS.01.03.08.a. Identify the following breeds of domestic livestock used for beef: Angus, Hereford, Charolais, Simmental, Belted Galloways, Scotch Highlanders, and Texas Longhorns .* CTE Assessment Standard, AS, A8		
CT-AS.01.03.09.a. Identify the following breeds of sheep: Dorset, South Downs, Cheviot, Romney, Suffolk, Merino, and Hampshire .* CTE Assessment Standard, AS, A9		
CT-AS.01.03.10.a. Identify the following breeds of goats: Toggenburg, Alpine, Nubian, Angora, Boer, Pygmy, and Saanen .* CTE Assessment Standard, AS, A10		
CT-AS.01.03.11.a. Identify the following breeds of swine: Yorkshire, Hampshire, Berkshire, Duroc, American Landrace, Potbellied, and Hereford .* CTE Assessment Standard, AS, A11		
CT-AS.01.03.12.a. Identify the following breeds of equine: Appaloosa, Arabian, Quarter Horse, Morgan, Thoroughbred, Saddlebred, Paint, Belgian, Clydesdale, Percheron, Friesian, Hackney, Haflinger, Shetland, Hanoverian, and Andalusian .* CTE Assessment Standard, AS, A12		
CT-AS.02. Performance Element: Examine anatomy and physiology of domesticated animals.		
CT-AS.02.02. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various animal systems.		
CT-AS.02.02.01.a. Identify basic characteristics of animal cells, tissues, organs and body systems.	CT-AS.02.02.01.b. Compare and contrast animal cells, tissues, organs and body systems.	CT-AS.02.02.01.c. Explain how the components and systems of animal anatomy and physiology relate to the production and use of animals.

CT-AS.02.02.02.a. Diagram a typical animal cell and identify the organelles.	CT-AS.02.02.02.b. Describe the functions of animal cell structures.	CT-AS.02.02.02.c. Describe the molecular makeup of animal cells and its importance in animal production and management.
CT-AS.02.02.03.a. Describe the basic functions of animal cells in growth and reproduction.	CT-AS.02.02.03.b. Detail the processes of meiosis and mitosis in animal growth, development, health and reproduction.	CT-AS.02.02.03.c. Explain the application of the processes of meiosis and mitosis to animal growth, development, health and reproduction.
CT-AS.02.02.04.a. Describe the properties, locations, functions and types of animal tissues.	CT-AS.02.02.04.b. Explain the relationship of animal tissues to growth, performance and health.	CT-AS.02.02.04.c. Explain the importance and uses made of animal tissues in the agriculture industry.
CT-AS.02.02.05.a. Describe the properties, locations, functions and types of animal organs.	CT-AS.02.02.05.b. Compare and contrast organ types and functions among animal species.	CT-AS.02.02.05.c. Relate the importance of animal organs to the health, growth and reproduction of animals.
CT-AS.02.02.06.a. Describe the functions of the animal body systems and system components.	CT-AS.02.02.06.b. Compare and contrast body systems and system adaptations between animal species.	CT-AS.02.02.06.c. Explain the impact of animal body systems on performance, health, growth and reproduction.
CT-AS.02.02.07a. Describe the locations and functions of domestic livestock and companion animal organs and their systems, including respiratory, circulatory, reproductive, endocrine, urinary, and digestive .* CTE Assessment Standard, AS, A23		
CT-AS.02.03. Performance Indicator: Select animals for specific purposes and maximum performance based on anatomy and physiology.		
CT-AS.02.03.01.a. Identify ways an animal's health can be affected by anatomical and physiological disorders.	CT-AS.02.03.01.b. Compare and contrast desirable anatomical and physiological characteristics of animals within and between species.	CT-AS.02.03.01.c. Evaluate and select animals to maximize performance based on anatomical and physiological characteristics that affect health, growth and reproduction.
CT-AS.02.03.02.a. Create a program to develop an animal to its highest potential performance.	CT-AS.02.03.02.b. Assess an animal to determine if it has reached its optimal performance level based on anatomical and physiological characteristics.	CT-AS.02.03.02.c. Develop efficient procedures to produce consistently high-quality animals well suited for their intended purposes.
CT-AS.03. Performance Element: Provide for the proper <u>health care</u> of animals.		
CT-AS.03.01. Performance Indicator: Prescribe and implement a prevention and treatment program for animal diseases, parasites and other disorders.		
CT-AS.03.01.01.a. Maintain animal health and sanitation for companion, production and/or lab animals.	CT-AS.03.01.01.b. Follow industry protocols for animal health.	CT-AS.03.01.01.c. Evaluate animals for health and sanitation.
CT-AS.03.01.02.a.Understand the procedures to maintain health and production records for companion, production and/or lab animals.	CT-AS.03.01.02.b. Perform simple health-check evaluations on animals.	CT-AS.03.01.02.c. Perform diagnostic tests to detect health problems in animals.

CT-AS.03.01.03.a. Evaluate preventive measures for controlling and limiting the spread of common diseases, and common parasites among companion and domestic animals, including vaccination, sanitation, observation, isolation, waste disposal, proper handling, protective clothing, and hand washing.* CTE Assessment Standard, AS, A13	CT-AS.03.01.03.b Recognize illnesses and disorders based on symptoms and problems caused by disease, parasites, and disorders among companion, lab and/or domestic animals.* CTE Assessment Standard, AS, A14	CT-AS.03.01.03.c. Treat common diseases, parasites and physiological disorders of animals.
CT-AS.03.01.04.a. Explain characteristics of causative agents and vectors of diseases and disorders in animals.	CT-AS.03.01.04.b. Evaluate preventive measures for controlling and limiting the spread of diseases, parasites and disorders among animals.	CT-AS.03.01.04.c. Design and implement a health maintenance and disease and disorder prevention plan for animals in their natural and/or confined environments.
CT-AS.03.01.05.a. Explain the clinical significance of common considerations in veterinary treatments, such as aseptic techniques.	CT-AS.03.01.05.b. Prepare animals, facilities and equipment for surgical and nonsurgical veterinary treatments and procedures.	CT-AS.03.01.05.c. Perform surgical and nonsurgical veterinary treatments and procedures in animal health care.
CT-AS.03.01.06.a. Identify and describe zoonotic diseases.	CT-AS.03.01.06.b. Explain the health risk of zoonotic diseases to humans and their historical significance and future implications.	CT-AS.03.01.06.c. Implement zoonotic disease prevention methods and procedures for the safe handling and treatment of animals.
CT-AS.03.02. Performance Indicator: Provide for the biosecurity of agricultural animals and production facilities.		
CT-AS.03.02.01.a. Explain the importance of biosecurity to the animal industry.	CT-AS.03.02.01.b. Discuss procedures at the local, state and national levels to ensure biosecurity of the animal industry.	CT-AS.03.02.01.c. Implement a biosecurity plan for an animal production operation.
CT-AS.04. Performance Element: Apply principles of animal <u>nutrition</u> to ensure the proper growth, development, reproduction and economic production of animals.		
CT-AS.04.01. Performance Indicator: Formulate feed rations to provide for the nutritional needs of animals.		
CT-AS.04.01.01.a. Identify and explain the function of the six nutrients required for life.* CTE Assessment Standard, AS, A15	CT-AS.04.01.01.b Determine the most cost effective diet using feeding guidelines and the price per pound of more than one feed .* CTE Assessment Standard, AS, A17	CT-AS.04.01.01.c. Select appropriate feedstuffs for animals based on factors such as economics, digestive system and nutritional needs.
CT-AS.04.01.02.a. Explain the feed ingredients, guaranteed analysis, and feeding guideline components of a feed label/tag .* CTE Assessment Standard, AS, A16	CT-AS.04.01.02.b. Appraise the adequacy of feed rations using data from the analysis of feedstuffs, animal requirements and performance.	CT-AS.04.01.02.c. Formulate animal feeds based on nutritional requirements, using feed ingredients for maximum nutrition and optimal economic production.
CT-AS.04.02. Performance Indicator: Formulate and administer animal supplements, animal feed additives and growth promotes in animal production.		
CT-AS.04.02.01.a. Explain the purpose and benefits of feed additives and growth promotes in animal production.	CT-AS.04.02.01.b. Discuss how feed additives and growth promotions are administered and the precautions that should be taken.	CT-AS.04.02.01.c. Prescribe and administer feed additives and growth promotions.
CT-AS.05. Performance Element: Evaluate and select animals based on <u>scientific principles</u> of animal production.		
CT-AS.05.01. Performance Indicator: Evaluate the male and female reproductive systems in selecting animals.		
CT-AS.05.01.01.a. Explain the male and female reproductive organs of the major animal species.	CT-AS.05.01.01.b. Describe the functions of major organs in the male and female reproductive systems.	CT-AS.05.01.01.c. Select breeding animals based on characteristics of the reproductive organs.

CT-AS.05.02. Performance Indicator: Evaluate animals for breeding readiness and soundness.		
CT-AS.05.02.01.a. Explain how age, size, life cycle, maturity level and health status affect the reproductive efficiency of male and female animals.	CT-AS.05.02.01.b. Summarize factors that lead to reproductive maturity.	CT-AS.05.02.01.c. Evaluate and select animals for reproductive readiness.
CT-AS.05.02.02.a. Discuss the importance of efficient and economic reproduction in animals.	CT-AS.05.02.02.b. Evaluate reproductive problems that occur in animals.	CT-AS.05.02.02.c. Treat or cull animals with reproductive problems.
CT-AS.05.03. Performance Indicator: Apply scientific principles in the selection and breeding of animals.		
CT-AS.05.03.01.a. Explain genetic inheritance in domestic livestock and companion animals.* CTE Assessment Standard, AS, A20	CT-AS.05.03.01.b. Explain the advantages of using genetically superior animals in the production of animals and animal products.	CT-AS.05.03.01.c. Select a breeding system based on the principles of genetics.
CT-AS.05.03.02.a. Define natural and artificial breeding methods.	CT-AS.05.03.02.b. Identify the uses, advantages, and disadvantages of natural breeding and artificial insemination .* CTE Assessment Standard, AS, A21	CT-AS.05.03.02.c. Select animal breeding methods based on reproductive and economic efficiency.
CT-AS.05.03.03.a. Explain the use of quantitative breeding values (e.g., EPDs) in the selection of genetically superior breeding stock.	CT-AS.05.03.03.b. Compare and contrast quantitative breeding value differences between genetically superior animals and animals of average genetic value.	CT-AS.05.03.03.c. Select animals based on quantitative breeding values for specific characteristics.
CT-AS.05.03.04.a. Explain the advantages of major reproductive management practices, including estrous synchronization, superovulation, flushing and embryo transfer.	CT-AS.05.03.04.b. Explain the processes of major reproductive management practices, including estrous synchronization, superovulation, flushing and embryo transfer.	CT-AS.05.03.04.c. Perform procedures for estrous synchronization, superovulation, flushing, embryo transfer and other reproductive management practices.
CT-AS.05.03.05.a. Discuss the uses and advantages and disadvantages of natural breeding and artificial insemination.	CT-AS.05.03.05.b. Explain the materials, methods and processes of artificial insemination.	CT-AS.05.03.05.c. Demonstrate artificial insemination techniques.
CT-AS.05.03.06.a. Discuss the principles of companion, production and/or lab animal reproduction, genetics and the application of new and emerging technologies in animal reproduction.		
CT-AS.06. Performance Element: demonstrate safety with animals and animal products.		
CT-AS.06.01. Performance Indicator: Demonstrate safe animal handling and management techniques.		
CT-AS.06.01.01.a Interpret domestic livestock and companion animal behaviors and outline safety procedures for working with those species.* CTE Assessment Standard, AS, A18	CT-AS.06.01.01.b. Outline safety procedures for working with animals by species.	
CT-AS.06.01.02.a. Compare and contrast animal welfare in relation to domestic livestock and companion animals.* CTE Assessment Standard, AS, A22	CT-AS.06.01.02.b. Design programs that assure the welfare of animals and prevent abuse or mistreatment.	CT-AS.06.01.02.c. Implement quality-assurance programs and procedures for animal production.
CT-AS.06.02. Performance Indicator: Implement procedures to ensure that animal products are safe.		
CT-AS.06.02.01.a. Identify animal production practices that could pose health risks or are considered to pose risks by some.	CT-AS.06.02.01.b. Discuss consumer concerns with animal production practices relative to human health.	CT-AS.06.02.01.c. Implement a program to assure the safety of animal products.

CT-AS.06.02.02.a. Describe how animal identification systems can track an animal's location, nutrition requirements, production progress and changes in health.	CT-AS.06.02.02.b. Explain why animal trace-back capability, using individual animal and farm identification systems, is important to producers and consumers.	CT-AS.06.02.02.c. Implement an animal and/or premises identification program.
CT-AS.07. Performance Element: Design and utilize comfortable and safe animal housing and equipment.		
CT-AS.07.01. Performance Indicator: Design animal housing, equipment and handling facilities for the major systems of animal production.		
CT-AS.07.01.01.a. Identify facilities needed to house and manage domestic livestock and companion animals safely and efficiently.* CTE Assessment Standard, AS, A24	CT-AS.07.01.01.b. Critique designs for an animal facility and prescribe alternative layouts and adjustments for the safe and efficient use of the facility.	CT-AS.07.01.01.c. Design an animal facility, focusing on animal requirements, efficiency, safety and ease of handling.
CT-AS.07.01.02.a. Identify equipment and handling facilities used in modern animal production.	CT-AS.07.01.02.b. Describe safe handling, shipment and bio-security of companion, production and/or lab animals.	CT-AS.07.01.02.c. Select equipment and implement animal handling procedures and improvements to enhance production efficiency.
CT-AS.07.01.03.a. Explain the importance of bio-security in relation to domestic livestock and companion animals. .* CTE Assessment Standard, AS, A19		
CT-AS.07.02. Performance Indicator: Comply with government regulations and safety standards for facilities used in animal production.		
CT-AS.07.02.01.a. List the general standards (e.g., environmental, zoning, construction) that must be met in facilities for animal production.	CT-AS.07.02.01.b. Evaluate an animal facility to determine if standards have been met.	CT-AS.07.02.01.c. Design a facility that meets standards for the legal, safe, ethical and efficient production of animals.
CT-AS.08. Performance Element: Analyze environmental factors associated with animal production.		
CT-AS.08.01. Performance Indicator: Reduce the effects of animal production on the environment.		
CT-AS.08.01.01.a. Evaluate the effects of animal agriculture on the environment.	CT-AS.08.01.01.b. Outline methods of reducing the effects of animal agriculture on the environment.	CT-AS.08.01.01.c. Implement measures to reduce the impact of animal agriculture on the environment.
CT-AS.08.02. Performance Indicator: Evaluate the effects of environmental conditions on animals.		
CT-AS.08.02.01.a. Identify optimal environmental conditions for animals.	CT-AS.08.02.01.b. Describe the effects of environmental conditions on animal populations and performance.	CT-AS.08.02.01.c. Establish and maintain favorable environmental conditions for animal growth and performance.
CT-AS.09. Performance Element: Evaluate trends within the food industry.		
CT-AS.09.01. Performance Indicator: Evaluate the significance and implications of changes and trends in the food product and processing industry.		
CT-AS.09.01.01.a Discuss the history and describe and explain the components (e.g., processing, distribution, byproducts) of the food products and processing industry.	CT-AS.09.01.01.b Evaluate changes and trends in the food products and processing industry.	CT-AS.09.01.01.c Predict trends and implications in the food products and processing industry.
CT-AS.09.01.02.a Identify and explain environmental and safety concerns about the food supply.	CT-AS.09.01.02.b Discuss the issues of safety and environmental concerns about foods and food processing (e.g., Genetically Modified Organisms, microorganisms, contamination, irradiation).	CT-AS.09.01.02.c Determine appropriate industry response to consumer concerns to assure a safe and wholesome food supply.

CT-AS.010. Performance Element: Establish food safety program.		
CT-AS.10.01. Performance Indicator: Performance Indicator: Implement Hazard Analysis and Critical Control Point (HACCP) procedures to establish operating parameters		
CT-AS.10.01.01.a Describe contamination hazards (physical, chemical and biological) associated with food products and processing.	CT-AS.10.01.01.b Outline procedures to eliminate possible contamination hazards associated with food products and processing.	CT-AS.10.01.01.c Analyze the effectiveness of a food products and processing company's Critical Control Point (CCP) procedures.
CT-AS.10.01.02.a Identify the seven principles of HACCP.	CT-AS.10.01.02.b Explain the implementation of the seven principles of HACCP.	CT-AS.10.01.02.c Implement an HACCP program for a food products and processing facility.
CT-AS.10.02. Performance Indicator: Apply safety and sanitation procedures in the handling, processing and storing of food products		
CT-AS.10.02.01.a Explain techniques and procedures for the safe handling of food products.	CT-AS.10.02.01.b Evaluate food product handling procedures.	CT-AS.10.02.01.c Demonstrate approved food product handling techniques.
CT-AS.10.02.02.a Describe the importance of performing quality-assurance tests on food products.	CT-AS.10.02.02.b Perform quality-assurance tests on food products.	CT-AS.10.02.02.c Interpret quality-assurance test results and apply corrective procedures.
CT-AS.10.02.03.a Describe the effects food-borne pathogens have on food products and humans.	CT-AS.10.02.03.b Explain the importance of microbiological tests in food product preparation, listing common spoilage and pathogenic microorganisms.	CT-AS.10.02.03.c Conduct and interpret microbiological tests for food-borne pathogens and implement corrective procedures.
CT-AS.011. Performance Element: Practice harvesting, selection and inspection to produce high quality food products.		
CT-AS.11.01. Performance Indicator: Utilize harvesting, selection and inspection techniques to obtain quality food products for processing		
CT-AS.11.01.01.a Identify quality and yield grades of food products.	CT-AS.11.01.01.b Discuss factors that affect quality and yield grades of food products.	CT-AS.11.01.01.c Assign quality and yield grades to food products according to industry standards.
CT-AS.11.01.02.a Select raw food products based on yield grades, quality grades and related selection criteria.	CT-AS.11.01.02.b Perform quality-control inspections of raw food products for processing.	CT-AS.11.01.02.c Implement procedures to maintain original food quality and yield.
CT-AS.11.01.03.a Identify and describe accepted animal treatment and harvesting techniques.	CT-AS.11.01.03.b Compare and contrast accepted animal treatment and harvesting techniques.	CT-AS.11.01.03.c Harvest animals using regulatory agency-approved or industry approved techniques.
CT-AS.11.01.04.a Describe the importance of premortem and post-mortem inspections of animals for harvest.	CT-AS.11.01.04.b Explain desirable and undesirable characteristics of both premortem and post-mortem animals in relation to the production of food products.	CT-AS.11.01.04.c Conduct pre-mortem and postmortem inspections of animals.

Aquaculture

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to the management of aquaculture.

Level 1	Level 2	Level 3
CT-AQ.01. Performance Element: Examine the components, historical development, global implications and future trends of the aquaculture industry.		
CT-AQ.01.01. Performance Indicator: Evaluate the development and implications of aquatic species origin, domestication and distribution.		
CT-AQ.01.01.01.a. Identify the origin, significance, distribution and commercial importance of aquatic species.	CT-AQ.01.01.b. Evaluate and describe characteristics of aquatic animals that developed in response to the aquatic species' environment and led to their commercial use.	CT-AQ.01.01.01.c. Predict adaptations of aquatic species to production practices and environments.
CT-AQ.01.01.02 List and describe how the following species are detrimental to aquaculture production: sea stars, oyster drills, zebra mussels, lice, parasitic copepods, and worms. .* CT Assessment Standard, AQ 11.		
CT-AQ.01.01.03 Identify and describe aquaculture intensive and extensive enhancement strategies.		
CT-AQ.02. Performance Element: Classify aquatic species according to hierarchical taxonomy and use.		
CT-AQ.02.01. Performance Indicator: Identify aquatic species by their hierarchical taxonomy and use.		
CT-AQ.02.01.01.a. Explain the importance of the binomial system of nomenclature.	CT-AQ.02.01.01.b. Explain how aquatic species are classified using Linnaeus's taxonomical classification system.	CT-AQ.02.01.01.c. Classify aquatic species according to the taxonomical classification system.
CT-AQ.02.01.02.a. Classify the following species of aquatic organisms as fresh water, marine, or diadromous, and by their genus and species: tilapia-Oreochromis mossambicus and Oreochromis nilotica, Atlantic salmon-Salmo salar, chinook salmon-Oncorhynchus tshawyscha, coho salmon- Oncorynchus kisutch, eastern oyster- Crassostrea virginicia, hard clam-Mercinaria mercinaria, American lobster- Homerus americanus, sugar kelp- Saccharina latissima, rainbow trout- Oncorynchus mykiss, Brook Trout-Salvelinus fontinalis, brown trout- Salmo trutta, channel catfish-Ictalurus punctatus, blue catfish-Ictalurus furcatus, white catfish-Ictalurus catus.* CT Assessment Standard, AQ 1.	CT-AQ.02.01.02.b. Compare and contrast the hierarchical classification of the major aquatic species.	CT-AQ.02.01.02.c. Appraise and evaluate the economic value of aquatic species for various applications in the aquaculture industry.
CT-AQ.02.01.03.a. Diagram the life cycle of tilapia, Atlantic salmon, eastern oysters, and American lobsters.* CT Assessment Standard, AQ 14.		

CT-AQ.03. Performance Element: Performance Element: Classify, evaluate, select and manage animals based on anatomical and physiological characteristics.		
CT-AQ.03.01. Performance Indicator: Apply principles of comparative anatomy and physiology to uses within various aquatic species.		
CT-AQ.03.01.01.a. Identify the following external morphological features of a finfish: dorsal, pectoral, pelvic, anal, caudal and adipose fins, lateral line, and operculum.* CT Assessment Standard, AQ 12.	CT-AQ.03.01.01.b. Identify the following external morphologic features of a crustacean: carapace, abdomen, walking legs, and claws. .* CT Assessment Standard, AQ 13.	CT-AQ.03.01.01.c. Explain how the components and systems of aquatic species anatomy and physiology relate to the production and use of aquatic species.
CT-AQ.03.01.02.a. Diagram a typical aquatic species cell and identify the organelles.	CT-AQ.03.01.02.b. Describe the functions of aquatic species cell structures.	CT-AQ.0.03.01.c. Describe the molecular makeup of aquatic species cells and its importance in aquaculture production and management.
CT-AQ.03.01.03.a. Describe the basic functions of aquatic species cells in growth and reproduction.	CT-AQ.03.01.03.b. Detail the processes of meiosis and mitosis in aquatic species growth, development, health and reproduction.	CT-AQ.03.01.03.c. Explain the application of the processes of meiosis and mitosis to aquatic species growth, development, health and reproduction.
CT-AQ.03.01.04.a. Describe the properties, locations, functions and types of aquatic species tissues.	CT-AQ.03.01.04.b. Explain the relationship of aquatic species tissues to growth, performance and health.	CT-AQ.03.01.04.c. Explain the importance and uses made of aquatic species tissues in the aquaculture industry.
CT-AQ.03.01.05.a. Describe the properties, locations, functions and types of aquatic species organs.	CT-AQ.03.01.05.b. Compare and contrast organ types and functions among aquatic species.	CT-AQ.03.01.05.c. Relate the importance of aquatic species organs to the health, growth and reproduction of animals.
CT-AQ.03.01.06.a. Describe the functions of the aquatic species body systems and system components.	CT-AQ.03.01.06.b. Compare and contrast body systems and system adaptations between aquatic species.	AS.03.01.06.c. Explain the impact of aquatic species body systems on performance, health, growth and reproduction.
CT-AQ.03.02. Performance Indicator: Select aquatic species for specific purposes and maximum performance based on anatomy and physiology.		
CT-AQ.03.02.01.a. Identify ways aquatic species' health can be affected by anatomical and physiological disorders.	CT-AQ.03.02.01.b. Compare and contrast desirable anatomical and physiological characteristics of aquatic plants and animals within and between species.	CT-AQ.03.02.01.c. Evaluate and select aquatic species to maximize performance based on anatomical and physiological characteristics that affect health, growth and reproduction.
CT-AQ.03.02.02.a. Create a program to develop an aquatic species to its highest potential performance.	CT-AQ.03.02.02.b. Assess an aquatic species to determine if it has reached its optimal performance level based on anatomical and physiological characteristics.	CT-AQ.03.02.02.c. Develop efficient procedures to produce consistently high-quality aquatic species well suited for their intended purposes.
CT-AQ.03.02.03.a. Understand the lifecycle of aquatic animals.		
AS.04. Performance Element: Provide for the proper health care of aquatic species.		
CT-AQ.04.01. Performance Indicator: Prescribe and implement a prevention and treatment program for aquatic species diseases, parasites and other disorders.		
CT-AQ.04.01.01.a. Explain methods of determining aquatic species health and disorders.	CT-AQ.04.01.b. Identify protocols needed to diagnose, treat and prevent basic aquatic diseases to maintain healthy populations.	CT-AQ.04.01.01.c. Perform diagnostic tests to detect health problems in aquatic species.

CT-AQ.04.01.02.a. Identify common diseases, parasites and physiological disorders that affect aquatic species.	CT-AQ.04.01.02.b. Diagnose illnesses and disorders of aquatic species based on symptoms and problems caused by diseases, parasites and physiological disorders.	CT-AQ.04.01.02.c. Treat common diseases, parasites and physiological disorders of aquatic species.
CT-AQ.04.01.03.a. Explain characteristics of causative agents and vectors of diseases and disorders in aquatic species.	CT-AQ.04.01.03.b.Evaluate the health and productivity of fish and shellfish populations.	CT-AQ.04.01.03.c. Design and implement a health maintenance and disease and disorder prevention plan for aquatic species in their natural and/or confined environments.
CT-AQ.04.01.04.a. Explain the clinical significance of common considerations in veterinary treatments, such as aseptic techniques.	CT-AQ.04.01.04.b. Prepare aquatic species, facilities and equipment for surgical and nonsurgical veterinary treatments and procedures.	CT-AQ.04.01.04.c. Perform surgical and nonsurgical veterinary treatments and procedures in aquatic animal health care.
CT-AQ.04.01.05.a. List and describe the following symptoms: pop-eyes, piping, flashing, fin erosion, abnormal behavior, and skin abnormalities such as lesions and scale loss.* CT Assessment Standard, AQ 7.	CT-AQ.04.01.05.b. Explain the health risk of zoonotic diseases to humans and their historical significance and future implications.	CT-AQ.04.01.05.c. Implement zoonotic disease prevention methods and procedures for the safe handling and treatment of aquatic animals.
CT-AQ.04.02.06.a. List and define the categories of infectious diseases: bacterial, fungal, viral, and parasitic.* CT Assessment Standard, AQ 8.		
CT-AQ.04.02.07.a. List and define the categories of non-infectious diseases: nutritional, environmental, chemical, and physiological. .* CT Assessment Standard, AQ 9.		
CT-AQ.04.02. Performance Indicator: Provide for the biosecurity of aquatic species and production facilities.		
CT-AQ.04.02.01.a. Explain the importance of biosecurity to the aquaculture industry.	CT-AQ.04.02.01.b. Discuss procedures at the local, state and national levels to ensure biosecurity of the aquaculture industry.	CT-AQ.04.02.01.c. Implement a biosecurity plan for an aquaculture production operation.
CT-AQ.05.Performance Element: Apply principles of animal and plant nutrition to ensure the proper growth, development, reproduction and economic production of aquatic species.		
CT-AQ.05.01. Performance Indicator: Formulate feed rations to provide for the nutritional needs of aquatic species.		
CT-AQ.05.01.01.a. Compare and contrast common types of feedstuffs and the roles they play in the diets of aquatic animals.	CT-AQ.05.01.01.b. Determine the relative nutritional value of feedstuffs by evaluating their general quality and condition.	CT-AQ.05.01.01.c. Select appropriate feedstuffs for aquatic animals based on factors such as economics, digestive system and nutritional needs.
CT-AQ.05.01.02.a. List and describe the following nutritional requirements in aquaculture production: proteins, carbohydrates, fats, vitamins, and minerals.* CT Assessment Standard, AQ 15.	CT-AQ.05.01.02.b. Appraise the adequacy of feed rations using data from the analysis of feedstuffs, aquatic animal requirements and performance.	CT-AQ.05.01.02.c. Formulate aquatic animal feeds based on nutritional requirements, using feed ingredients for maximum nutrition and optimal economic production.
CT-AQ.06. Performance Element: Evaluate and select aquatic species based on scientific principles of animal and plant production.		
CT-AQ.06.01. Performance Indicator: Evaluate the male and female reproductive systems in selecting aquatic species.		
CT-AQ.06.01.01.a. Explain the male and female reproductive organs of the major aquatic animal species.	CT-AQ.06.01.01.b. Describe the functions of major organs in the male and female reproductive systems.	CT-AQ.06.01.01.c. Select breeding species based on characteristics of the reproductive organs.

CT-AQ.06.02. Performance Indicator: Evaluate aquatic animals for breeding readiness and soundness.		
CT-AQ.06.02.01.a. Explain how age, size, life cycle, maturity level and health status affect the reproductive efficiency of male and female aquatic animals.	CT-AQ.06.02.01.b. Summarize factors that lead to reproductive maturity.	CT-AQ.06.02.01.c. Evaluate and select aquatic animals for reproductive readiness.
CT-AQ.06.02.02.a. Discuss the importance of efficient and economic reproduction in aquatic animals.	CT-AQ.06.02.02.b. Evaluate reproductive problems that occur in aquatic animals.	CT-AQ.06.02.02.c. Treat or cull aquatic animals with reproductive problems.
CT-AQ.06.03. Performance Indicator: Apply scientific principles in the selection and breeding of aquatic species.		
CT-AQ.06.03.01.a. Explain genetic inheritance in aquatic species.	CT-AQ.06.03.01.b. Explain the advantages of using genetically superior species in the production of aquatic plants and animals and aqua cultural products.	CT-AQ.06.03.01.c. Select a breeding system based on the principles of genetics.
CT-AQ.06.03.02.a. Define natural and artificial breeding methods.	CT-AQ.06.03.02.b. Explain the processes of natural and artificial breeding methods.	CT-AQ.06.03.02.c. Select aquatic species breeding methods based on reproductive and economic efficiency.
CT-AQ.06.03.03.a. Explain the use of quantitative breeding values (e.g., EPDs) in the selection of genetically superior breeding stock.	CT-AQ.06.03.03.b. Compare and contrast quantitative breeding value differences between genetically superior aquatic species and aquatic species of average genetic value.	CT-AQ.06.03.03.c. Select aquatic species based on quantitative breeding values for specific characteristics.
CT-AQ.07. Performance Element: Prepare and implement aquatic animal handling procedures for the safety of animals, producers and consumers of aqua cultural products.		
CT-AQ.07.01. Performance Indicator: Demonstrate safe aquatic animal handling and management techniques.		
CT-AQ.07.01.01.a. Discuss the dangers involved in working with aquatic animals.	CT-AQ.07.01.01.b. Outline safety procedures for working with aquatic animals by species.	CT-AQ.07.01.01.c. Interpret animal behaviors and execute protocols for safe handling of aquatic animals.
CT-AQ.07.01.02.a. Explain the implications of animal welfare and animal rights for aquaculture.	CT-AQ.07.01.02.b. Design programs that assure the welfare of aquatic animals and prevent abuse or mistreatment.	CT-AQ.07.01.02.c. Implement quality-assurance programs and procedures for aquatic animal production.
CT-AQ.07.02. Performance Indicator: Implement procedures to ensure that aquaculture products are safe.		
CT-AQ.07.02.01.a Identify aquatic animal production practices that could pose health risks or are considered to pose risks by some.	CT-AQ.07.02.01.b. Discuss consumer concerns with aquatic animal production practices relative to human health.	CT-AQ.07.02.01.c. Implement a program to assure the safety of animal products.
CT-AQ.07.02.01.a. Describe the reasons for grading both before and during harvesting.* CT Assessment Standard, AQ 10.		
CT-AQ.07.02.02.a. Describe how aquatic animal identification systems can track an animal's location, nutrition requirements, production progress and changes in health.	CT-AQ.07.02.02.b. Explain why aquatic animal trace-back capability, using individual aquatic animal and aquaculture facility identification systems, is important to producers and consumers.	CT-AQ.07.02.02.c. Implement an aquatic animal and/or premises identification program.

CT-AQ.07.03. Performance Indicator: Design aquatic species housing, equipment and handling facilities for the major systems of aquaculture production.		
CT-AQ.07.03.01.a. Identify the following types of aquaculture systems: raceways, ponds, recirculating systems, and net pens or cages.* CT Assessment Standard, AQ 2.	CT-AQ.07.03.01.b. Critique designs for an aquaculture facility and prescribe alternative layouts and adjustments for the safe and efficient use of the facility.	CT-AQ.07.03.01.c. Design an aquatic facility, focusing on aquatic species requirements, efficiency, safety and ease of handling.
CT-AQ.07.03.02.a. Identify equipment and handling facilities used in modern aquaculture production.	CT-AQ.07.03.02.b. Explain how modern equipment and handling facilities enhance the safe and economic production of aquatic species.	CT-AQ.07.03.02.c. Select equipment and implement handling procedures and improvements to enhance production efficiency of aquatic species.
CT-AQ.07.03.03.a Identify and describe the following parts of a recirculating aquaculture system (RAS): tank, sump or reservoir, pump, solid waste filter, U/V sterilizer, heat exchanger, bio-filter, and aeration.* CT Assessment Standard, AQ 3.	CT-AQ.07.03.03.b. Explain the basic electrical, plumbing and mechanical components of aquaponic systems.	
CT-AQ.07.03.04. Describe how the bio-filter of a recirculating aquaculture system (RAS) converts ammonia to nitrite, and nitrite to nitrate.* CT Assessment Standard, AQ 4.		
CT-AQ.07.04. Performance Indicator: Comply with government regulations and safety standards for facilities used in aquaculture production.		
CT-AQ.07.04.01.a. List the general standards (e.g., environmental, zoning, construction) that must be met in facilities for aquaculture production.	CT-AQ.07.04.01.b. Evaluate an aquaculture facility to determine if standards have been met.	CT-AQ.07.04.01.c. Design a facility that meets standards for the legal, safe, ethical and efficient production of aquatic species.
CT-AQ.06. Performance Element: Use analytical procedures to plan and evaluate aquatic environments.		
CT-AQ.08.01. Performance Indicator: Reduce the effects of aquaculture on the environment.		
CT-AQ.08.01.01.a. Evaluate the effects of aquaculture on the environment.	CT-AQ.08.01.01.b. Outline methods of reducing the effects of aquaculture on the environment.	CT-AQ.08.01.01.c. Apply sustainable principles and practices to aquaculture production and management.
CT-AQ.08.02. Performance Indicator: Evaluate the effects of environmental conditions on aquatic species.		
CT-AQ.08.02.01.a. Identify optimal environmental conditions for aquatic species.	CT-AQ08.02.01.b. Describe the effects of environmental conditions on aquatic species populations and performance.	CT-AQ.08.02.01.c. Establish and maintain favorable environmental conditions for aquatic species growth and performance.
CT-AQ.08.02.02.a. Apply environmental and ecological concepts to aquaculture production.		
CT-AQ.09. Performance Element: Recognize the historical, social, cultural and potential applications of biotechnology.		
CT-AQ.09.01. Performance Indicator: Distinguish major innovators, historical developments and potential applications of biotechnology in aquaculture.		
CT-AQ.09.01.01.a. Define biotechnology and explore the historical impact it has had on agriculture.	CT-AQ.09.01.01.b. Create a timeline and use it to explain the developmental progression of biotechnology.	CT-AQ.09.01.01.c. Research and report on the major innovators and milestones in the development of biotechnology.

CT-AQ.09.01.02.a. Investigate current applications of biotechnology in aquaculture.	CT-AQ.09.01.02.b. Research and report on current work being done in aqua cultural biotechnology.	CT-AQ.09.01.02.c. Analyze the scope and impact of aqua cultural biotechnology in today's global society.
CT-AQ.09.01.03.a. Examine potential future applications of biotechnology in aquaculture and compare them with alternative approaches to improving aquaculture.	CT-AQ.09.01.03.b. Research and report on emerging problems and issues associated with aqua cultural biotechnology.	CT-AQ.09.01.03.c. Assess the future impact aqua cultural biotechnology could have on world populations.
CT-AQ.09.02. Performance Indicator: Determine regulatory issues and identify agencies associated with biotechnology.		
CT-AQ.09.02.01.a. Describe the role of agencies that regulate biotechnology.	CT-AQ.09.02.01.b. Interpret the major regulatory issues related to biotechnology.	CT-AQ.09.02.01.c. Research, evaluate and articulate a major regulatory issue pertaining to biotechnology.
CT-AQ.09.03. Performance Indicator: Analyze the ethical, legal, social and cultural issues relating to biotechnology.		
CT-AQ.09.03.01.a. Explore ethical, legal and social biotechnology issues	CT-AQ.09.03.01.b. Evaluate the benefits and risks associated with biotechnology.	CT-AQ.09.03.01.c. Research, evaluate and articulate the implications of an ethical, legal, social or cultural biotechnology issue.
CT-AQ.09.03.02.a. Explore the emergence, evolution and implications of bioethics	CT-AQ.09.03.02.b. Examine an ethical dilemma associated with biotechnology by identifying its components.	CT-AQ.09.03.02.c. Research and debate an ethical issue associated with biotechnology.
CT-AQ.09.03.03.a. Explain the meaning of intellectual properties as related to biotechnology.	CT-AQ.09.03.03.b. Examine intellectual properties associated with biotechnology by defining their components.	CT-AQ.09.03.03.c. Analyze an intellectual property issue associated with bioethics.
CT-AQ.10. Performance Element: Demonstrate laboratory skills as applied to biotechnology.		
CT-AQ.10.01. Performance Indicator: Maintain and interpret biotechnology laboratory records.		
CT-AQ.10.01.01.a. Maintain a biotechnology laboratory notebook.	CT-AQ.10.01.01.b. Analyze strengths of the research based on data and procedures, and propose future investigation.	CT-AQ.10.01.01.c. Utilize external reviews and compares them to research conducted.
CT-AQ.10.02. Performance Indicator: Operate biotechnology laboratory equipment according to standard procedures.		
CT-AQ.10.02.01.a. Operate basic laboratory equipment and measurement devices.	CT-AQ.10.02.01.b. Operate advanced laboratory equipment and measurement devices.	CT-AQ.10.02.01.c. Calibrate laboratory equipment and conduct instrument qualification tests.
CT-AQ.10.03. Performance Indicator: Demonstrate proper laboratory procedures using biological materials.		
CT-AQ.10.03.01.a.Demonstrate basic aseptic techniques in the biotechnology laboratory.	CT-AQ.10.03.01.b. Demonstrate advanced aseptic techniques in the biotechnology laboratory.	CT-AQ.10.03.01.c. Perform bioassays and experiments under aseptic conditions.
CT-AQ.10.03.02.a. Perform procedures with biological materials according to directions.	CT-AQ.10.03.02.b. Select an appropriate standard operating procedure for working with biological materials.	CT-AQ.10.03.02.c. Develop a standard operating procedure for a biological process.
CT-AQ.10.04. Performance Indicator: Perform microbiology, molecular biology, enzymology and immunology procedures.		
CT-AQ.10.04.01.a. Differentiate the types of organisms and demonstrate how to handle them safely.	CT-AQ.10.04.01.b. Isolate maintains, quantify and store cell cultures.	CT-AQ.10.04.01.c. Characterize the physical, chemical and biological properties of microbes.

CT-AQ.10.04.02.a. Explain the structures of DNA and RNA and how genotype influences phenotype.	CT-AQ.10.04.02.b. Explain the molecular basis for heredity and the tools and techniques used in DNA and RNA manipulations.	CT-AQ.10.04.02.c. Analyze factors that influence gene expression.
CT-AQ.10.04.03.a. Extract and purify DNA and RNA.	CT-AQ.10.04.03.b. Perform electrophoretic techniques and interpret electrophoresis fragmentation patterns.	CT-AQ.10.04.03.c. Perform DNA and RNA manipulations, such as cloning/sub cloning, blotting, sequencing and amplification
CT-AQ.10.04.04.a. Perform simple enzyme activity assays to detect proteins	CT-AQ.10.04.04.b. Perform protein separation techniques and interpret the results.	CT-AQ.10.04.04.c. Characterize the biochemical properties of proteins.
CT-AQ.10.04.05.a. Describe how antibodies are formed and how they can be used in biotechnology applications.	CT-AQ.10.04.05.b. Conduct an Enzyme-Linked Immunosorbent Assay (ELISA).	CT-AQ.10.04.05.c. Use antibodies to detect and quantify antigens.
CT-AQ.10.04.06.a. Explain reasons for detecting microbes and identify sources of microbes	CT-AQ.10.04.06.b. Research and describe the use of biotechnology to detect microbes.	CT-AQ.10.04.06.c. Design and perform an assay to detect a target microorganism in food, water or the environment.
CT-AQ.11. Performance Element: Demonstrate the application of biotechnology to aquaculture.		
CT-AQ.11.01. Performance Indicator: Evaluate the application of genetic engineering to improve products of aquaculture.		
CT-AQ.11.01.01.a. Explain biological, social, agronomic and economic reasons for genetic modification of eukaryotes.	CT-AQ.11.01.01.b. Diagram the processes and describe the techniques used to produce transgenic eukaryotes.	CT-AQ.11.01.01.c. Design and conduct an experiment to evaluate an existing transgenic eukaryote.
CT-AQ.11.01.02.a. Describe enzymes, the changes they cause in foods and the physical and chemical parameters that affect enzymatic reactions.	CT-AQ.11.01.02.b. Describe processes by which enzymes are produced through biotechnology.	CT-AQ.11.01.02.c. Use biotechnology tools or microbial strain selection to improve or discover enzymes for use in food processing.
CT-AQ.11.01.03.a. Compare and contrast the use of natural organisms and genetically engineered organisms in the treatment of wastes.	CT-AQ.11.01.03.b. Diagram the processes by which organisms are genetically engineered for waste treatment.	CT-AQ.11.01.03.c. Monitor and evaluate the treatment of a waste product using a genetically engineered organism.
CT-AQ.11.01.04.a. Describe the benefits and risks associated with the use of biotechnology to increase productivity and improve quality of aquatic species.	CT-AQ.11.01.04.b. Investigate and report on genetic engineering procedures used in the production of aquatic species.	CT-AQ.11.01.04.c. Conduct field or clinical trials for genetically modified aquatic species.
CT-AQ.11.02. Performance Indicator: Perform biotechnology processes used in aquaculture.		
CT-AQ.11.02.01.a. Explain the process of transesterification.	CT-AQ.11.02.01.b. Diagram the process used in producing biodiesel from biomass.	CT-AQ.11.02.01.c. Produce biodiesel and co-products from biomass.
CT-AQ.11.03. Performance Indicator: Use biotechnology to monitor and evaluate procedures performed in AFNR systems.		
CT-AQ.11.03.01.a. Describe the selective plant breeding process.	CT-AQ.11.03.01.b. Select biotechnology tools used to monitor and direct plant breeding.	CT-AQ.11.03.01.c. Design and conduct an experiment using biotechnology tools to evaluate selectively bred plants.
CT-AQ.11.03.02.a. Describe biotechnology processes applicable to aquatic species health.	CT-AQ.11.03.02.b. Assess the benefits, risks and opportunities associated with using biotechnology to promote animal health.	CT-AQ.11.03.02.c. Design animal-care protocols that use biotechnology tools to ethically monitor and promote aquaculture.

CT-AQ.11.03.03.a. Give examples of instances in which bioremediation can be applied to clean up environmental contaminants.	CT-AQ.11.03.03.b. Describe the use of biotechnology in bioremediation.	CT-AQ.11.03.03.c. Monitor and evaluate the effectiveness of bioremediation efforts by participating in a bioremediation project.
CT-AQ.11.03.04.a. Explain the use of microorganisms in biological waste management.	CT-AQ.11.03.04.b. Describe the processes involved in biotreatment of biological wastes.	CT-AQ.11.03.04.c. Monitor and evaluate the treatment of biological wastes with microorganisms.
CT-AQ.11.03.05.a. Explain the role of microorganisms in aqua cultural chemical waste treatment.	CT-AQ.11.03.05.b. Interpret the processes involved in biotreatment of aqua cultural chemical wastes.	CT-AQ.11.03.05.c. Monitor and evaluate the treatment of aqua cultural chemical wastes with microorganisms.
CT-AQ.11.03.06.a. Explain the global importance of biodiversity.	CT-AQ.11.03.06.b. Select biotechnology tools used to measure biodiversity.	CT-AQ.11.03.06.c. Use biotechnology tools to measure biodiversity in a population.
CT-AQ.11.03.07.a. Explain the consequences of aqua cultural practices on wild populations.	CT-AQ.11.03.07.b. Explain how biotechnology tools can be used to monitor the effects of aqua cultural practices on wild populations	CT-AQ.11.03.07.c. Analyze the implications of biotechnology on wild species.
CT-AQ.11.03.08.a. Explain biomass and sources of biomass.	CT-AQ.11.03.08.b. Assess the characteristics of biomass that make it useful for biofuels production.	CT-AQ.11.03.08.c. Evaluate the technologies used to create biofuels from biomass.
CT-AQ.12. Performance Element: Apply hydrology principles to aquaculture.		
CT-AQ.12.02. Performance Indicator: Manage water resources for Aquaculture		
CT-AQ.12.01.01.a. Describe the world's water supplies and discusses the many uses of water.	CT-AQ.12.01.01.b. Describe characteristics of water that influence the biosphere and sustain life.	CT-AQ.12.01.01.c. Research and debate one or more current environmental issues associated with the supplies of groundwater and surface water.
CT-AQ.12.01.02.a. Demonstrate knowledge of hydrogeology by differentiating between groundwater and surface water.	CT-AQ.12.01.02.b. Describe interactions between groundwater and surface water.	CT-AQ.12.01.02.c. Use groundwater-flow equations and Darcy's Law to explain how geology and meteorology affect groundwater and groundwater flow.
CT-AQ.12.01.03.a. Define groundwater potential.	CT-AQ.12.01.03.b. Identify differences in groundwater potential.	CT-AQ.12.01.03.c. Delineate groundwater potential zones.
CT-AQ.12.01.04.a. Identify environmental hazards associated with groundwater supplies.	CT-AQ.21.01.04.b. Describe precautions taken to prevent/reduce contamination of groundwater supplies.	CT-AQ.12.01.04.c. Test and document the quality of groundwater supplies.
CT-AQ.12.01.05.a. Identify and describe how the following environmental factors impact aquaculture production: temperature, salinity, ammonia, nitrate, nitrite, dissolve oxygen, and pH.* CT Assessment Standard, AQ 6.	CT-AQ.12.01.05.b. Explain how aquaponics can be utilized to enhance sustainable aquaculture practices by reducing water consumption and waste production. .* CT Assessment Standard, AQ 5.	
CT-AQ.12.02. Performance Indicator: Apply principles of wastewater treatment to manage wastewater disposal in keeping with rules and regulations.		
CT-AQ.12.02.01.a. Define wastewater.	CT-AQ.12.02.01.b. Diagram the steps in wastewater treatment.	CT-AQ.12.02.01.c. Demonstrate the use of water-testing instruments and water-treatment equipment to treat wastewater.

CT-AQ.12.03. Performance Indicator: Manage hazardous materials to assure a safe facility and to comply with applicable regulations.		
CT.12.03.01.a. Identify types of hazardous materials.	CT-AQ.12.03.01.b. Describe risks related to hazardous materials and describe health and safety practices to reduce risks from hazardous materials.	CT-AQ.12.03.01.c. Describe the procedures for the treatment and disposal of hazardous materials and hazardous waste.
CT-AQ.13. Performance Element: Manage vehicles, equipment, and vessels for aquaculture production.		
CT-AQ.13.01. Performance Indicator: Design vehicles, vessels and equipment for aquaculture production.		
CT-AQ.13.01.01.a. Identify vehicles, tools and equipment used for aquaculture.	CT-AQ.13.01.01.b. Critique designs for vehicles, tools and equipment used in aquaculture.	CT-AQ.13.01.01.c. Design vehicles, vessels, tools and equipment used in aquaculture.
CT-AQ.13.01.02.a. Repair and maintain vehicles, tools and equipment.	CT-AQ.13.01.02.b. Determine costs and expenses of aquaculture vehicles, tools and equipment.	CT-AQ.13.01.02.c. Build industry appropriate marine vehicles and ancillary infrastructure based on industry standards.
CT-AQ.13.01.03.a. Identify principles, equipment and procedures related to the production, harvesting and processing of aquaculture products and species.		
CT-AQ.13.02. Performance Indicator: Demonstrate the ability to perform safely with aquaculture production vehicles, tools and equipment.		
CT-AQ.13.02.01.a. List the general standards (e.g., environmental, USCG, DEP, ABYC) specific to aquaculture.	CT-AQ.13.02.01.b. Evaluate aquaculture vehicles, tools and equipment to determine if standards have been met.	CT-AQ.13.02.01.c. Design vehicles, tools and equipment that meets standards for aquaculture.
CT-AQ.13.02.02.a. Define proper vocabulary necessary for safe operation of marine vehicles, tools and equipment used in aquaculture.	CT-AQ.13.02.02.b. Identify all aspects of vehicles, tools and equipment in aquaculture.	CT-AQ.13.02.0.c. Operate, maintain and repair vehicles, tools and equipment in aquaculture.
CT.13.03.03.a.Understand principles of boating safety and handling.		

Natural Resources Systems

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to the management of natural resources.

Level 1	Level 2	Level 3
CT-NRS.01. Performance Element: Explain interrelationships between natural resources and humans necessary to conduct management activities in natural environments.		
CT-NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.		
CT-NRS.01.01.01.a. Identify the ecosystem structure in terms of food web, biodiversity, and carrying capacity.*CT Assessment Standard NRE 4.	CT-NRS.01.01.01.b. Describe the interdependence of organisms within an ecosystem.	CT-NRS.01.01.01.c. Conduct a field studies of an ecosystem and record and document observations of species interactions.
CT-NRS.01.01.02.a. Describe morphological characteristics used to identify trees and other woody plants, herbaceous plants, wildlife and aquatic species native to New England.	CT-NRS.01.01.02.b. Demonstrate use of a dichotomous key to identify trees, fish, and wildlife.*CT Assessment Standard NRE 15.	CT-NRS.01.01.02.c. Conduct a field inventory of trees and other woody plants, herbaceous plants, wildlife, and aquatic species, record, native to New England, and analyze data to create a management plan.
CT-NRS.01.01.03.a Define and identify the following non-renewable resources: minerals, soil, and fossil fuels.*CT Assessment Standard NRE 2.	CT-NRS.01.01.03.b. Identify rock, mineral and soil types.	CT-NRS.01.01.03.c. Conduct a field inventory of rock, mineral and soil types, and record and document findings.
CT-NRS.01.01.04.a Identify native New England tree species and their products.	CT-NRS.01.01.04.b Understand the procedures for conducting resource inventories and population studies.	
CT-NRS.01.01.05. Define threatened, endangered, and extinct in terms of wildlife.*CT Assessment Standard NRE 3.		
CT-NRS.01.02. Performance Indicator: Classify natural resources.		
CT-NRS.01.02.01.a. Define and identify the following renewable resources: water, trees, fish, wildlife, sunlight, and air.*CT Assessment Standard NRE 1.		
CT-NRS.01.02.02.a. Identify the following habitat types in Connecticut: deciduous forest, coniferous forest, wetland, field or meadow, tidal marsh, and edge.*CT Assessment Standard NRE 5.		
CT-NRS.02.01. Performance Indicator: Develop a safety plan for work with natural resources.		
CT-NRS.02.01.01.a. Identify hazards associated with the outdoor environment.	CT-NRS.02.01.01.b. Demonstrate safety practices when working in an outdoor environment.	CT-NRS.02.01.01.c. Demonstrate appropriate responses to accidents and injuries that occur in an outdoor environment.
CT-NRS.02.01.02.a. Recognize biohazards associated with natural resources.	CT-NRS.02.01.02.b. Use appropriate techniques and equipment when working with biohazards.	CT-NRS.02.01.02.c. Demonstrate appropriate responses for disasters involving bio hazardous materials.

CT-NRS.02.02. Performance Indicator: Demonstrate cartographic skills to aid in developing, implementing and evaluating natural resource management plans.		
CT-NRS.02.02.01.a. Demonstrate how to use maps to identify directions and features, calculate actual distance and determine the elevations of points.	CT-NRS.02.02.01.b. Locate natural resources using a land survey and geographic coordinate system.	CT-NRS.02.02.01.c. Employ Global Positioning System and Geographic Information Systems technologies to inventory features in natural resource management.
CT-NR.02.02.02.a Understand drawings, prints, maps and navigational technology used in natural resources.	CT-NR.02.02.02.b Follow a drawing or print to carry out a task	CT-NR.02.02.02.c Create drawings and prints to carry out a task.
CT-NRS.02.02.03.a. Identify the following components of a topographical map: contour lines, wetlands, buildings, compass, and scale. *CT Assessment Standard NRE 11.	CT-NRS.02.02.03.b. Describe basic applications of global positioning systems in natural resources.*CT Assessment Standard NRE 12.	
CT-NRS.02.03. Performance Indicator: Demonstrate natural resource enhancement techniques.		
CT-NRS.02.03.01.a. Identify the different kinds of streams.	CT-NRS.02.03.01.b. Identify indicators of the biological health of a stream.	CT-NRS.02.03.01.c. Create and implement a stream enhancement plan.
CT-NRS.02.03.02.a. Identify characteristics of a healthy forest.	CT-NRS.02.03.02.b. Identify ways in which forest stands may be improved.	CT-NRS.02.03.02.c. Formulate a timber stand improvement plan for a forest.
CT-NRS.02.03.03.a. Identify characteristics of a healthy wildlife habitat.	CT-NRS.02.03.03.b. Identify methods of wildlife habitat improvement.	CT-NRS.03.04.03.c. Conduct a survey of a habitat and devise a comprehensive improvement plan.
CT-NRS.02.03.04.a. Identify recreational uses of natural resources in New England.*CT Assessment Standard NRE 13.	CT-NRS.02.03.04.b. Identify natural resource management techniques for improving recreation opportunities.	CT-NRS.02.03.04.c. Evaluate the impact of recreational activities on natural resources and create an improvement plan.
CT-NRS.02.03.05.a. Identify characteristics of healthy marine and coastal natural resources.	CT-NRS.02.03.05.b. Identify methods to improve marine and coastal natural resources.	CT-NRS.02.03.05.c. Assess marine and coastal natural resources and prepare an improvement plan.
CT-NRS.02.03.06.a. Identify the following water quality indicators: pH, temperature, nitrates, nitrites, ammonia, dissolved oxygen, and turbidity.*CT Assessment Standard NRE 14.		
CT-NRS.02.04. Performance Indicator: Interpret laws related to natural resource management and protection.		
CT-NRS.02.04.01.a. Describe how laws can be used as a fish and wildlife management technique in New England.*CT Assessment Standard NRE 10.	CT-NRS.02.04.01.b. Identify the purposes of laws and policies associated with natural resource systems.	CT-NRS.02.04.01.c. Abide by specific laws and policies pertaining to natural resource systems.
CT-NRS.02.04.02.a. Define mitigation.	CT-NRS.02.04.02.b. Identify issues involving mitigation of natural resources.	CT-NRS.02.04.02.c. Demonstrate mitigation techniques for natural resources.
CT-NRS.02.05. Performance Indicator: Manage hazardous materials to assure a safe facility and to comply with applicable regulations.		
CT-NRS.02.05.01.a. Identify types of hazardous materials.	CT-NRS.02.05.01.b. Describe risks related to hazardous materials and describe health and safety practices to reduce risks from hazardous materials.	CT_NRS.02.05.01.c. Describe the procedures for the treatment and disposal of hazardous materials and hazardous waste.

CT-NRS.02.06. Performance Indicator: Apply ecological concepts and principles to natural resource systems.		
CT-NRS.02.06.01.a. Identify biogeochemical cycles.	CT-NRS.02.06.01.b. Diagram biogeochemical cycles and explains the processes.	CT-NRS.02.06.01.c. Determine the human influence on biogeochemical cycles.
CT-NRS.02.06.02.a. Describe properties of watersheds and identify the boundaries of local watersheds.	CT-NRS.02.06.02.b. Define and describe the principal functions of a watershed.*CT Assessment Standard NRE 7.	CT-NRS.02.06.02.c. Analyze ecosystem functions of a watershed.
CT-NRS.02.06.03.a. Compare and contrast groundwater and surface-water flow.	CT-NRS.02.06.03.b. Explain stream hydrology and structure, and determine the different classes of streams.	CT-NRS.02.06.03.c. Classify and predict the behavior of local streams.
CT-NRS.02.06.04.a. Define riparian zones and riparian buffers, and explain their functions.	CT-NRS.02.06.04.b. Identify techniques used in the creation, enhancement and management of riparian zones and riparian buffers.	CT-NRS.02.06.04.c. Create, enhance and manage riparian zones and riparian buffers.
CT-NRS.02.06.05.a. Describe the process of ecological succession in New England. .*CT Assessment Standard NRE 9.	CT-NRS.02.06.05.b. Give examples of primary-succession and secondary-succession species in a community of organisms.	CT-NRS.02.06.05.c. Conduct a field studies to determine the stages of ecological succession in a community of organisms.
CT-NRS.02.06.06.a. Explain population ecology, population density and population dispersion.	CT-NRS.02.06.06.b. Discuss factors that influence population density and population dispersion.	CT-NRS.02.06.06.c. Create and implement a management plan based on a population study for a community of organisms.
CT-NRS.02.06.07.a Define invasive species and describe their impact on the New England environment.*CT Assessment Standard NRE 8.	CT-NRS.02.06.07.b. Discuss factors that influence the establishment, spread and impact of invasive species.	CT-NRS.02.06.07.c. Develop and implement a plan to reduce the impact of invasive species on natural resources.
CT-NRS.02.06.08.a. Define point source and non-point source pollution.* CT Assessment Standard NRE 6.	CT-NRS.02.06.08.b. Describe the impact of pollution on natural resources.	CT-NRS.02.06.08.c. Create and implement a plan to prevent or limit the effects of pollution on natural resources.
CT-NRS.02.06.09.a. Describe climatic factors that influence natural resources.	CT-NRS.02.06.09.b. Describe the impact climate has on natural resources.	CT-NRS.02.06.09.c. Monitor the effects of climate on plants and wildlife.
CT-NRS.03.01. Performance Indicator: Produce, harvest, process and use natural resource products.		
CT-NRS.03.01.01.a. Describe forest harvesting methods.	CT-NRS.03.01.01.b. Determine when to harvest forest products.	CT-NRS.03.01.01.c. Harvest forest products according to principles of sustainable forest management.
CT-NRS.03.01.02.a Identify native New England tree species and their products.	CT-NRS.03.01.02.b. Describe processing of forest products.	CT-NRS.03.01.02.c. Process forest products.
CT-NRS.03.01.03.a. Identify wildlife species that can be sustainably harvested.	CT-NRS.03.01.03.b. Describe techniques used in the harvesting of wildlife.	CT-NRS.03.01.03.c. Formulate a management plan for protecting wildlife from overexploitation.
CT-NRS.03.01.04.a. Describe the value of fossil fuels to the economy.	CT-NRS.03.01.04.b. Describe sources of fossil fuels and products made from fossil fuels.	CT-NRS.03.01.04.c. Give examples of methods used to extract and process fossil fuels.
CT-NRS.03.01.05.a. Identify recreational uses of natural resources.	CT-NRS.03.01.05.b. Debate an issue related to the recreational use of natural resources.	CT-NRS.03.01.05.c. Evaluate a natural resource site and recommend opportunities for recreational activities.
CT-NRS.03.01.06.a. Identify aquatic species harvested for commercial and recreational purposes.	CT-NRS.03.01.06.b. Describe techniques used to harvest aquatic species.	CT-NRS.03.01.06.c. Harvest aquatic species according to sustainable management principles.

CT-NRS.03.01.07.a. Identify uses of aquatic species.	CT-NRS.03.01.07.b. Explain techniques used to process aquatic species.	CT-NRS.03.01.07.c. Process harvested aquatic species.
CT-NRS.04.01. Performance Indicator: Diagnose plant and wildlife diseases and follow protocol to prevent their spread.		
CT-NRS.04.01.01.a. Identify causes of diseases in plants.	CT-NRS.04.01.01.b. Report the observance of diseases affecting plants to the appropriate authorities.	CT-NRS.04.01.01.c. Explain management techniques used to reduce infection and spread of plant diseases in natural resources.
CT-NRS.04.01.02.a. Identify causes of diseases in wildlife.	CT-NRS.04.01.02.b. Report the observance of diseases affecting wildlife to the appropriate authorities.	CT-NRS.04.01.02.c. Discuss various methods of disease and pest control in the natural environment.
CT-NRS.04.01.03.a. Identify concepts and techniques used in environmental conservation law enforcement.	CT-NRS.04.01.03.b. Explain the importance of concepts and techniques in environmental conservation law enforcement and the impact illegal activities have on the environment.	
CT-NRS.04.02. Performance Indicator: Manage insect infestations of natural resources.		
CT-NRS.04.02.01.a. Identify harmful and beneficial insects and signs of insect damage to natural resources.	CT-NRS.04.02.01.b. Report observance of insect pests to the appropriate authorities.	CT-NRS.04.02.01.c. Describe techniques used to manage pests of natural resources.
CT-NRS.05.01. Performance Indicator: Communicate natural resource information to the public.		
CT-NRS.05.01.01.a. Identify ways in which a message regarding natural resources may be communicated to the public.	CT-NRS.05.01.01.b. Design and construct a display that communicates a natural resource topic and discusses the topic in a public forum.	CT-NRS.05.01.01.c. Communicate a natural resource message through the press, radio, television or public appearances.
CT-NRS.06.01. Performance Indicator: Apply soil science principles to environmental service systems.		
CT-NRS.06.01.01.a. Explain the process of soil formation through weathering.	CT-NRS.06.01.01.b. Differentiate rock types and relate the chemical composition of mineral matter in soils to the parent material.	CT-NRS.06.01.01.c. Apply knowledge of soil orders to environmental service systems.
CT-NRS.06.01.02.a. Describe the biodiversity found in soil and the contribution of biodiversity to the physical and chemical characteristics of soil.	CT-NRS.06.01.02.b. Relate the activities of microorganisms in soil to environmental service systems.	CT-NRS.06.01.02.c. Evaluate the uses of soil microorganisms in environmental service systems.
CT-NRS.06.01.03.a. Explain how the physical qualities of the soil influence the infiltration and percolation of water.	CT-NRS.06.01.03.b. Identify the physical qualities of the soil that determine its use for environmental service systems.	CT-NRS.06.01.03.c. Conduct tests of soil to determine its use for environmental service systems.
CT-NRS.06.01.04.a. Identify land uses, capability factors and land capability classes.	CT-NRS.06.01.04.b. Use a soil survey to determine the land capability classes for different parcels of land in an area.	CT-NRS.06.01.04.c. Design a master land-use management plan for a given area.
CT-NRS.06.02. Performance Indicator: Apply hydrology principles to environmental service systems.		
CT-NRS.06.02.01.a. Describe the world's water supplies and discusses the many uses of water.	CT-NRS.06.02.01.b. Describe characteristics of water that influence the biosphere and sustain life.	CT-NRS.06.02.01.c. Research and debate one or more current environmental issues associated with the supplies of groundwater and surface water.

CT-NRS.06.02.02.a. Demonstrate knowledge of hydrogeology by differentiating between groundwater and surface water.	CT-NRS.06.02.02.b. Describe interactions between groundwater and surface water.	CT-NRS.06.02.02.c. Use groundwater-flow equations and Darcy's Law to explain how geology and meteorology affect groundwater and groundwater flow.
CT-NRS.06.02.03.a. Define groundwater potential.	CT-NRS.06.02.03.b. Identify differences in groundwater potential.	CT-NRS.06.02.03.c. Delineate groundwater potential zones.
CT-NRS.06.02.04.a. Identify environmental hazards associated with groundwater supplies.	CT-NRS.06.02.04.b. Describe precautions taken to prevent/reduce contamination of groundwater supplies.	CT-NRS.06.02.04.c. Test, document and monitor the quality of groundwater supplies.
CT-NRS.07.01. Performance Indicator: Use pollution control measures to maintain a safe facility environment.		
CT-NRS.07.01.01.a. Identify types of pollution and distinguish between point source and nonpoint source pollution.	CT-NRS.07.01.01.b. Give examples of how industrial and nonindustrial pollution has damaged the environment.	CT-NRS.07.01.01.c. Survey the local area for evidence of industrial and nonindustrial pollution.
CT-NRS.07.01.02.a. Describe ways in which pollution can be managed and prevented.	CT-NRS.07.01.02.b. Conduct tests to determine the presence and extent of pollution.	CT-NRS.07.01.02.c. Plan and develop a pollution remediation, management or prevention program.
CT-NRS.07.01.03.a Identify types of air pollutants and their sources.	CT-NRS.07.01.03.b Determine and describe impact air quality has on the environment and society.	CT-NRS.07.01.03.c Monitor air quality and assess environmental risks.
CT-NRS.07.02. Performance Indicator: Manage safe disposal of all categories of solid waste.		
CT-NRS.07.02.01.a.Understand appropriate soil, air and water monitoring and waste management practices.	CT-NRS.07.02.01.b. Evaluate environmental hazards created by different types of solid waste, solid waste accumulation and solid waste disposal.	CT-NRS.07.02.01.c. Analyze environmental hazards associated with the identification and acceptance of solid waste disposal sites.
CT-NRS.07.02.02.a. Discuss practical management options for treating solid waste.	CT-NRS.07.02.02.b. Identify characteristics of solid waste treatment and recognize the byproducts of solid waste treatment.	CT-NRS.07.02.02.c. Collect and treat solid waste materials.
CT-NRS.07.02.03.a. Define sanitary landfill.	CT-NRS.07.02.03.b. Explain basic sanitary landfill operating procedures and design.	CT-NRS.07.02.03.c. Evaluate sanitary landfill procedures.
CT-NRS.07.02.04.a. Define compost and composting.	CT-NRS.07.02.04.b. Explain scientific principles related to composting.	CT-NRS.07.02.04.c. Evaluate methods of operating a composting facility.
CT-NRS.07.02.05.a. Explain the basic concepts associated with solid waste incineration.	CT-NRS.07.02.05.b. Describe the environmental impact of solid waste incineration.	CT-NRS.07.02.05.c. Evaluate methods of incinerating solid waste, including those used in waste-to-energy plants.
CT-NRS.07.02.06.a. Explain the importance of recycling.	CT-NRS.07.02.06.b. Describe recycling methods and identify materials that can be recycled.	CT-NRS.07.02.06.c. Survey and evaluate local recycling programs and procedures.
CT-NRS.08.01. Performance Indicator: Develop skill in the safe use of natural resources related tools and equipment.		
CT-NRS.08.01.01.a. Identify the following tools in natural resources: GPS unit, diameter tape, telemetry unit, seines, aquatic net, water meter, animal tag or band, Biltmore stick, Secchi disk, analog refractometer, and hydrometer. .*CT Assessment Standard NRE 16.	CT-NRS.08.01.01.b. Describe the proper safe use or function of tools, materials and equipment for use in natural resources.	CT-NRS.08.01.01.c. Demonstrate the safe use of tools, materials and equipment for use in natural resources.

Plant Science

Pathway Content Standard: The student will demonstrate competence in the application of scientific principles and techniques to the production and management of plants.

Level 1	Level 2	Level 3
CT-PS.01.01. Performance Indicator: Classify agricultural plants according to taxonomy systems.		
CT-PS.01.01.01.a. Identify the genus and species (specific epithet), cultivar, and variety of a scientific plant.* CT Assessment Standard, PS 2.	CT-PS.01.01.01.b.Identify plants important to the Connecticut Horticulture industry by common names.	CT-PS.01.01.01.c. Identify plants important to the Connecticut Horticulture industry by scientific names.
CT-PS.01.01.02.a. Explain the life cycle of annuals, biennials, and perennial plants.* CT Assessment Standard, PS 9.		
CT-PS.01.02. Performance Indicator: Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.		
CT-PS.01.02.01.a. Diagram a typical plant cell and identify plant cell organelles and their functions.	CT-PS.01.02.01.b. Describe the processes of mitosis and meiosis as they relate to plant growth and development.	CT-PS.01.02.01.c.Apply the knowledge of cell differentiation to plant propagation and production.
CT-PS.01.02.02.a. Identify the components, the types and the functions of plant roots.	CT-PS.01.02.02.b. Identify the different types or root systems on plant species important to the Connecticut Horticulture industry.	CT-PS.01.02.02.c. Apply the knowledge of root structure to plant production, propagation and use by consumers.
CTPS.01.02.03.a. Identify the components and the functions of plant stems.	CT-PS.01.02.03.b. Describe the processes of translocation.	CT-PS.01.02.03.c. Apply concepts associated with translocation to the management of plants.
CT-PS.01.02.04.a. Discuss leaf morphology and the functions of leaves.	CT-PS.01.02.04.b. Explain how leaves capture light energy and allow for the exchange of gases.	CT-PS.01.02.04.c. Identify and design systems to manage the capture of light energy.
CT-PS.01.02.05.a. Identify the components of a flower, the functions of a flower and the functions of flower components.	CT-PS.01.02.05.b. Identify the different types and forms of flowers based on their botanical structure.	CT--PS.01.02.05.c. Apply the knowledge of flower structures to plant breeding, production and use.
CT-PS.01.02.06.a. Explain the functions and components of seeds and fruit.	CT-PS.01.02.06.b. Identify the major types of fruit.	CT-PS.01.02.06.c. Apply the knowledge of seed and fruit structures to plant culture and use.
CT-PS.01.02.07.a. Identify and describe the function(s) of the following plant parts: leaf, blade, petiole, flower, stamen, pistil, stem, nodes, roots, and root hairs. .* CT Assessment Standard, PS 1.		
CT-PS.01.03. Performance Indicator: Apply knowledge of plant physiology and energy conversion to plant systems.		
CT-PS.01.03.01.a. Explain requirements necessary for photosynthesis to occur and identify the products and by-products of photosynthesis.* CT Assessment Standard, PS 3.	CT-PS.01.03.01.b. Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis.	CT-PS.01.03.01.c. Explain the light-dependent and light-independent reactions that occur during photosynthesis and apply the knowledge to plant management.
CT-PS.01.03.02.a. Explain cellular respiration and its importance to plant life.	CT-PS.01.03.02.b. Explain factors that affect cellular respiration and identify the products and byproducts of cellular respiration.	CT-PS.01.03.02.c. Explain the process of aerobic respiration and how it relates to plant growth, crop management and post-harvest handling.

CT-PS.01.03.03.a. Describe the role of the apical meristem in primary growth.	CT-PS.01.03.03.b. Identify how common management practices affect plant growth.	CT-PS.01.03.03.c. Apply the principles of plant growth and common management practices to horticultural production.
CTPS.01.03.04.a. Identify naturally occurring plant hormones and synthetic growth regulators.	CT-PS.01.03.04.b. Identify the plant responses to plant growth regulators and different forms of tropism.	CT-PS.01.03.04.c. Select plant growth regulators to produce desired responses from plants.
CT-PS.02.01. Performance Indicator: Determine the influence of environmental factors on plant growth.		
CT-PS.02.01.01.a. Describe the effects air, temperature and water have on plant metabolism and growth.	CT-PS.02.01.01.b. Determine the optimal air, temperature and water conditions for plant growth.	CT-PS.02.01.01.c. Design, implement and evaluate a plan to maintain optimal conditions for plant growth.
CT-PS.02.02. Performance Indicator: Evaluate soil/media and prepare soil/growth media for use in plant systems.		
CT-PS.02.02.01.a Describe the following components of growing media: perlite, vermiculite, and peat. .* CT Assessment Standard, PS 5.	CT-PS.02.02.01.b. Describe the physical characteristics of soil/growing media and explain the influence they have on plant growth.	CT-PS.02.02.01.c. Select, formulate and prepare soil/growing media for specific plants or crops.
CT-PS.02.02.02.a. Identify the differences between clay, sand and silt soils.	CT-PS.02.02.02.b. Describe how soil texture affects drainage and plant growth.* CT Assessment Standard, PS 4.	CT-PS.02.02.02.c. Determine soil texture and make necessary modifications to maximize plant growth.
CT-PS.02.02.03a. Describe the influence of soil (including growing media), water and other environmental factors on horticultural plant growth.		
CT-PS.02.03. Performance Indicator: Develop and implement a fertilization plan for specific plants or crops.		
CT-PS.02.03.01.a. Identify the essential nutrients for plant growth and development and their major functions.	CT-PS.02.03.01.b. Describe nutrient deficiency symptoms and recognize environmental causes of nutrient deficiencies.	CT-PS.02.03.01.c. Monitor plants for signs of nutrient deficiencies and prepare a scouting report.
CT-PS.02.03.02.a. Describe pH and its effect on plant growth.* CT Assessment Standard, PS 6.	CT-PS.02.03.02.b. Explain the influence of pH and cation exchange capacity on the availability of nutrients.	CT-PS.02.03.02.c. Adjust the pH of growing media.
CT-PS.02.03.03.a. Collect soil samples for testing and interpret test results.	CT-PS.02.03.03.b. Determine the nutrient content of soil using appropriate laboratory procedures.	CT-PS.02.03.03.c. Analyze results of soil tests to develop a nutrient management plan.
CT-PS.02.03.04.a. Identify the following from a label of a fertilizer container: percentage of N, P, and K, and calculate the actual amount of the nutrient(s) in the container.* CT Assessment Standard, PS 7.	CT-PS.02.03.04.b. Describe the role of N, P, and K in regards to vegetative growth, root development, seed production, and plant stress. .* CT Assessment Standard, PS 8.	CT-PS.02.03.04.c. Calculate fertilizer rates calibrate and operate equipment needed to meet crop nutrient needs.
CT-PS.02.03.05.a. Compare fertilizer types/sources.	CT-PS.02.03.05.b. Compare costs and potential environmental impact of fertilizer types.	CT-PS.02.03.05.c. Evaluate cost/benefits of fertilization plans.
CT-PS.03. Performance Element: <u>Propagate culture and harvest</u> plants.		
CT-PS.03.01. Performance Indicator: Demonstrate plant propagation techniques.		
CT-PS.03.01.01.a. Explain sexual and asexual propagation.	CT-PS.03.01.01.b. Describe the process of plant pollination and fertilization.* CT Assessment Standard, PS 11.	
CT-PS.03.01.02.a.Describe types of seed and explain proper seed storage.	CT-PS.03.01.02.b Describe favorable conditions for germination.* CT Assessment Standard, PS 12.	CT-PS.03.01.02.c. Evaluate and adjust germination conditions, monitor for common disorders during germination.

CT-PS.03.01.03.a. Identify methods and optimal conditions for asexual propagation.	CT-PS.03.01.03.b. Demonstrate proper techniques used to propagate plants by cuttings, division, separation, layering, budding and grafting.	CT-PS.03.01.03.c. Evaluate asexual propagation practices based on productivity and efficiency.
CT-PS.03.01.04.a. Define micro propagation and explain its use in horticultural production.	CT-PS.03.01.04.b. Explain the advantages of micro propagation and the potential for problems with this method.	CT-PS.03.01.04.c. Describe optimal conditions for asexual propagation and demonstrate an understanding of techniques used in asexual plant propagation and plant micro-propagation.
CT-PS.03.01.05.a. Explain the principles behind recombinant DNA technology and the basic steps in the process.	CT-PS.03.01.05.b. Give examples of the risks and advantages associated with genetically modified plants.	CT-PS.03.01.05.c. Evaluate the performance of genetically modified crops.
CT-PS.03.01.06.a. Describe asexual propagation techniques by cuttings, division, grafting, and tissue culture.* CT Assessment Standard, PS10.	CT-PS.03.01.06.b. Identify advantages and disadvantages of hybrid plants.* CT Assessment Standard, PS 13.	
PS.03.02. Performance Indicator: Develop and implement a plant management plan for crop production.		
CT-PS.03.02.01.a. Demonstrate proper planting procedures and post-planting care.	CT-PS.03.02.01.b. Select and demonstrate appropriate planting procedures and post-planting care techniques.	CT-PS.03.02.01.c. Evaluate the effectiveness of various pre-plant treatments and post planting procedures for crops.
CT-PS.03.02.02.a. Demonstrate appropriate cultural practices for crops.	CT-PS.03.02.02.b. Observe and record the effects of environmental conditions and cultural practices on crops.	CT-PS.03.02.02.c. Design a management plan, monitor crop progress and make adjustments as necessary to maximize production.
CT-PS.03.02.03.a. Identify factors that influence water holding capacity and drainage in soil/growing media.	CT-PS.03.02.03.b. Compare and contrast irrigation and water conservation methods.	CT-PS.03.02.03.c. Design and evaluate irrigation systems for plant production.
CT-PS.03.02.04.a. Identify examples of crops where the production schedule is influenced by market demand.	CT-PS.03.02.04.b. Develop a crop schedule for various horticulture crops based on desired market delivery date.	CT-PS.03.02.04.c. Implement and evaluate the effectiveness of alternative crop schedules for a specific horticultural crop.
CT-PS.03.02.05.a. Identify advantages and disadvantages of plant growing structures and specific crop growing areas.	CT-PS.03.02.05.b. Explain how greenhouses promote plant growth through light, air movement, temperature, and humidity control.* CT Assessment Standard, PS 15.	CT-PS.03.02.05.c. Design the layout of the planting area to maximize the use of growing space and produce quality crops.
CT-PS.03.03. Performance Indicator: Develop and implement a plan for integrated pest management.		
CT-PS.03.03.01.a. Identify types of plant pests and disorders.	CT-PS.03.03.01.b. Identify major local weeds, insect pests and infectious and noninfectious plant diseases.	CT-PS.03.03.01.c. Design and implement a crop scouting program.
CT-PS.03.03.02.a. Describe damage caused by plant pests and diseases.	CT-PS.03.03.02.b. Diagram the life cycles of major plant pests and diseases.	CT-PS.03.03.02.c. Predict pest and disease problems based on environmental conditions and life cycles.
CT-PS.03.03.03.a. Describe Integrated Pest Management (IPM) strategies.* CT Assessment Standard, PS 14.	CT-PS.03.03.03.b. Describe integrated pest management strategies.	CT-PS.03.03.03.c. Develop and implement a plant management plan for greenhouse production including Integrated Pest Management (I.P.M.).

CT-PS.03.03.04.a. Explain risks and benefits associated with the materials and methods used in plant pest management.	CT-PS.03.03.04.b. Explain procedures for the safe handling, use and storage of pesticides.	CT-PS.03.03.04.c. Evaluate environmental and consumer concerns regarding pest management strategies.
CT-PS.03.04. Performance Indicator: Apply principles and practices of various plant production methods to meet the needs of the market.		
CT-PS.03.04.01.a. Explain sustainable agriculture and objectives associated with the strategy.	CT-PS.03.04.01.b. Describe sustainable agriculture practices and compares the ecological effects of traditional agricultural practices with those of sustainable agriculture.	CT-PS.03.04.01.c. Prepare and implement a plan for an agricultural enterprise that involves practices in support of sustainable agriculture.
CT-PS.03.04.02.a. Compare methods of production including the social/marketing aspects of organic farming, sustainable agriculture, and genetic engineering in plant science.	CT-PS.03.04.02.b. Determine the 'marketability' of sustainable and/or organic methods of production.	CT-PS.03.04.02.c. Evaluate environmental effects and consumer attitudes regarding different production strategies.
CT-PS.03.04.03.a. Identify types of crops that can be produced and marketed in a specified 'local' area.	CT-PS.03.04.03.b. Determine the 'marketability' of locally grown products.	CT-PS.03.03.02.c. Evaluate cost/benefits of locally grown and marketed products.
CT-PS.04. Performance Element: Employ <u>elements of design</u> to enhance an environment.		
CT-PS.04.01. Performance Indicator: Create designs using plants.		
CT-PS.04.01.01.a. Apply artistic principles in both floral and landscape design.	CT-PS.04.01.01.b. Explain focal point, balance, proportion, and scale as they are applied to floral design.* CT Assessment Standard, PS 16.	CT-PS.04.01.01.c. Select plants, hard goods, supplies and other materials for use in a design based on a range of criteria.
CT-PS.04.01.02.a. Discuss the applications of art in agriculture/horticulture.	CT-PS.04.01.02.b. Discuss principles of design that form the basis of artistic impression.	CT-PS.04.01.02.c. Evaluate and create designs by following established principles of art.
CT-PS.04.01.03.a. Describe the factors that influence the conditioning and vase life of cut flowers, greens and decorative plants.	CT-PS.04.01.03.b. Demonstrate appropriate conditioning and storage of cut flowers.* CT Assessment Standard, PS 17.	CT-PS.04.01.03.c. Evaluate the effects of proper care and handling of cut flowers greens and decorative plants.
CT-PS.04.01.04.a. Identify and select common forms and types of flowers and foliage's used in the floriculture industry.	CT-PS.04.01.04.b. Order the correct quantity of flowers and foliage to create a floral piece.	CT-PS.04.01.04.c. Evaluate the use and positioning of flowers and foliage in a floral piece.
CT-PS.04.01.05.a. Identify common tools and supplies used in the floral industry.	CT-PS.04.01.05.b. Select and safely use tools, supplies and equipment common in the floral industry.	CT-PS.04.01.05.c. Evaluate tools and supplies available in lab/shop and order supplies based on needs of the lab.
CT-PS.04.01.06.a. Identify factors that influence pricing, scheduling and marketing of a floriculture product or crop.	CT-PS.04.01.06.b. Assess the scheduling, pricing and marketing effectiveness of a floriculture product or crop.	CT-PS.04.01.06.c. Create a production plan for a floriculture product or crop that considers scheduling pricing and marketing.
CT-PS.04.02 Performance Indicator: Determine supplies needed to create landscape designs and develop a marketing plan.		
CT-PS.04.02.01.a.Identify the uses and the selection criteria of landscape plants and hardscape materials for a Connecticut landscape plan.	CT-PS.04.02.01.b. Evaluate the landscape plants and hardscape design selected to meet the needs of a specific landscape plan.	CT-PS.04.02.01.c. Create a landscape plan that utilizes proper landscape plants and hardscapes to meet the needs of a client's landscape plan.

CT-PS.04.02.02.a.Identify techniques, tools and technology used in landscape drawings.	CT-PS.04.02.02.b. Select and safely use tools, supplies and equipment in the landscape industry.	CT-PS.04.02.02.c. Evaluate supplies and equipment available in lab/business and order equipment and supplies based on needs of the lab/business.
CT-PS.04.02.03.a. Identify common plant and hardscape landscape symbols.	CT-PS.04.02.03.b. Create a landscape drawing using an architect/engineer scale and related drawing tools.	CT-PS.04.02.03.c. Create a landscape drawing using a variety of artistic methods.
CT-PS.04.02.04.a. Define the principles of landscape design.	CT-PS.04.02.04.b. Evaluate a landscape and explain the impact of the design principles.	CT-PS.04.02.04.c. Create a landscape proposal that implements the principles of design.
CT-PS.04.02.05.a. Identify factors that influence pricing and marketing of landscape estimate.	CT-PS.04.02.05.b. Assess the pricing and marketing effectiveness of a landscape estimate.	CT-PS.04.02.05.c. Create a business plan and estimate for a landscape proposal that considers scheduling, pricing and marketing.
CT-PS.04.02.06.a. Identify factors that should be considered for turf grass installation, establishment, maintenance and management.	CT-PS.04.02.06.b. Develop a plan to successfully install or establish and maintain turf grass.	CT-PS.04.02.06.c. Demonstrate skills and knowledge used in turf grass installation, establishment, maintenance and management.
CT-PS.04.02.07.a. Identify factors that influence pricing, scheduling and marketing of a floriculture product or crop.	CT-PS.04.02.07.b. Assess the scheduling, pricing and marketing effectiveness of a floriculture product or crop.	CT-PS.04.02.07.c. Create a production plan for a floriculture product or crop that considers scheduling pricing and marketing.
CT-PS.04.02.07.a. Select and safely use the following hand tools and equipment in the landscape industry: garden rake, leaf rake, shovel, spade, hand shears, loppers, rotary spreader, and drop spreader.* CT Assessment Standard, PS 18.		

Power Structural and Technical Systems (Agriculture Mechanics)

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural and technical systems.

Level 1	Level 2	Level 3
CT-PST.01. Performance Element: Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.		
CT-PST.01.0. Performance Indicator: Apply physical science laws and principles to identify, classify and use lubricants.		
CT-PST.01.01.01.a. Classify lubricants by source, sustainability and equipment compatibility.	CT-PST.01.01.01.b. Classify lubricants by SAE viscosity and API service classifications.	PST.01.02.01.c. Select, use and dispose of lubricants according to local, state and federal regulations.
CT-PST.01.02. Performance Indicator: Identify and use hand and power tools and equipment for service, construction and fabrication.		
CT-PST.01.02.01.a. Identify and explain the uses of the following woodworking tools used in agricultural construction: circular saw, drill press, jig/sabre saw, reciprocating saw, table saw, orbital sander, belt sander, router, portable drill, and miter saw.* CTE Assessment Standard, AM, A1	CT-PST.01.02.01.b. Maintain and repair tools used in agriculture mechanics.	CT-PST.01.02.01.c. Assess the performance of self and/or peers in use of hand and power tools to safely and efficiently service, construct and fabricate quality products.
CT-PST.01.02.02.a.Select appropriate tools and materials to construct wood structures related to agriculture.		
CT-PST.02. Performance Element: Perform maintenance, trouble shoot and solve problems related to power units and equipment.		
CT-PST.02.01. Performance Indicator: Perform service routines to maintain power units and equipment.		
CT-PST.02.01.01.a. Identify and schedule power unit and equipment lubrication.	CT-PST.02.01.01.b. Ensure the presence and function of safety systems and hardware on tools and equipment.	CT-PST.02.01.01.c. Test and service electrical systems.
CT-PST.02.02. Performance Indicator: Operate, service and diagnose the condition of power units and equipment.		
CT-PST.02.02.01.a. Identify the safety and operational procedures and service intervals based on a tractor or equipment operator's manual.* CTE Assessment Standard, AM, A13	CT-PST.02.02.01.b. Follow the operator's manual to maintain tractors and skid steers.* CTE Assessment Standard, AM, A15	CT_PST.02.02.01.c. Select power units and equipment for operational efficiencies.
CT-PST.02.02.02.a. Perform pre-operation inspection according to manufacturers' specifications and/or prevailing industry standards.	CT-PST.02.02.02.b.Explain the safe operation of agricultural tractors and related agricultural equipment.	CT-PST.02.02.02.c. Adjust equipment for safe and efficient operation.
CT-PST.02.03.01.aUtilize a Briggs and Stratton repair manual to find engine specifications.* CTE Assessment Standard, AM, A14		
CT-PST.03. Performance Element: Use physical science principles and engineering applications with internal combustion engines.		
CT-PST.03.01. Performance Indicator: Troubleshoot and repair internal combustion engines.		
CT-PST.03.01.01.a. Identify components and systems of internal combustion engines.	CT_PST.03.01.01.b. Utilize technical manuals and computer-based diagnostics in engine analysis and repair.	CT-PST.03.01.01.c. Performance test internal combustion engines to determine service and repair needs.

CT-PST.03.01.02.a. Describe the operation of internal combustion engines by types of fuel used.	CT-PST.03.01.02.b. Analyze and troubleshoot internal combustion engines.	CT-PST.03.01.02.c. Overhaul spark-and-compression internal combustion engines.
CT-PST.04. Performance Element: Use physical science principles and engineering applications with Power/Transmission and Hydraulics		
CT-PST.04.01. Performance Indicator: Service and repair power transmission systems of agricultural equipment.		
CT-PST.04.01.01.a. Identify and describe applications of simple machines in power systems.	CT-PST.04.01.01.b. Identify and compare operation principles and features, benefits and applications of various power transmission systems.	CT-PST.04.01.01.c. Use speed, torque and power measurements to improve efficiency in power transmission systems.
CT-PST.04.01.02.a. Calculate mechanical advantage in mechanical systems.	CT-PST.04.01.02.b. Describe features, benefits and applications of mechanical transmission components, including belts, chains, gears, bearings, seals, universals and drive shafts.	CT-PST.04.01.02.c. Inspect, analyze and repair hydrostatic transmissions.
CT-PST.04.01.03.a. Identify power transfer principles, including those using friction, gears and fluids.	CT-PST.04.01.03.b. Inspect, analyze and repair clutches and brakes.	CT-PST.04.01.03.c. Inspect, analyze and repair differentials, final drives, transmissions (including gear-type and power-shift transmissions) and auxiliary drives.
CT-PST.04.02. Performance Indicator: Service and repair hydraulic and pneumatic systems.		
CT-PST.04.02.01.a. Describe features, benefits and applications of common types of hydraulic and pneumatic systems.	CT-PST.04.02.01.b. Describe principles of hydraulic and pneumatic system operation.	CT-PST.04.02.01.c. Utilize symbols and schematic drawings in the maintenance of hydraulic and pneumatic systems.
CT-PST.04.02.02.a. Apply hydrostatic and hydrodynamic principles in hydraulics and pneumatics, including Archimedes' principle and Pascal's law.	CT-PST.04.02.02.b. Identify major components of hydraulic and pneumatic systems and describe their use.	CT-PST.04.02.02.c. Inspect, analyze and repair hydraulic and pneumatic system components, including fluid and compressed-air conveyance components.
CT-PST.04.02.03.a. Evaluate hydraulic and pneumatic system functionality.	CT-PST.04.02.03.b. Identify hydraulic and pneumatic system fittings and ports.	CT-PST.04.02.03.c. Use a pressure-and-flow tester in diagnosing malfunctions and repairing hydraulic and pneumatic systems.
CT-PST.04.02.04.a. Describe the meaning and use of sensors, controllers and actuators.	CT-PST.04.02.04.b. Identify sensor, control, and actuator system components on power units and equipment.	CT-PST.04.02.04.c. Diagnose malfunctions and repair control systems and sensors, including those of engines, transmissions and implements.
CT- PST.04.03. Performance Indicator: Install maintains and troubleshoots agricultural electrical systems.		
CT-PST.04.03.01.a. Define and measure amps, volts, and watts.* CTE Assessment Standard, AM, A4	CT-PST.04.03.01.b. Assess and install electrical circuits, including conductors, insulators and controls.	CT-PST.04.03.01.c. Evaluate power unit and equipment electrical systems, including ignition, lighting, auxiliary and electronic braking.
CT-PST.04.03.02.a. Identify the kinds and applications of electricity, including direct and alternating current.	CT-PST.04.03.02.b. Interpret electrical system symbols and diagrams.	CT-PST.04.03.02.c. Assess and repair malfunctioning electrical systems and components, such as battery, lighting, instrumentation and accessories.
CT-PST.04.03.03.a. Identify electricity measurements and make measurement calculations.	CT-PST.04.03.03.b. Distinguish electrical circuits and components of each.	CT-PST.04.03.03.c. Install and/or repair electrical wiring components and fixtures following appropriate codes and standards.

CT-PST.04.03.04.a. Discuss various types and sources of electricity including renewable and sustainable sources.	CT-PST.04.03.04.b. Use volt and amp meters and continuity testers to demonstrate electricity principles.	CT-PST.004.03.04.c. Locate and use electrical codes and regulations.
CT-PST.04.03.05.a. Recognize common electrical symbols.	CT-PST.04.03.05.b. Read and design schematic drawings for an electrical control system.	CT-PST.04.03.05.c. Identify and use electrical control system components, including transistors, relays, HVAC and logic controllers.
CT-PST.04.03.06.a. Describe the process of installing the following electrical circuits: duplex receptacle, single pole switch with light, and three-way switch with light.* CTE Assessment Standard, AM, A5	CT-PST.04.03.06.b. Interpret maintenance schedules for electrical control systems.	CT-PST.04.03.06.c. Troubleshoot electrical control system performance problems.
CT-PST.04.03.07.a. Identify hazards and safety practices in planning, installing and using electricity.	CT-PST.04.03.07.b. Distinguish and select materials and tools used in electrical control circuit installation.	CT-PST.04.03.07.c. Plan and install electrical control circuits to assure proper operation.
CT-PST.05. Performance Element: Plan, build and maintain agricultural structures.		
CT-PST.05.01. Performance Indicator: Create sketches and plans of agricultural structures.		
CT-PST.05.01.01.a. Identify the following from a technical drawing of an agricultural structure: square feet of the building, height of the building, number of rafters/trusses, and the scale of the drawing .* CTE Assessment Standard, AM, A2	CT-PST.05.01.01.b. Develop plans and sketches using drafting equipment and computer programs.	CT-PST.05.01.01.c. Apply principles of design, fabrication and installation of agricultural structures.
CT-PST.05.01.02.a. Prepare bills of materials to accompany plans and sketches.	CT-PST.05.01.02.b. Use scale measurement and dimension to develop plans and sketches.	CT-PST.05.01.02.c. Design functional and efficient facilities for agricultural use.
CT-PST.05.02. Performance Indicator: Apply structural plans, specifications and building codes.		
CT-PST.05.02.01.a.Understand agricultural plans/drawings and measure accurately.	CT-PST.05.02.01.b. Identify and interpret different views of a construction drawing.	CT-PST.05.02.01.c. Locate, explain and apply elements of a construction drawing.
CT-PST.05.02.02.a. Identify the sources and importance of industry construction and materials standards, including those of the American National Standards Institute (ANSI) and Underwriters' Laboratories (UL).	CT-PST.05.02.02.b. Identify local code enforcement agencies and procedures.	CT-PST.05.02.02.c. Follow local construction and safety codes and specifications in agricultural construction.
CT-PST.05.02.03.a. Identify design and construction recommendations and practices in agricultural structures.	CT-PST.05.02.03.b. Read and interpret local structural code information.	CT-PST.05.02.03.c. Complete appropriate local permit applications for a construction project.
CT-PST.05.02.04a. Explain wiring of basic agricultural structures.		
CT-PST.05.03. Performance Indicator: Examine structural requirements for materials and procedures and estimate construction cost.		
CT-PST.05.03.01.a. Identify criteria in selecting materials in agricultural construction/fabrication.	CT-PST.05.03.01.b. Select types of materials; determine quantities and estimate their costs and other costs associated with a specified project plan.	CT-PST.05.03.01.c. Prepare a project cost estimate, including materials, labor and management.
CT-PST.05.03.02.a. Explain the importance and use of requests for construction bids.	CT-PST.05.03.02.b. Establish business relationships with vendors of materials and services used in agricultural construction.	CT-PST.05.03.02.c. Prepare a bid package for a planned construction project, including construction timelines, site evaluation, construction plans and related management factors.

CT-PST.05.04. Performance Indicator: Follow architectural and mechanical plans to construct and/or repair equipment, buildings and facilities.		
CT-PST.05.04.01.a.Plan, build and maintain agricultural structures.	CT-PST.05.04.01.b. Demonstrate the following skills in plumbing: soldering/sweating a copper joint, cementing PVC fittings, and threading black pipe.* CTE Assessment Standard, AM, A6	CT-PST.05.04.01.c. Evaluate work products or samples for quality and efficiency of workmanship following architectural and mechanical plans.
CT-PST.05.04.02.a. Calculate areas and volumes for coatings.	CT-PST.05.04.02.b. Paint or protect with coatings.	CT-PST.05.04.02.c. Electroplate or otherwise coat materials.
CT-PST.05.04.03.a. List the steps involved in building with concrete, including calculating the amount of concrete required for a job, preparing the base, constructing the forms, pouring the concrete, finishing, and curing.* CTE Assessment Standard, AM, A3	CT-PST.05.04.03.b. Explain building and repair of concrete and masonry structures related to agriculture.	CT-PST.05.04.03.c. Seal, pigment and otherwise prepare concrete, brick, stone or masonry unit surfaces.
CT-PST.05.05. Performance Indicator: Follow architectural and mechanical plans to construct and/or repair equipment, buildings and facilities utilizing welding techniques.		
CT-PST.05.05.01.a. Identify kinds and characteristics of metal materials.	CT-PST.05.05.01.b.Compare welding (arc, oxyacetylene and M.I.G.) techniques used in agriculture mechanics.	
CT-PST.05.05.02.a. Identify personal protection equipment (PPE) used in welding.* CTE Assessment Standard, AM, A7	CT-PST.05.05.02.b. Demonstrate how to safely setup, use, and turn off oxy-acetylene welding equipment. .* CTE Assessment Standard, AM, A8	CT-PST.05.05.02.c. Construct and/or repair metal structures and equipment using welding fabrication procedures, including those associated with SMAW, GMAW, GTAW, fuel-oxygen and plasma arc torch methods.
CT-PST.05.05.03.a. Use the five-digit AWS classification system for selecting electrodes used in shielded metal arc welding (SMAW).* CTE Assessment Standard, AM, A11	CT-PST.05.05.03.a. Demonstrate how to safely set up, use, and turn off shielded metal arc welding (SMAW) equipment.* CTE Assessment Standard, AM, A9	
CT-PST.05.05.04.a. Demonstrate how to safely set up, use, and turn off a gas metal arc welding system (GMAW).* CTE Assessment Standard, AM, A10	CT-PST.05.05.03.b. Analyze the following qualities of welding beads: current, arc length, and travel speed.* CTE Assessment Standard, AM, A12	

Appendix I

CTE Assessment Standards

Agricultural Education

CONTENT AREA—

Agriculture Mechanics

PERFORMANCE STANDARDS AND COMPETENCIES

A. Agriculture Mechanics: Understand the concepts and skills necessary related to agricultural mechanics technology.

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1. Identify and explain the uses of the following woodworking tools used in agricultural construction: circular saw, drill press, jig/sabre saw, reciprocating saw, table saw, orbital sander, belt sander, router, portable drill, and miter saw.
2. Identify the following from a technical drawing of an agricultural structure: square feet of the building, height of the building, number of rafters/trusses, and the scale of the drawing.
3. List the steps involved in building with concrete, including calculating the amount of concrete required for a job, preparing the base, constructing the forms, pouring the concrete, finishing, and curing.
4. Define and measure amps, volts, and watts.
5. Describe the process of installing the following electrical circuits: duplex receptacle, single pole switch with light, and three-way switch with light.
6. Demonstrate the following skills in plumbing: soldering/sweating a copper joint, cementing PVC fittings, and threading black pipe.
7. Identify personal protection equipment (PPE) used in welding.
8. Demonstrate how to safely setup, use, and turn off oxy-acetylene welding equipment.
9. Demonstrate how to safely set up, use, and turn off shielded metal arc welding (SMAW) equipment.
10. Demonstrate how to safely set up, use, and turn off a gas metal arc welding system (GMAW).
11. Use the five-digit AWS classification system for selecting electrodes used in shielded metal arc welding (SMAW).
12. Analyze the following qualities of welding beads: current, arc length, and travel speed.
13. Identify the safety and operational procedures and service intervals based on a tractor or equipment operator's manual.
14. Utilize a Briggs and Stratton repair manual to find engine specifications.
15. Follow the operator's manual to maintain tractors and skid steers.

Agricultural Education

CONTENT AREA—
Agriculture Mechanics

PERFORMANCE STANDARDS AND COMPETENCIES

B. Safety with Agricultural Chemicals: Understand the concepts and procedures for handling, usage, and storage of agricultural chemicals.

16. Identify the following from the label of an agricultural chemical container: appropriate use, warning signs, signal words, precautionary statements, EPA Registration Number, directions for use, storage, and disposal.
17. Identify the following from a Safety Data Sheets (SDS): first aid measures, firefighting measures, handling and storage, and personal protection equipment (PPE).

C. Career Exploration and Development: Understand the diversity of careers related to the agricultural industry and strategies to acquire and advance in an agricultural career.

18. Identify 21st century skills required for all careers in agriculture.
19. Demonstrate the essential skills that are part of a job search, including preparing the cover letter, resume, application, and participating in the interview process.
20. Explain the purpose and types of Supervised Agriculture Experience programs (SAE).

D. Leadership, Personal Growth, and Career Success: Understand the concepts, strategies, and tools needed, which contribute to premier leadership, personal growth, and career success through the participation in FFA.

21. Identify FFA opportunities, including individual and chapter awards, career development events, leadership skills development, and FFA service engagement.
22. Explain the purpose of using parliamentary procedure in FFA meetings.
23. Demonstrate knowledge of parliamentary procedures such as use of the gavel, making and amending main motions, debating, and voting.
24. Exhibit the skills needed to lead a meeting or activity that engages all participants in the process.

Agricultural Education

CONTENT AREA—

Animal Science

PERFORMANCE STANDARDS AND COMPETENCIES

A. Animal Science: Understand the concepts and skills necessary related to animal science technology.

1. Identify the following breeds of dogs: Labrador Retriever, Golden Retriever, German Shepherd, Yorkshire Terrier, Beagle, Boxer, Poodle, Rottweiler, Greyhound, Dachshund, Bulldog, and Doberman Pinscher.
2. Identify the following breeds of cats: Maine Coon, Bengal, Russian Blue, Abyssinian, Ragdoll, American Shorthair, Siamese, Manx, Persian, and Himalayan.
3. Identify the following breeds of pocket pets: Sugar Glider, Gerbil, Hamster, Guinea Pig, Ferret, Chinchilla, white mice, and rats.
4. Identify the following breeds of rabbits: Netherland Dwarf, Dutch, Flemish Giant, French Lop, American Chinchilla, Holland Lop, Satin, English Angora, Mini Rex, and Himalayan.
5. Identify the following breeds of birds: Cockatiel, Cockatoos, Parakeets, African Grey, and Blue and Gold Macaw.
6. Identify the following breeds of reptiles and amphibians: Bearded Dragons, Iguana, Chameleon, Gecko, Boa Constrictor, Corn Snake, Red Ear Slider, Box Turtle, Tree Frog, and Toad.
7. Identify the following breeds of domestic livestock used for dairy: Holstein-Friesian, Jersey, Guernsey, Brown Swiss, Ayrshire, and Milking Shorthorn.
8. Identify the following breeds of domestic livestock used for beef: Angus, Hereford, Charolais, Simmental, Belted Galloways, Scotch Highlanders, and Texas Longhorns.
9. Identify the following breeds of sheep: Dorset, South Downs, Cheviot, Romney, Suffolks, Merino, and Hampshires.
10. Identify the following breeds of goats: Toggenburg, Alpine, Nubian, Angora, Boer, Pygmy, and Saanens.
11. Identify the following breeds of swine: Yorkshire, Hampshire, Berkshire, Duroc, American Landrace, Potbellied, and Hereford.
12. Identify the following breeds of equine: Appaloosa, Arabian, Quarter Horse, Morgan, Thoroughbred, Saddlebred, Paint, Belgian, Clydesdale, Percheron, Friesian, Hackney, Haflinger, Shetland, Hanoverian, and Andalusian.
13. Evaluate preventive measures for controlling and limiting the spread of common diseases, and common parasites among companion and domestic animals, including vaccination, sanitation, observation, isolation, waste disposal, proper handling, protective clothing, and hand washing.

Agricultural Education

CONTENT AREA—
Animal Science

PERFORMANCE STANDARDS AND COMPETENCIES

A. Animal Science: Understand the concepts and skills necessary related to animal science technology.

14. Recognize illnesses and disorders based on symptoms and problems caused by disease, parasites, and disorders among companion, lab and/or domestic animals.
15. Identify and explain the function of the six nutrients required for life.
16. Explain the feed ingredients, guaranteed analysis, and feeding guideline components of a feed label/tag.
17. Determine the most cost effective diet using feeding guidelines and the price per pound of more than one feed.
18. Interpret domestic livestock and companion animal behaviors and outline safety procedures for working with those species.
19. Explain the importance of bio-security in relation to domestic livestock and companion animals.
20. Explain genetic inheritance in domestic livestock and companion animals.
21. Identify the uses, advantages, and disadvantages of natural breeding and artificial insemination.
22. Compare and contrast animal welfare in relation to domestic livestock and companion animals.
23. Describe the locations and functions of domestic livestock and companion animal organs and their systems, including respiratory, circulatory, reproductive, endocrine, urinary, and digestive.
24. Identify facilities needed to house and manage domestic livestock and companion animals safely and efficiently.

B. Safety with Agricultural Chemicals: Understand the concepts and procedures for handling, usage, and storage of agricultural chemicals.

25. Identify the following from the label of an agricultural chemical container: appropriate use, warning signs, signal words, precautionary statements, EPA Registration Number, directions for use, storage, and disposal.
26. Identify the following from a Safety Data Sheets (SDS): first aid measures, firefighting measures, handling and storage, and personal protection equipment (PPE).

Agricultural Education

CONTENT AREA—
Animal Science

PERFORMANCE STANDARDS AND COMPETENCIES

C. Career Exploration and Development: Understand the diversity of careers related to the agricultural industry and strategies to acquire and advance in an agricultural career.

27. Identify 21st century skills required for all careers in agriculture.
28. Demonstrate the essential skills that are part of a job search, including preparing the cover letter, resume, application, and participating in the interview process.
29. Explain the purpose and types of Supervised Agriculture Experience programs (SAE).

D. Leadership, Personal Growth, and Career Success: Understand the concepts, strategies, and tools needed, which contribute to premier leadership, personal growth, and career success through the participation in FFA.

30. Identify FFA opportunities, including individual and chapter awards, career development events, leadership skills development, and FFA service engagement.
31. Explain the purpose of using parliamentary procedure in FFA meetings.
32. Demonstrate knowledge of parliamentary procedures such as use of the gavel, making and amending main motions, debating, and voting.
33. Exhibit the skills needed to lead a meeting or activity that engages all participants in the process.

Agricultural Education

CONTENT AREA—
Aquaculture

PERFORMANCE STANDARDS AND COMPETENCIES

A. Aquaculture: Understand the concepts and skills related to aquaculture production and management.

1. Classify the following species of aquatic organisms as fresh water, marine, or diadromous, and by their genus and species: tilapia-Oreochromis mossambicus and Oreochromis nilotica, Atlantic salmon- Salmo salar, chinook salmon- Oncorhynchus tshawyscha, coho salmon- Oncorynchus kisutch, eastern oyster- Crassostrea virginicia, hard clam-Mercinaria mercinaria, American lobster- Homerus americanus, sugar kelp- Saccharina latissima, rainbow trout- Oncorynchus mykiss, Brook Trout-Salvelinus fontinalis, brown trout- Salmo trutta, channel catfish- Ictalurus punctatus, blue catfish-Ictalurus furcatus, white catfish-Ictalurus catus.
2. Identify the following types of aquaculture systems: raceways, ponds, recirculating systems, and net pens or cages.
3. Identify and describe the following parts of a recirculating aquaculture system (RAS): tank, sump or reservoir, pump, solid waste filter, U/V sterilizer, heat exchanger, biofilter, and aeration.
4. Describe how the biofilter of a recirculating aquaculture system (RAS) converts ammonia to nitrite, and nitrite to nitrate.
5. Explain how aquaponics can be utilized to enhance sustainable aquaculture practices by reducing water consumption and waste production.
6. Identify and describe how the following environmental factors impact aquaculture production: temperature, salinity, ammonia, nitrate, nitrite, dissolve oxygen, and pH.
7. List and describe the following symptoms: pop-eyes, piping, flashing, fin erosion, abnormal behavior, and skin abnormalities such as lesions and scale loss.
8. List and define the categories of infectious diseases: bacterial, fungal, viral, and parasitic.
9. List and define the categories of non-infectious diseases: nutritional, environmental, chemical, and physiological.
10. Describe the reasons for grading both before and during harvesting.
11. List and describe how the following species are detrimental to aquaculture production: sea stars, oyster drills, zebra mussels, lice, parasitic copepods, and worms.
12. Identify the following external morphological features of a finfish: dorsal, pectoral, pelvic, anal, caudal and adipose fins, lateral line, and operculum.
13. Identify the following external morphologic features of a crustacean: carapace, abdomen, walking legs, and claws.
14. Diagram the life cycle of tilapia, Atlantic salmon, eastern oysters, and American lobsters.
15. List and describe the following nutritional requirements in aquaculture production: proteins, carbohydrates, fats, vitamins, and minerals.

Agricultural Education

CONTENT AREA—

Aquaculture

PERFORMANCE STANDARDS AND COMPETENCIES

A. Aquaculture: Understand the concepts and skills related to aquaculture production and management.

16. Describe free access feeding with demand feeders, versus schedule feeding by hand or automated feeder.
17. Describe the function of the following agencies as related to aquaculture: NOAA, DEEP, EPA, World Aquaculture Society, SeaGrant, FDA, USDA, Army Corps of Engineers, and United States Coast Guard.

B. Safety with Agricultural Chemicals: Understand the concepts and procedures for handling, usage, and storage of agricultural chemicals.

18. Identify the following from the label of an agricultural chemical container: appropriate use, warning signs, signal words, precautionary statements, EPA Registration Number, directions for use, storage, and disposal.
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Agricultural Education

CONTENT AREA—
Natural Resources and Environmental

PERFORMANCE STANDARDS AND COMPETENCIES

A. Natural Resources and Environmental Technologies: Understand the concepts and skills necessary related to natural resources and environmental management.

1. Define and identify the following renewable resources: water, trees, fish, wildlife, sunlight, and air.
2. Define and identify the following non-renewable resources: minerals, soil, and fossil fuels.
3. Define threatened, endangered, and extinct in terms of wildlife.
4. Identify the ecosystem structure in terms of food web, biodiversity, and carrying capacity.
5. Identify the following habitat types in Connecticut: deciduous forest, coniferous forest, wetland, field or meadow, tidal marsh, and edge.
6. Define point source and non-point source pollution.
7. Define and describe the principal functions of a watershed.
8. Define invasive species and describe their impact on the New England environment.
9. Describe the process of ecological succession in New England.
10. Describe how laws can be used as a fish and wildlife management technique in New England.
11. Identify the following components of a topographical map: contour lines, wetlands, buildings, compass, and scale.
12. Describe basic applications of global positioning systems in natural resources.
13. Identify recreational uses of natural resources in New England.
14. Identify the following water quality indicators: pH, temperature, nitrates, nitrites, ammonia, dissolved oxygen, and turbidity.
15. Demonstrate use of a dichotomous key to identify trees, fish, and wildlife.
16. Identify the following tools in natural resources: GPS unit, diameter tape, telemetry unit, seines, aquatic net, water meter, animal tag or band, Biltmore stick, Secchi disk, analog refractometer, and hydrometer.

Agricultural Education

CONTENT AREA—
Natural Resources and Environmental

PERFORMANCE STANDARDS AND COMPETENCIES

B. Safety with Agricultural Chemicals: Understand the concepts and procedures for handling, usage, and storage of agricultural chemicals.

17. Identify the following from the label of an agricultural chemical container: appropriate use, warning signs, signal words, precautionary statements, EPA Registration Number, directions for use, storage, and disposal.
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Agricultural Education

Content Area-

Plant Science

PERFORMANCE STANDARDS AND COMPETENCIES

A. Plant Science: Understand the concepts and skills necessary related to plant science technology.

1. Identify and describe the function(s) of the following plant parts: leaf, blade, petiole, flower, stamen, pistil, stem, nodes, roots, and root hairs.
2. Identify the genus and species (specific epithet), cultivar, and variety of a scientific plant.
3. Explain requirements necessary for photosynthesis to occur and identify the products and by-products of photosynthesis.
4. Describe how soil texture affects drainage and plant growth.
5. Describe the following components of growing media: perlite, vermiculite, and peat.
6. Describe soil pH and its effect on plant growth.
7. Identify the following from a label of a fertilizer container: percentage of N, P, and K, and calculate the actual amount of the nutrient(s) in the container.
8. Describe the role of N, P, and K in regards to vegetative growth, root development, seed production, and plant stress.
9. Explain the life cycle of annuals, biennials, and perennial plants.
10. Describe asexual propagation techniques by cuttings, division, grafting, and tissue culture.
11. Describe the process of plant pollination and fertilization.
12. Describe favorable conditions for germination.
13. Identify advantages and disadvantages of hybrid plants.
14. Describe Integrated Pest Management (IPM) strategies.
15. Explain how greenhouses promote plant growth through light, air movement, temperature, and humidity control.
16. Explain focal point, balance, proportion, and scale as they are applied to floral design.
17. Demonstrate appropriate conditioning and storage of cut flowers.
18. Select and safely use the following hand tools and equipment in the landscape industry: garden rake, leaf rake, shovel, spade, hand shears, loppers, rotary spreader, and drop spreader.

Agricultural Education

CONTENT AREA— Plant Science

PERFORMANCE STANDARDS AND COMPETENCIES

B. Safety with Agricultural Chemicals: Understand the concepts and procedures for handling, usage, and storage of agricultural chemicals.

19. Identify the following from the label of an agricultural chemical container: appropriate use, warning signs, signal words, precautionary statements, EPA Registration Number, directions for use, storage, and disposal.
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Appendix II
Common Core States Standards English Language Arts Alignment

Agricultural Science & Technology Education Grades 9-12 Standards ENGLISH LANGUAGE ARTS Science & Technical Subjects Literacy Grade 9-12	PATHWAYS		
	FOUNDATION SKILLS (FS)	LEADERSHIP SKILLS (LS)	ANIMAL SCIENCE (AS)
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. RST.11-12.1 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.	02.01.01a, 06.02.01a, 06.03.01a, 10.03.01a, 10.02.01a, 13.01.01a 02.01.01b, 03.01.0.b, 05.01.0.b, 05.04.01b, 10.01.01b, 10.02.01b		02.01.01a, 02.01.02a, 02.02.01a, 02.02.06a, 03.01.04a, 03.06.06a, 05.02.01a, 05.03.01a, 05.13.13a, 06.02.01a, 08.01.01a, .09.01.02a, 10.01.01a, 10.01.02a, 11.01.01a, 11.01.04a 01.01.10b, 02.02.02b, 02.02.04b, 02.02.05b, 02.02.06b, 02.03.01b, 03.01.03b, 08.02.01b, 10.01.01b, 11.01.01b
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. RST.11-12.2 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.	03.01.02a, 04.01.01a, 05.04.01a, 12.03.01a		02.01.01a, 02.01.02a, 05.03.02a, 08.01.01a
RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. RST.11-12.3 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.	01.01.02a, 04.03.01a, 10.02.01a 01.01.02b, 06.02.01b, 06.03.01b, 14.02.01b	01.01.06a, 01.02.03a, 01.04.03a 02.04.01b	02.03.01a, 02.03.02a, 03.01.01a, 03.01.05a, 04.01.02a, 08.02.01a, 11.01.02a
RST.9-10.4 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 9–10 texts and topics*.	01.01.01a, 01.01.03a,	02.06.01a	02.01.01b, 02.01.02b, 02.02.03b, 03.01.01b, 03.01.02b, 03.01.05b,

RST.11-12.4 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.	01.01.01b, 01.01.02b, 03.01.02b, 14.03.01b		05,03.03b, 10.02.02b, 11.01.02b
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*). RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.	01.01.02a, 06.06.01a 03.01.01b, 12.03.01b, 12.03.02b		 07.02.01b
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. RST.11-12.6 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.	12.03.01b, 12.03.02b, 12.03.02b		
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. RST.11-12.7 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.	01.01.01a, 01.01.03a, 03.01.01a, 04.03.02a, 04.04.01a, 04.01.01b, 04.03.01b, 05.03,01b, 14.03.02b		
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. RST.11-12.8 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.	10.03.02a, 12.03.03a, 14.03.02a 04.01.01b, 04.03.01b, 04.04.01b, 05.03.01b		04.02.01a 04.01.01b, 04.01.02b, 05,02,02b, 09.01.01b, 10.02.01b
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. RST.11-12.9 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.	05.03.01a, 07.01.01a, 08.01.01a, 14.02.01a 04.01.01b, 04.02.01b, 04.03.01b, 05.03.01b		01.01.01a, 03.01.02a, 04.02.02a, 05.02.02a, 05.03.05a, 05.03.06a, 06.01.02a, 06.02.02a, 07.01.01a, 10.02.01a, 11.01.03a 04.01.01b, 05.02.01b, 05.03.01b, 05.03.02b, 05.03.05b, 06.02.02b,

			07.01.02b, 10.02.03b, 11.01.03b, 11.01.04b
Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHST			
WHST.9-12.1 Write arguments focused on discipline-specific content.			02.02.05a, 03.01.05a, 04.02.01a 02.02.01b, 02.02.04b
WHST.9-10.1a Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.			03.01.05a, 04,02,01a
WHST.9-10.1c Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.			02.02.04b
WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	03.01.01a, 03.01.02a, 04.02.01a, 04.03.01a, 05.03.01a, 08.01.01a 02.02.05b, 03.01.06b, 04.01.02b		06.02.01a, 09.01.01a
WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.			02.02.05b, 04.01.02b
WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	03.01.02a, 14.01.01a, 14.02.01a,	01.01.02a, 01.04.06a, 01.04.06a	02.02.06a, 03.01.01a, 03.01.05a, 03.02.01a, 04.01.01a, 04.01.02a, 05.01.01a, 05.02.01a, 05.02.02a, 05.03.02a, 05.03.03a, 05.03.05a,

11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	01.01.02b, 10.01.01b	01.01.02b, 01.01.05b, 01.02.04b, 01.06.01b, 02.01.01b, 02.01.01b, 03.01.02b	07.02.01a, 10,01,01a 01.01.01b, 02.03.01b, 05.03.04b, 05.03.05b, 06.01.02b, 06.02.01b, 06.02.02b,07.01.02b, 08.02.01b, 10.01.01b
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. WHST.11-12.5 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.			
WHST.9-10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically WHST.11-12.6 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..	14.02.01a, 14.03.01a	01.06.04a, 03.02.04a 01.06.04b, 03.01.01b	08.01.01a 03.01.04b, 03.02.01b, 06.01.02b
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. WHST.11-12.7 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.	03.01.03a 04.03.01b	02.05.04a 02.01.02b, 02.01.03b, 02.05.03b, 02.05.04b	02.02.04a, 02.02.06a, 02.03.01a, 02.03.02a, 05.03.01a, 05.03.06a, 06.01.02a, 06.02.02a, 08.01.01a, 09.01.02a 03.01.04b, 05.02.02b, 05.03.03b, 06.01.02b, 06.02.01b, 06.02.02b, 10.02.03b
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. WHST.11-12.8 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	04.03.01b	01.01.04a, 03.03.02a 01.01.04b	02.03.02a, 05.03.06a, 06.01.02a, 06.02.02a, 08.01.01a 03.01.04b, 05.02.02b, 05,03.03b, 06.01.02b, 06.02.02b, 10.02.03b

any one source and following a standard format for citation.			
WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and rese		01.04.01a, 01.06.03a, 02.01.01a, 02.02.03a, 03.02.02a	01.01.02a, 05.02.01a, 05.02.02a, 05.03.06a, 10.02.02a, 11.01.04a
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and rese	01.01.01b, 04.02.01b, 04.03.01b	01.03.03b, 01.06.03b, 02.04.02b, 02.04.03b	01.01.02b, 02.01.01b, 03.01.04b, 05.02.02b, 05.03.01, 05.03.02b, 05.03.03b, 09.01.01b
Speaking & Listening » Grade 9-12			
SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.		01.02.02b	
SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.		01.02.02b,	
SL.9-10.1a Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.	05.04.01a, 06.01.02a, 07.01.01a, 08.01.01a		
SL.11-12.1a Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.			
SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.		01.02.01a, 01.03.04a, 01.04.02a, 01.04.04a, 01.04.06a, 01.05.01a, 01.06.01a, 01.06.02a, 01.06.05a, 02.01.02a, 02.01.03a, 02.04.01a, 02.04.03a, 02.05.01a, 02.05.03a, 02.02.05a, 02.06.02a, 03.01.02a	01.01.02a, 02.01.01a
SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.	03.01.02b, 06.01.01b, 10.02.01b, 14,01,01b, 14,02.01b, 14.03.02b	01.04.01b, 02.04.01b, 02.06.02b, 03.01.03b	03.01.01b, 05.03.01b, 05.03.03b, 05.03.04b

SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	03.01.01a, 04.03.01a, 04.04.01a, 05.01.01a, 05.02.01a, 05.03.01a, 05.04.01a, 05.04.02a, 06.01,01a, 06.02.01a, 06.03.01a, 10.02.01a, 10.03.01a, 12.03.01a, 14.02.01a, 14.03.01a 02.01.01b, 03.01.02b, 04.01.01b, 04.03.01b, 04.04.01b, 05.01.01b, 05.03.01b, 05.04.01b, 06.01.01b, 06.01.02b, 06.02.01b, 06.03.01b, 10.02.01b, 10.01.01b, 14.02.01b, 14.03.02b, 14.03.02b		01.01.02a, 02.01.02a, 02.03.01a, 03.01.02a, 03.01.03a, 03.01.04a, 03.01.05a, 03.01.06a, 03.02.01a, 04.02.01a, 05.03.01a, 05.03.02a, 05,03.03a, 05.03.06a 03.01.03b, 03.01.04b, 03.01.05b, 03.01.06b, 03.02.01b, 04.02.01b, 05.03.01b, 05.03.03b, 05.03.04b, 05.03.05b , 06.01.01b, 06.01.02b
SL.9-10.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9–10 Language standards 1 and 3 here for specific expectations.) SL.11-12.6 Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 here for specific expectations.)	 04.04.01b, 06.01.01b, 14.02.01b		03.01.02a, 03.01.03a, 03.01.04a, 03.01.05a, 03.01.06a, 03.02.01a, 05.03.06a 03.01.01b, 05.03.01b, 05.03.03b, 05.03.04b
Agricultural Science & Technology Education Grades 9-12 Standards ENGLISH LANGUAGE ARTS Science & Technical Subjects Literacy Grade 9-12	**PATHWAYS**		
	AQUACULTURE (AQ)	**NATURAL RESOURCES SYSTEM (NRS)**	**PLANT SCIENCE (PS)**
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.			01.01.01a, 01.01.02a, 01.02a, 01.03a, 02.01.01a, 02.02a, 02.03a, 03.01a, 03.02.03a, 03.02.04a, 03.02.05a, 03.03.01a, 03.03.02a, 03.03.04a,

RST.11-12.1 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.			03.04a, 04.01.01a, 04.01.02a, 04.01.03a, 04.01.06a, 04.02.01a, 04.02.04a, 04.02.05a, 04.02.06a, 04.02.07a, 04.02.08a 02.02.01b, 02.02.02b, 03.01.04b, 03.02b, 03.03.03b, 03.03.04b, 03.04.01b, 03.04.02b, 03.04.03b, 04.01.01b, 04.01.02b, 04.01.03b, 04.01.06b, 04.02.01b, 04.02.04b, 04.02.05b, 04.02.06b, 04.02.07b
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. RST.11-12.2 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.			01.02.01b, 01.02.03b, 01.02.04b

RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.	01.01a, 02.01.02a, 02.01.03a, 03.01.02a, 03.01.05a, 04.01a, 06.02.01a, 07.01.02a, 08.02a, 09.01.03a, 10.102.01a, 10.03a, 10.04.03a, 10.04.04a	01.01.03a, 01.01.04a, 02.03a, 02.05.01a, 02.06.01a, 02.06.07a, 03.01.02a, 03.01.02a, 03.01.05a, 03.01.06a, 03.01.07a, 04.02.01a, 05.01.01a, 06.01.04a, 06.02.02a, 07.01.01a, 07.01.03a, 08.01.01a	04.01.03a
RST.11-12.3 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.	02.02.01b, 02.02.05b, 02.02.06b, 02.03.01b, 02.03.02b, 03.01.01b,	01.01.02b, 01.01.03b, 02.03b, 02.06.03b, 02.06.04b, 03.01.01b,	02.03.03b, 03.03.04b, 04.01.03b

	03.01.02b, 03.01.03b, 03.01.04b, 04.01.02b, 04.01.02b, 05.05.02b, 10.02.01b, 10.03.01b, 10.04.01b, 10.4.03b, 10,04,04b, 01.04.06b, 11.03.06b, 11.03.08b	06.01.01b, 06.01.03b, 06.01.04b, 06.02.03b, 0702.01b, 07.02.02b	
RST.9-10.4 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 9–10 texts and topics*. RST.11-12.4 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.	02.03.01a, 05.03.02a, 12.01.02a, 12.01.03a, 12.02.01a, 12.03.01a, 13.02.02a 11.03.05b, 12.01.03b	02.02.02a, 02.02.04a, 02.06.02a, 06.02.03a, 06.02.04a, 07.02.03a, 07.02.04a 02.02.02b, 02.06.01b, 07.01.03b	01.01.01a, 01.03.01a, 01.03.02a, 02.02.02a 01.01.01b, 01.02.01b, 01.02.03b, 01.02.04b, 01.03.02b
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*). RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.			01.01.02a, 01.03.02a, 02.02.03a, 02.03.02a 01.03.01b, 01.03.02b, 02.02.01b, 02.02.02b, 02.03.01b, 03.02.02b
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. RST.11-12.7 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.	10.01.01b		02.01.01a, 03.04.02a 03.04.01b
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. RST.11-12.8 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.			03.04.02a 03.04.01b
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments,	13.01.01b, 13.02.01b		02.02.01a, 02.02.03a, 03.04.02a, 04.02.05a, 04.02.07a 02.01.01b, 03.02.04b,

simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.			03.04.01b, 04.02.07b
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.			01.01a, 01.02a, 01.03a, 02.01.01a, 02.02a, 02.03a, 03.01a, 03.02.03a, 03.02.04a, 03.02.05, 03.02.06a, 03.03.01a, 03.03.02a, 03.04.01a, 03.04.01a, 03.04.03a, 04.01.01a, 04.01.02a, 04.01.03a, 04.01.06a, 04.02.01a, 04.02.04a, 04.02.05a, 04.02.06a, 04.02,07a, 04.02.08a 03.02b, 03.04.02b, 03.04.03b, 04.01.02b, 0.01.03b, 04.01.06b, 04.02.01b, 04.02.04b, 04.02.05b, 04.02.06b, 04.02,07b

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHST			
WHST.9-12.1 Write arguments focused on discipline-specific content.			03.04.02a, 02.03.05b, 03.04.01b, 04.02.01b
WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	02.03.02a, 02.02.01a, 10.01.01a, 13.02.01a 05.02.01b, 06.01.01b, 06.01.02b, 09.01.01b		01.01.01a, 01.02.06a, 01.03.01a, 01.03.02a 01.02.03b, 01.02.04b, 01.03.01b, 01.03.02b, 01.03.03b, 03.01.04b
WHST.9-10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically WHST.11-12.6 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..			03.04.02a 03.04.01b
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. WHST.11-12.7 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.	08.01.01a 07.02.01b, 09.01.02b, 09.01.03b, 11.01.04b	 07.01.02b	02.01.01a, 02.03.05a, 03.04.02a 01.03.02b, 01.03.04b, 02.01.01b, 02.03.04b, 03.01.04b, 03.04.01b
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. WHST.11-12.8 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			02.01.01a, 02.03.05a, 03.04.02a 01.03.02b, 01.03.02b, 01.03.04b, 03.01.04b, 03.04.01b

one source and following a standard format for citation.			
WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and rese WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and rese	02.03.02a, 07.02.02a, 10.04.01a, 12.01.04a, 12.01.05a, 13.01.01a, 13.01.03a, 13.03.03a 01.01.01b, 02.02.02b, 07.01.01b, 09.02.01b, 09.03.01b, 09.03.02b, 09.03.03b, 11.01.04b, 11.03.01b, 13.01.02b, 13.02.02b	01.01.01a, 02.01.01a, 02.01.02a, 02.02.01a, 02.02.02a, 02.04.01a, 02.06.05a, 07.02.01a, 02.01.01b, 02.01.02b, 02.04,01b, 02.04.02b, 02.06.02b	01.03.03a, 02.03.05a, 03.02.05a, 03.04.02a 01.03.02b, 01.03.04b, 02.03.04b, 03.01.04b, 03.04.01b, 04.01.01b, 04.02.06b
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. WHST.11-12.10 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.			
Speaking & Listening » Grade 9-12			
SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.	05.02.02a 06.02.01b	 02.06.06b, 02.06.07b, 03.01.05b	
SL.9-10.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.	09.03.01a, 09.03.02a		
SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.	01.01.03a, 02.01.01a, 02.02.06a, 03.01.01a, 03.01.03a, 03.01.04a, 03.01.05a, 03.02.01a, 05.01.01a, 05.02.01a,	01.01.02a, 02.06.02a, 02.06.06a, 02.06.08a, 02.06.09a, 03.01.01a, 03.01.04a, 06.01.01a, 06.01.02a, 06.01.03a,	

	05.03.01a, 05.03.03a, 06.01.01a, 06.01.02a, 06.0202a, 09.02.01a, 09.03.03a, 10.04.02a, 10.04.06a, 11.01.01a, 11.01.02a, 11.01.04a, 11.02.01a, 11.03a, 12.01.01a	06.02.01a, 07.01.02a, 07.02.02a, 07.02.05a, 07.02.06a	
SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.	01.01.01a, 02.01.01b, 02.02.02b, 02.02.04b, 03.01.05b, 03.02.01b, 05.01.01b, 05.03.01b, 05.03.01b, 05.03.02b, 06.02.02b, 07.01.02b, 07.01.03b, 10.04.02b, 11.01.01b, 11.03.03b, 11.03.04b, 11.03.07b, 12.01.01.b, 12.01.02b, 12.03.04b, 12.03.01b	01.01.01b, 02.05.01b, 02.06.01b, 02.06.01b, 02.06.01b, 02.06.03b, 02.06.05b, 02.06.08b, 02.06.09b, 03.01.02b, 03.01.03b, 03.01.04b, 03.01.06b, 03.01.07b, 04.02.01b, 05.01.01b, 06.02.02b, 06.02.04b, 07.01.01b, 07.01.03b, 07.02.03b, 07.02.04b, 07.02.05b, 07.02.06b, 0801.01b	

Agricultural Science & Technology Education Grades 9-12 Standards ENGLISH LANGUAGE ARTS Science & Technical Subjects Literacy Grade 9-12	PATHWAY POWER, STRUCTURAL AND TECHNICAL SYSTEMS (PST)
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. RST.11-12.1 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.	04.02.02a
RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. RST.11-12.3 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.	01.01.01a 01.01.01b
RST.9-10.4 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 9–10 texts and topics*. RST.11-12.4 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.	03.04.01a, 03.04.05a, 04.01.01a 03.04.03b, 03.04.03b, 03.04.05b, 03.04.07b, 04.02.01b, 04.02.03b
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. RST.11-12.9 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.	01.02.02a, 02.01.01a, 02.01.01a, 02.02.02a, 03.01.01a, 03.02.01a, 03.02.3a, 03.03.03a, 03.04.02a, 03.04.03a, 03.04.06a, 03.04.07a, 04.02.01a, 04.02.03a, 04.03.01a, 05.01.01a 01.02.01b, 02.01.01b, 02.02.01b, 03.01.01b, 03.01.02b, 03.02.03b, 03.03.02b, 03.03.03b, 03.03.04b, 03.04.04b, 03.04.06b, 04.02.01b, 04.02.02b, 04.032.03.03b
Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHST	
WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	04.01.02a
WHST.9-10.6 Use technology, including the Internet, to produce, publish, and update	04.01.02a

individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically WHST.11-12.6 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..	

Appendix III
Common Core States Standards Mathematics Alignment

MATHEMATICS	PATHWAYS		
Standards for Mathematical Practice	**FOUNDATION SKILLS (FS)**	**LEADERSHIP SKILLS (LS)**	**ANIMAL SCIENCE (AS)**
CCSS.Math.Practice.MP1. Make sense of problems and persevere in solving them.			07.01, 07.02
CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.			02.02.02, 02.03
CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.	10.01, 13.01		02.03
CCSS.Math.Practice.MP4 Model with mathematics.	05.04,12.03.03	01.01.05	01.01, 02.03, 10.01, 10.02, 11.01
CCSS.Math.Practice.MP5 Use appropriate tools strategically.	10.02		07.01, 07.02, 11.01
CCSS.Math.Practice.MP6 Attend to precision.			07.01, 07.02, 11.01
CCSS.Math.Practice.MP7 Look for and make use of structure.			11.01
Algebra – A-CED – Creating Equations			
Create equations that describe numbers or relationships			
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions. 1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)	09.01		
High School - Algebra - Arithmetic with Polynomials & Rational Expressions			
Perform arithmetic operations on polynomials.			
1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	09.01		
Algebra – A-REI – Reasoning with Equations and Inequalities			
Solve equations and inequalities in one variable.			
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	09.01		05.01, 05.03
Functions – F-IF-Interpreting Functions			
Interpret functions that arise in applications in terms of the context.			
1. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts;	03.01, 09.01		05.01, 05.03

intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*			
Geometry – G-CO - Congruence			
Make geometric constructions			
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.			06.01, 06.02, 06.03
Geometry – G-GMD – Geometric Measurement and Dimensions			
Explain volume formulas and use them to solve problems			
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.			06.01, 06.02, 06.03
Geometry – G-MG – Modeling with Geometry			
Apply geometric concepts in modeling situations			
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).			06.01, 06.02, 06.03
Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry			
Define trigonometric ratios and solve problems involving right triangles			
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. 8.1 Know and use angle and side relationships in problems with special right triangles. such as, 30°, 60°**,** and 90' triangles and 45', 45', and 90' triangles. (CA Standard Geometry - 20.0)			06.01, 06.02, 06.03
Statistics and Probability- S-IC- Making Inferences and Justify Conclusions			
Understand and evaluate random processes underlying statistical experiments			
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	03.01		
Make inferences and justify conclusions from sample surveys, experiments, and observational studies			
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	03.01, 09.01		05.01, 05.03
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant	03.01, 09.01		
Statistics and Probability- S-ID- Interpreting Categorical and Quantitative Data			
Summarize, represent, and interpret data on a single count or measurement variable			
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	01.03		

2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	01.03		
Interpret linear models			
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	01.03		

MATHEMATICS	**PATHWAYS**		
Standards for Mathematical Practice	**FOUNDATION SKILLS (FS)**	**FOUNDATION SKILLS (FS)**	**FOUNDATION SKILLS (FS)**
CCSS.Math.Practice.MP1. Make sense of problems and persevere in solving them.	02.01, 07.01, 13.01, 13.02,	06.01	
CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.	07.01, 12.01, 13.01, 13.02	06.01	
CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.	07.01, 13.01, 13.02		
CCSS.Math.Practice.MP4 Model with mathematics.	02.01, 02.03, 07.01, 11.03, 12.01, 12.02, 13.01, 13.02	02.06, 03.01, 06.01, 07.02	01.03, 01.20, 02.01, 02.02, 03.03
CCSS.Math.Practice.MP5 Use appropriate tools strategically.	03.01, 07.01, 11.03, 12.01, 12.02, 13.01, 13.02	02.06, 03.01, 06.01, 07.02	01.03,
CCSS.Math.Practice.MP6 Attend to precision.	03.01	03.01	
CCSS.Math.Practice.MP7 Look for and make use of structure.			
CCSS.Math.Practice.MP8 Look for and express regularity in repeated reasoning.			

Algebra – A-CED – Creating Equations			
Create equations that describe numbers or relationships			
1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions. 1.1 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (CA Standard Algebra II - 11.2)		02.03, 04.01	
Algebra – A-REI – Reasoning with Equations and Inequalities			
Solve equations and inequalities in one variable.			
3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.		02.03, 04.01	
Geometry – G-CO - Congruence			
Make geometric constructions			
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.			02.03, 04.02
Geometry – G-GMD – Geometric Measurement and Dimensions			
Explain volume formulas and use them to solve problems			
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.			02.03, 04.02
Geometry – G-MG – Modeling with Geometry			
Apply geometric concepts in modeling situations			
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).			02.03, 04.01, 04.02
Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry			
Define trigonometric ratios and solve problems involving right triangles			
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. 8.1 Know and use angle and side relationships in problems with special right triangles. such as, 30°, 60°**,** and 90' triangles and 45', 45', and 90' triangles. (CA Standard Geometry - 20.0)			04.02

Statistics and Probability- S-IC- Making Inferences and Justify Conclusions			
Understand and evaluate random processes underlying statistical experiments			
1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	08.01, 09.01, 10.01, 11.01, 11.03	02.03, 04.01, 06.02	02.03, 03.02, 03.04
Make inferences and justify conclusions from sample surveys, experiments, and observational studies			
3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.		02.03, 04.01	
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	08.01, 09.01, 10.01, 11.01, 11.03	02.03, 04.01, 06.02	02.03, 03.02, 03.04
Statistics and Probability- S-ID- Interpreting Categorical and Quantitative Data			
Summarize, represent, and interpret data on a single count or measurement variable			
1. Represent data with plots on the real number line (dot plots, histograms, and box plots).		06.02	02.03
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.		06.02	02.03
Interpret linear models			
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.		06.02	02.03

MATHEMATICS	**PATHWAY**
Standards for Mathematical Practice	**POWER, STRUCTURAL AND TECHNICAL SYSTEMS (PST)**
CCSS.Math.Practice.MP1. Make sense of problems and persevere in solving them.	03.03
CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.	03.03
CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.	
CCSS.Math.Practice.MP4 Model with mathematics.	
CCSS.Math.Practice.MP5 Use appropriate tools strategically.	02.01, 02.02, 03.03
CCSS.Math.Practice.MP6 Attend to precision.	
CCSS.Math.Practice.MP7 Look for and make use of structure.	
Interpret functions that arise in applications in terms of the context.	

Geometry – G-CO - Congruence	
Make geometric constructions	
12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	04.04
Geometry – G-GMD – Geometric Measurement and Dimensions	
Explain volume formulas and use them to solve problems	
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	04.04
Geometry – G-MG – Modeling with Geometry	
Apply geometric concepts in modeling situations	
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	02.01, 02.0203.02, 03.03, 04.03, 04.04
Geometry – G-SRT – Similarity, Right Triangles, and Trigonometry	
Define trigonometric ratios and solve problems involving right triangles	
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. 8.1 Know and use angle and side relationships in problems with special right triangles. such as, 30°, 60°**,** and 90' triangles and 45', 45', and 90' triangles. (CA Standard Geometry - 20.0)	05.01

Appendix IV
Common Cores of States Standards: English Language Arts

College and Career Readiness Anchor Standards for Reading

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
3. Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.
6. Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.*
8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

Note on range and content of student reading

To become college and career ready, students must grapple with works of exceptional craft and thought whose range extends across genres, cultures, and centuries. Such works offer profound insights into the human condition and serve as models for students' own thinking and writing. Along with high-quality contemporary works, these texts should be chosen from among seminal U.S. documents, the classics of American literature, and the timeless dramas of Shakespeare. Through wide and deep reading of literature and literary nonfiction of steadily increasing sophistication, students gain a reservoir of literary and cultural knowledge, references, and images; the ability to evaluate intricate arguments; and the capacity to surmount the challenges posed by complex texts.

10. Read and comprehend complex literary and informational texts independently and proficiently.

Responding to Literature

11. Respond to literature by employing knowledge of literary language, textual features, and forms to read and comprehend, reflect upon, and interpret literary texts from a variety of genres and a wide spectrum of American and world cultures.

*Please see "Research to Build Knowledge" in Writing and "Comprehension and Collaboration" in Speaking and Listening for additional standards relevant to gathering, assessing, and applying information from print and digital sources.

Reading Standards for Literature 9–12 [RL]

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 9–10 students:	Grades 11–12 students:
Key Ideas and Details	
1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	**1.** Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
2. Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.	**2.** Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.
3. Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme.	**3.** Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed).
Craft and Structure	
4. Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).	**4.** Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.)
5. Analyze how an author's choices concerning how to structure a text, order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks) create such effects as mystery, tension, or surprise.	**5.** Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.
6. Analyze a particular point of view or cultural experience reflected in a work of literature from outside the United States, drawing on a wide reading of world literature.	**6.** Analyze a case in which grasping point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).
Integration of Knowledge and Ideas	

Grades 9–10 students:	Grades 11–12 students:
7. Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment (e.g., Auden's "Musée des Beaux Arts" and Breughel's *Landscape with the Fall of Icarus*). a. Analyze works by authors or artists who represent diverse world cultures.	**7.** Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.) a. Analyze multiple interpretations of full-length works by authors who represent diverse world cultures.
8. (Not applicable to literature)	**8.** (Not applicable to literature)
9. Analyze how an author draws on and transforms source material in a specific work (e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare).	**9.** Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.
Range of Reading and Level of Text Complexity	
10. By the end of grade 9, read and comprehend literature, including stories, dramas, and poems, in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 9–10 text complexity band independently and proficiently.	**10.** By the end of grade 11, read and comprehend literature, including stories, dramas, and poems, in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11-CCR text complexity band independently and proficiently.
Responding to Literature	**Responding to Literature**
11. Interpret, analyze, and evaluate narratives, poetry, and drama, aesthetically and ethically by making connections to: other texts, ideas, cultural perspectives, eras, personal events and situations. a. Self-select text to respond and develop innovative perspectives. b. Establish and use criteria to classify, select, and evaluate texts to make informed judgments about the quality of the pieces.	**11.** Interpret, analyze, and evaluate narratives, poetry, and drama, aesthetically and philosophically by making connections to: other texts, ideas, cultural perspectives, eras, personal events, and situations. a. Self-select text to respond and develop innovative perspectives. b. Establish and use criteria to classify, select, and evaluate texts to make informed judgments about the quality of the pieces.

Reading Standards for Informational Text 9–12 [RI]

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 9–10 students:	Grades 11–12 students:
Key Ideas and Details	
1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. a. Develop factual, interpretive, and evaluative questions for further exploration of the topic(s).	**1.** Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. a. Develop factual, interpretive, and evaluative questions for further exploration of the topic(s).

Grades 9–10 students:	Grades 11–12 students:
2. Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.	**2.** Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.
3. Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.	**3.** Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
Craft and Structure	
4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).	**4.** Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).
5. Analyze in detail how an author's ideas or claims are developed and refined by particular sentences, paragraphs, or larger portions of a text (e.g., a section or chapter).	**5.** Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.
6. Determine an author's point of view or purpose in a text and analyze how an author uses rhetoric to advance that point of view or purpose.	**6.** Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.
Integration of Knowledge and Ideas	
7. Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.	**7.** Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
8. Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.	**8.** Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., *The Federalist*, presidential addresses).
9. Analyze seminal U.S. documents of historical and literary significance (e.g., Washington's Farewell Address, the Gettysburg Address, Roosevelt's Four Freedoms speech, King's "Letter from Birmingham Jail"), including how they address related themes and concepts. a. Read, annotate, and analyze informational texts on topics related to diverse and non-traditional cultures and viewpoints.	**9.** Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features. a. Read, annotate, and analyze informational texts on topics related to diverse and non-traditional cultures and viewpoints.
Range of Reading and Level of Text Complexity	
10. By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.	**10.** By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

College and Career Readiness Anchor Standards for Writing

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

*Text Types and Purposes**

1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Note on range and content of student writing

For students, writing is a key means of asserting and defending claims, showing what they know about a subject, and conveying what they have experienced, imagined, thought, and felt. To be college- and career- ready writers, students must take task, purpose, and audience into careful consideration, choosing words, information, structures, and formats deliberately. They need to know how to combine elements of different kinds of writing—for example, to use narrative strategies within argument and explanation within narrative—to produce complex and nuanced writing. They need to be able to use technology strategically when creating, refining, and collaborating on writing. They have to become adept at gathering information, evaluating sources, and citing material accurately, reporting findings from their research and analysis of sources in a clear and cogent manner. They must have the flexibility, concentration, and fluency to produce high-quality first-draft text under a tight deadline as well as the capacity to revisit and make improvements to a piece of writing over multiple drafts when circumstances encourage or require it.

Responding to Literature

11. Develop personal, cultural, textual, and thematic connections within and across genres as they respond to texts through written, digital, and oral presentations, employing a variety of media and genres.

*These broad types of writing include many subgenres. See Appendix A for definitions of key writing types.

Writing Standards 9–12

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 9–10 students:	Grades 11–12 students:
Text Types and Purposes	
1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. Explore and inquire into areas of interest to formulate an argument. a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from and supports the argument presented.	**1.** Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. Explore and inquire into areas of interest to formulate an argument. a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from and supports the argument presented.

Grades 9–10 students:	Grades 11–12 students:
2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. a. Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use appropriate and varied transitions to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide 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).	**2.** Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. a. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop 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. c. Use 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. d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide 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).

Writing Standards 9–12

Grades 9–10 students:	Grades 11–12 students:
Text Types and Purposes (continued)	
3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. a. Engage and orient the reader by setting out a problem, situation, or observation, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events. b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters. c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole. d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters. e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative. f. Adapt voice, awareness of audience, and use of language to accommodate a variety of cultural contexts.	**3.** Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. a. Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events. b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters. c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution). d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters. e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative. f. Adapt voice, awareness of audience, and use of language to accommodate a variety of cultural contexts.

Grades 9–10 students:	Grades 11–12 students:
Production and Distribution of Writing	
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)	**4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
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. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 9–10 on page 68.)	**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. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11–12 on page 68.)
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	**6.** 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.
Research to Build and Present Knowledge	
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. a. Explore topics dealing with different cultures and world viewpoints.	**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. a. Explore topics dealing with different cultures and world viewpoints.
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.	**8.** 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 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.

Writing Standards 9–12

[W]

Grades 9–10 students:	Grades 11–12 students:
Research to Build and Present Knowledge (continued)	
9. Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grades 9–10 Reading standards* to literature (e.g., "Analyze how an author draws on and transforms source material in a specific work [e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare]"). b. Apply *grades 9–10 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the	**9.** Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grades 11–12 Reading standards* to literature (e.g., "Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics"). b. Apply *grades 11–12 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the reasoning in seminal U.S. texts, including the application of

reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning").	constitutional principles and use of legal reasoning [e.g., in U.S. Supreme Court Case majority opinions and dissents] and the premises, purposes, and arguments in works of public advocacy [e.g., *The Federalist*, presidential addresses]").
Range of Writing	
10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	**10.** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
Responding to Literature	**Responding to Literature**
11. Create literary texts that demonstrate knowledge and understanding of a wide variety of texts of recognized literary merit. a. Engage in a wide range of prewriting experiences, such as using a variety of visual representations, to express personal, social, and cultural connections and insights. b. Identify, analyze, and use elements and techniques of various genres of literature. c. Develop critical and interpretive texts from more than one perspective, including historical and cultural. d. Create poetry, stories, plays, and other literary forms (e.g. videos, art work).	**11.** Create interpretive and responsive texts to demonstrate knowledge and a sophisticated understanding of the connections between life and the literary work. a. Engage in using a wide range of prewriting strategies, such as visual representations and the creation of factual and interpretive questions, to express personal, social and cultural connections and insights. b. Identify, analyze, and use elements and techniques of various genres of literature, such as allegory, stream of consciousness, irony, and ambiguity, to affect meaning. c. Develop innovative perspectives on texts, including historical, cultural**,** sociological, and psychological contexts. d. Create poetry, stories, plays, and other literary forms (e.g. videos, art work).

College and Career Readiness Anchor Standards for Speaking and Listening

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Comprehension and Collaboration

1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

6. Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Note on range and content of student speaking and listening

To become college and career ready, students must have ample opportunities to take part in a variety of rich, structured conversations—as part of a whole class, in small groups, and with a partner—built around important content in various domains. They must be able to contribute appropriately to these conversations, to make comparisons and contrasts, and to analyze and synthesize a multitude of ideas in accordance with the standards of evidence appropriate to a particular discipline. Whatever their intended major or profession, high school graduates will depend heavily on their ability to listen attentively to others so that they are able to build on others' meritorious ideas while expressing their own clearly and persuasively.

New technologies have broadened and expanded the role that speaking and listening play in acquiring and sharing knowledge and have tightened their link to other forms of communication. The Internet has accelerated the speed at which connections between speaking, listening, reading, and writing can be made, requiring that students be ready to use these modalities nearly simultaneously. Technology itself is changing quickly, creating a new urgency for students to be adaptable in response to change.

Speaking and Listening Standards 6–12 [SL]

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 9–10 students:	Grades 11–12 students:
Comprehension and Collaboration	
1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues*, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. a. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. b. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. c. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. d. Seek to understand other perspectives and cultures and communicate effectively with audiences or individuals from varied backgrounds.	**1.** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues*, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. e. Seek to understand other perspectives and cultures and communicate effectively with audiences or individuals from varied backgrounds.
2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.	**2.** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.	**3.** Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
Presentation of Knowledge and Ideas	
4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.	**4.** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9–10 Language standards 1 and 3 on pages 68 for specific expectations.)	**6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 on page 68 for specific expectations.)

College and Career Readiness Anchor Standards for Language

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Conventions of Standard English

1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Vocabulary Acquisition and Use

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Note on range and content of student language use

To be college and career ready in language, students must have firm control over the conventions of standard English. At the same time, they must come to appreciate that language is as at least as much a matter of craft as of rules and be able to choose words, syntax, and punctuation to express themselves and achieve particular functions and rhetorical effects. They must also have extensive vocabularies, built through reading and study, enabling them to comprehend complex texts and engage in purposeful writing about and conversations around content. They need to become skilled in determining or clarifying the meaning of words and phrases they encounter, choosing flexibly from an array of strategies to aid them. They must learn to see an individual word as part of a network of other words—words, for example, that have similar denotations but different connotations. The inclusion of Language standards in their own strand should not be taken as an indication that skills related to conventions, effective language use, and vocabulary are unimportant to reading, writing, speaking, and listening; indeed, they are inseparable from such contexts.

Language Standards 9–12

[L]

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 9–10 students:	Grades 11–12 students:
Conventions of Standard English	
1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Use parallel structure.* b. Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.	**1.** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested. b. Resolve issues of complex or contested usage, consulting references (e.g., *Merriam-Webster's Dictionary of English Usage*, *Garner's Modern American Usage*) as needed.
2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses. b. Use a colon to introduce a list or quotation. c. Spell correctly.	**2.** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Observe hyphenation conventions. b. Spell correctly.
Knowledge of Language	
3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. a. Write and edit work so that it conforms to the guidelines in a style manual (e.g., *MLA Handbook*, Turabian's *Manual for Writers*) appropriate for the discipline and writing type.	**3.** Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. a. Vary syntax for effect, consulting references (e.g., Tufte's *Artful Sentences*) for guidance as needed; apply an understanding of syntax to the study of complex texts when reading.
Vocabulary Acquisition and Use	
4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 9–10 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *analyze*, *analysis*, *analytical*; *advocate*, *advocacy*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its	**4.** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *conceive*, *conception*, *conceivable*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.

etymology. b. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).
5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., euphemism, oxymoron) in context and analyze their role in the text. b. Analyze nuances in the meaning of words with similar denotations.	**5.** Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text. b. Analyze nuances in the meaning of words with similar denotations.
6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	**6.** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Standards for Literacy in Science, and Technical Subjects

College and Career Readiness Anchor Standards for Reading

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade span. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.
6. Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.*
8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

10. Read and comprehend complex literary and informational texts independently and proficiently.

*Please see "Research to Build and Present Knowledge" in Writing for additional standards relevant to gathering, assessing, and applying information from print and digital sources.

Reading Standards for Literacy in Science, and Technical Subjects 9–12 [RH]

The standards below begin at grade 6; standards for K–5 reading in history/social studies, science, and technical subjects are integrated into the K–5 Reading standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 9–10 students:	Grades 11–12 students:
1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.	**1.** Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.	**2.** Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.
3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.	**3.** Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.

4.	Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social studies.	**4.**	Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).
5.	Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.	**5.**	Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.
6.	Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.	**6.**	Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.
7.	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.	**7.**	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.
8.	Assess the extent to which the reasoning and evidence in a text support the author's claims.	**8.**	Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information.
9.	Compare and contrast treatments of the same topic in several primary and secondary sources.	**9.**	Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.
10.	By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.	**10.**	By the end of grade 12, read and comprehend history/social studies texts in the grades 11-CCR text complexity band independently and proficiently.

Reading Standards for Literacy in Science and Technical Subjects 9–12 [RST]

Grades 9–10 students:		Grades 11–12 students:	
1.	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	**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.
2.	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.	**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.
3.	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.	**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.

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 9–10 texts and topics*.	**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*.
5. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force*, *friction*, *reaction force*, *energy*).	**5.** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.	**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.
7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	**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.
8. Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	**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.
9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.	**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.
10. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.	**10.** By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

College and Career Readiness Anchor Standards for Writing

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade span. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

*Text Types and Purposes**

1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

Note on range and content of student writing

For students, writing is a key means of asserting and defending claims, showing what they know about a subject, and conveying what they have experienced, imagined, thought, and felt. To be college and career ready writers, students must take task, purpose, and audience into careful consideration, choosing words, information, structures, and formats deliberately. They need to be able to use technology strategically when creating, refining, and collaborating on writing. They have to become adept at gathering

2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.

Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

*These broad types of writing include many subgenres. See Appendix A for definitions of key writing types.

Writing Standards for Literacy in Science, and Technical Subjects 9–12 [WHST]

The standards below begin at grade 6; standards for K–5 writing in history/social studies, science, and technical subjects are integrated into the K–5 Writing standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 9–10 students:	Grades 11–12 students:
1. Write arguments focused on *discipline-specific content*. a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.	**1.** Write arguments focused on *discipline-specific content*. a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.

Grades 9–10 students:	Grades 11–12 students:
2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide 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).	**2.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop 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. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
(See note; not applicable as a separate requirement)	(See note; not applicable as a separate requirement)

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.

Writing Standards for Literacy in Science, and Technical Subjects 9–12 [WHST]

Grades 9–10 students:	Grades 11–12 students:
3. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	**3.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
4. 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.	**4.** 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.
5. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	**5.** 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.
6. 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.	**6.** 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.
7. 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.	**7.** 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.
8. Draw evidence from informational texts to support analysis, reflection, and research.	**8.** Draw evidence from informational texts to support analysis, reflection, and research.
9. 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.	**9**. 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.

Appendix V
Common Core States Standards: Mathematics

The Common Core State Standards Initiative is a state-led effort coordinated by the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO). The standards were developed in collaboration with teachers, school administrators, and experts, to provide a clear and consistent framework to prepare our children for college and the workforce.

The NGA Center and CCSSO received initial feedback on the draft standards from national organizations representing, but not limited to, teachers, postsecondary educators (including community colleges), civil rights groups, English language learners, and students with disabilities. Following the initial round of feedback, the draft standards were opened for public comment, receiving nearly 10,000 responses.

The standards are informed by the highest, most effective models from states across the country and countries around the world, and provide teachers and parents with a common understanding of what students are expected to learn. Consistent standards will provide appropriate benchmarks for all students, regardless of where they live.

These standards define the knowledge and skills students should have within their K-12 education careers so that they will graduate high school able to succeed in entry-level, credit-bearing academic college courses and in workforce training programs. The standards:

- Are aligned with college and work expectations;
- Are clear. understandable and consistent;
- Include rigorous content and application of knowledge through high order skills;
- Build upon strengths and lessons of current state standards;
- Are informed by other top performing countries. so that all students are prepared to succeed in our global economy and society; and
- Are evidence based.

Grade High School Standards for Mathematical Practice (SMP)

The K.12 Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. This page gives examples of what the practice standards look like at the specified grade level.

Standards	***Explanations and Examples***
Students are expected to: **SMP1. Make sense of problems and persevere in solving them**.	High school students start to examine problems by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students

	might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. By high school, students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. They check their answers to problems using different methods and continually ask themselves. "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
Students are expected to: **SMP2. Reason abstractly and quantitatively.**	High school students seek to make sense of quantities and their relationships in problem situations. They abstract a given situation and represent it symbolically, manipulate the representing symbols, and pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Students use quantitative reasoning to create coherent representations of the problem at hand; consider the units involved; attend to the meaning of quantities, not just how to compute them; and know and flexibly use different properties of operations and objects.
Students are expected to: **SMP3. Construct viable arguments and critique the reasoning of others.**	High school students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. High school students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. High school students learn to determine domains, to which an argument applies, listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
Standards	***Explanations and Examples***
Students are expected to: **SMP4. Model with mathematics.**	High school students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. High school students making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely

	interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
Students are expected to: **SMP5. Use appropriate tools strategically.**	High school students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. High school students should be sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. They are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts
Students are expected to: **SMP9. Attend to precision**	High school students try to communicate precisely to others by using clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standards	***Explanations and Examples***
Students are expected to: **SMP7. Look for and make use of structure.**	By high school, students look closely to discern a pattern or structure. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y. High school students use these patterns to create equivalent expressions, factor and solve equations, and compose functions, and transform figures.
Students are expected to: **SMP8. Look for and express**	High school students notice if calculations are repeated, and look both for general methods and for shortcuts. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x2 + x$

regularity in repeated reasoning.	+ 1), and (x – 1)(x3 + x2 + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, derive formulas or make generalizations, high school students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Algebra

Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A.REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Solve equations and inequalities in one variable.

A.REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A.REI.4. Solve quadratic equations in one variable.

Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p)2 = q that has the same solutions. Derive the quadratic formula from this form.

Solve quadratic equations by inspection (e.g. for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.

Solve systems of equations.

A.REI.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A.REI.9. Solve systems of linear equations exactly and approximately (e.g. with graphs), focusing on pairs of linear equations in two variables.

A.REI.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = –3x and the circle x2 + y2 = 3.

A.REI.8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.

A.REI.9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

Represent and solve equations and inequalities graphically.

A.REI.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

A.REI.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g. using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

A.REI.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Functions

Understand the concept of a function and use function notation.

F.IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph off is the graph of the equation y = f(x).

F.IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1. f(n+1) = f(n) + f(n.1) for n ≥ 1.

Interpret functions that arise in applications in terms of the context.

F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

F.IF.5. Relate the domain of a function to its graph and. where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

F.IF.9. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Analyze functions using different representations.

F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

F.IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t. y = (0.97)t. y = (1.01)12t. y = (1.2)t/10, and classify them as representing exponential growth or decay.

F.IF.9. Compare properties of two functions each represented in a different way (algebraically. graphically. numerically in tables. or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

Geometry

Experiment with transformations in the plane

G.CO.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

G.CO.2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g. translation versus horizontal stretch).

G.CO.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

G.CO.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

G.CO.5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using. e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. Understand congruence in terms of rigid motions

G.CO.9. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

G.CO.7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

G.CO.8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Prove geometric theorems

G.CO.9. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

G.CO.10. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.

G.CO.11. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

Make geometric constructions

G.CO.12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

G.CO.13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Statistics

Summarize, represent, and interpret data on a single count or measurement variable

S.ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

S.ID.2. Use statistics appropriate to the shape of the data distribution to compare center (median. mean) and spread (interquartile range. standard deviation) of two or more different data sets.

S.ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

S.ID.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize, represent, and interpret data on two categorical and quantitative variables

S.ID.5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint. marginal. and conditional relative frequencies). Recognize possible associations and trends in the data.

S.ID.9. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models

S.ID.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S.ID.8. Compute (using technology) and interpret the correlation coefficient of a linear fit.

S.ID.9. Distinguish b