

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

**Original Adoption:** 2023 NJSLs English Language Arts and English as a Second Language (8-21-24); Math NJSLs Mathematics (8-21-24); 2020 NJSLs Science, Social Studies, Career Readiness, Life Literacies & Key Skills, Computer Design & Thinking, Visual & Performing Arts, World Language, Comprehensive Health and Physical Education (5-11-22)

**Created By:**

### Recommended Pacing Guide

Unit 1: Safety in Horticulture	20 days
Unit 2: Floral Design	40 days
Unit 3: Greenhouse Production	40 days
Unit 4: Fruit and Vegetable Production	40 days
Unit 5: Pest Control/ IPM	40 days

### Alignment with State Mandates

The following colors are used throughout this document to indicate areas in which the curriculum is aligned with the following NJSA requirements:

- **Holocaust and genocides** ([N.J.S.A. 18A:35-28](#))
- **History and contributions of African-Americans** (Amistad Law) ([N.J.S.A. 18A:35-4.43](#))
- **Highlight and promote diversity and inclusion** (Diversity & Inclusion Law) ([N.J.S.A. 18A:35-4.36a](#))
- **History of disabled and LGBT persons** included in middle and high school curriculum ([Section 18A:35-4.35](#))
- **Climate Change** - to prepare students to understand how and why climate change happens, the impact it has on our local and global communities and to act in informed and sustainable ways. Please [click here](#) for specific examples (by subject).

Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<b>Unit 1: Safety in Horticulture</b>	<b>20 days</b>
<a href="#"><u>New Jersey Learning Standards-Science</u></a>	
<b>HS-LS1-1</b>	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
<b>HS-LS1-2</b>	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
<b>HS-LS1-3</b>	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
<b>HS-LS1-5</b>	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
<b>HS-LS1-6</b>	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
<b>HS-LS1-7</b>	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Science and Engineering Practices	Discipline Core Ideas/Unit Enduring Understandings	Crosscutting Concepts
<p><b>Developing and Using Models</b> Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. --Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) -- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4), (HS-LS1-5), (HS-LS1-7)</p> <p><b>Planning and Carrying Out Investigations</b> Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide</p>	<p><b>LS1.A: Structure and Function</b></p> <ul style="list-style-type: none"> <li>• Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)</li> <li>• All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3- 1.)</li> <li>• Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)</li> <li>• Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change</li> </ul>	<p><b>Systems and System Models</b></p> <ul style="list-style-type: none"> <li>• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)</li> </ul> <p><b>Energy and Matter</b></p> <ul style="list-style-type: none"> <li>• Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)</li> <li>• Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)</li> </ul> <p><b>Structure and Function</b></p> <ul style="list-style-type: none"> <li>• Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)</li> </ul>

evidence for and test conceptual, mathematical, physical, and empirical models.

--Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.  
(HS-LS1-3)

### **Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student generated sources of evidence consistent with scientific ideas, principles, and theories.

--Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.  
(HS-LS1-1)

--Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations,

within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

### **LS1.B: Growth and Development of Organisms**

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

### **LS1.C: Organization for Matter and Energy Flow in Organisms**

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)
- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)

### **Stability and Change**

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

### **Connections to Engineering, Technology, and Applications of Science**

### **Influence of Engineering, Technology, and Science, on Society and the Natural World**

#### **Connections to Nature of Science**

- Scientific Investigations Use a Variety of Methods Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

## Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<p>peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)</p>		
--	--	--

<b>Social and Emotional Learning Standards</b>	
<b>Self-Awareness</b>	<ul style="list-style-type: none"> <li>Recognize one’s personal traits, strengths, and limitations</li> <li>Recognize the importance of self-confidence in handling daily tasks and challenges</li> </ul>
<b>Self-Management</b>	<ul style="list-style-type: none"> <li>Recognize the skills needed to establish and achieve personal and educational goals</li> <li>Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one’s goals</li> </ul>
<b>Social Awareness</b>	<ul style="list-style-type: none"> <li>Demonstrate an understanding of the need for mutual respect when viewpoints differ</li> </ul>
<b>Responsible Decision-Making</b>	<ul style="list-style-type: none"> <li>Develop, implement and model effective problem solving and critical thinking skills</li> </ul>

<b>Interdisciplinary Connections</b>	
<b>ELA Standards</b>	
<ul style="list-style-type: none"> <li><b>RST.11-12.1</b></li> </ul>	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.
<ul style="list-style-type: none"> <li><b>WHST.11-12.8</b></li> </ul>	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 over reliance on any one source and following a standard format for citation.
<ul style="list-style-type: none"> <li><b>SL.II.11–12.2</b></li> </ul>	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.
<ul style="list-style-type: none"> <li><b>L.SS.11–12.1</b></li> </ul>	Demonstrate command of the system and structure of the English language when writing or speaking.
<b>Math Standards</b>	
<ul style="list-style-type: none"> <li><b>MP.4</b></li> </ul>	Model with mathematics.
<ul style="list-style-type: none"> <li><b>HSF-BF.A.1</b></li> </ul>	Write a function that describes a relationship between two quantities.

<b>Computer Science &amp; Design Thinking</b>
<b>8.1 Computer Science</b>

## Lakewood School District Curriculum Guide

Grade: High School

Content Area: Science - Horticulture

- 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
- 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects

### **8.2 Design Thinking**

- 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
- 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
- 8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
- 8.2.12.NT.2: Redesign an existing product to improve form or function.

## **Career Readiness, Life Literacies & Key Skills**

### **9.1 Personal Financial Literacy**

- 9.1.12.CDM.3: Determine ways to leverage debt beneficially
- 9.1.12.EG.6: Analyze the rights and responsibilities of buyers and sellers under consumer protection laws

### **9.2 Career Readiness, Life Literacies, and Key Skills**

- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.

### **9.3 Career & Technical Education (CTE)**

- 9.3.12.AG.1: Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.
- 9.3.12.AG.3: Examine and summarize the importance of health, safety and environmental management systems in AFNR businesses.
- 9.3.12.AG-BIZ.5: Use sales and marketing principles to accomplish AFNR business objectives.
- 9.3.12.AG-ENV.3: Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.
- 9.3.12.AG-FD.1: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.
- 9.3.12.AG-FD.3: Select and process food products for storage, distribution and consumption.
- 9.3.12.AG-PL.1: Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- 9.3.12.AG-PL.4: Apply principles of design in plant systems to enhance an environment (e.g., floral, forest, landscape and farm).

### **9.4 Life Literacies & Key Skills**

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).

### Evidence of Student Learning

**Formative Tasks:**

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers
- Teacher Observation
- DOL
- Quiz Classwork
- NJSLA Released questions
- Problem of the Day

**Alternative Assessments:**

- Teacher-Created Projects
- <https://www.khanacademy.org/>
- Completion of webquests
- On-Line Laboratory activities
- Online assessment activities example:
  - Kahoot
  - Quizizz

**Summative Assessments:**

- Unit Tests
- Midterm Exam
- Final Exam

**Benchmark Assessments:**

- Quarterly Benchmarks
- Beginning/End of Year Assessment
- Unit Common Assessment

### Knowledge & Skills

**Enduring Understandings:**

- Living organisms, including plants, rely on DNA-directed protein production to carry out essential functions necessary for growth, repair, and survival.
- Specialized plant cells and tissues work together in organized systems to maintain healthy structure and function.
- Homeostasis in plants is maintained through feedback mechanisms that regulate internal conditions such as water balance, temperature, and nutrient uptake.
- Photosynthesis converts light energy into stored chemical energy, forming the foundation of plant growth and food production systems.

**Essential Questions:**

- What safety procedures are to be followed everyday, in every instance?
- What are the steps that need to be followed in handling hazardous substances?
- What are the specific rules involved when using different pesticides?
- Are these rules chemical specific?
- What are the parts of a chemical label; and how do you interpret them?
- What are the WPS?
- What are the EPA rules regarding chemical use and disposal?
- Why are listening skills important?
- What constitutes a harmful amount of a hazardous chemical?
- Why is it important to understand what a chemical label says?

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- Carbon-based molecules formed through photosynthesis serve as the building blocks for plant structures and metabolic processes.
- Cellular respiration allows plants to release usable energy from stored sugars to support growth, maintenance, and response to environmental conditions.
- Energy transformation processes in plants involve chemical reactions that must be understood to manage plants safely and effectively.
- Safe horticultural practices depend on understanding how plant systems function and respond to environmental stressors, tools, and chemical inputs.

**Content**

*Students will know...*

- Appropriate shop safety rules and regulations as prescribed by New Jersey State laws, Worker Protection Standards (WPS), and Board of Education policies.
- The safe operation and use of various machines, tools and supplies in the greenhouse and classroom.
- The proper techniques needed in various greenhouse methods of production of plants grown commercially.
- Appropriate skills in reading and mathematics, particularly as they relate to handling hazardous chemicals and safety issues.
- Safety procedures are to be consistently followed and will be monitored throughout the course.
- There are specific procedures involved in handling hazardous situations.
- There are specific rules and procedures in ensuring the safe use of pesticides.
- It is vital that when using hazardous substances, one reads the chemical label.
- The Worker Protection Standards (WPS) are to be followed
- Application of the specific rules for chemical use and disposal as outlined by the EPA
- There are central ideas to identify, describe, evaluate and synthesize in informational texts.
- Listening skills are an important part of safety

**Skills**

*Students will be able to ...*

- The functions of the different safety equipment found in the room.
- Definitions of different kinds of hazardous chemicals: acids, bases, pesticides
- The recommended uses of specific substances
- The importance of having clean water available
- The importance of proper attire.
- The proper amounts of chemicals used and how much is too much.
- Listening skills are important when following safety procedures
- Determine proper attire by reading the label on the pesticide container.
- Find the Worker Protection Standards on chemical labels.
- Identify and define different types of pesticides.
- Identify and define different levels of toxicity.
- Read and decipher chemical labels.
- Identify signal words on chemical labels, like, DANGER, WARNING, and CAUTION
- Identify the four toxicity categories categorized by the EPA
- Calculate the necessary amount of a chemical needed.
- Follow safety procedures using written and verbal prompts.

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- That numbers have meanings and consequences
- Use and approximate equivalents between standard and metric systems to aid in understanding harmful amounts of chemicals.

### Core Instructional & Supplemental Materials

**Suggested Activities/Resources:**

- Introduction to Horticulture as a division of the Applied Plant Sciences.
- Students will design a poster highlighting the parts of a chemical label and identifying the safety procedures that must be followed.
- Create a visual highlighting all of the WPS and EPA rules
- Choose a chemical from the teacher and identify all of the important safety aspects it shows.
- Students will extract the information from the label and identify safety concerns.
- Safety rules should pertain to the information on the label
- Posters will be visually compelling and informative.
- Smart Board Lecture/note taking
- Define terms found on labels
- List and identify safety rules to be used when working with chemicals
- Emphasize the importance of reading labels and following procedures
- Cooperative Learning and Group Work.
- Match game: match the safety rule with the hazard
- Group quiz: What tools do you need? What would you do?
- Calculate the appropriate amounts of chemicals to be used.
- Researching and completing poster
- Successfully identifying and following safety procedures
- Project Planning
- Complete and present poster
- Competitive Practice
- Safety rules and procedures must be followed for success in any and all competitive games.

**Supplemental resources:**

- Text
- Powerpoint presentations
- Smartboard Presentations
- Horticultural tools and supplies
- Lab Practical stations
- Pesticide containers with labels
- Seed packages with labels
- Calculators
- Chromebooks
- Flash card templates
- Class specific email list for communication
- Stationery supplies
- Various job site scenarios
- Field experience
- Team inspection practice
- Google Classroom and Suite
- Greenhouses
- Guest speakers
- Live specimens
- [Race & Social Justice Teacher Resources](#)

### Suggested Accommodations

**English Language Learners:**

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

**Special Education/Students with Disabilities:**

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

**504 Plans:**

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

### **Gifted and Talented:**

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

### **Students at Risk of Failure:**

- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Tiered Activities
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues
- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

### **Economically Disadvantaged:**

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

<b>Unit 2: Floral Design</b>		<b>40 days</b>
<a href="#"><u>New Jersey Learning Standards-Science</u></a>		
<b>HS-LS1-1</b>	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.	
<b>HS-LS1-2</b>	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	
<b>HS-LS1-3</b>	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	
<b>HS-LS1-5</b>	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	
<b>HS-LS1-6</b>	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.	
<b>HS-LS1-7</b>	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	

<b>Science and Engineering Practices</b>	<b>Discipline Core Ideas/Unit Enduring Understandings</b>	<b>Crosscutting Concepts</b>
<b>Developing and Using Models</b>	<b>LS1.A: Structure and Function</b>	<b>Systems and System Models</b> ● Models (e.g., physical, mathematical,

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

--Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

-- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4), (HS-LS1-5), (HS-LS1-7)

### **Planning and Carrying Out Investigations**

Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

--Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

### **Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)

- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3- 1.)

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

- Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

### **LS1.B: Growth and Development of Organisms**

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex

computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)

### **Energy and Matter**

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)

- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)

### **Structure and Function**

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

### **Stability and Change**

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

### **Connections to Engineering, Technology, and Applications of Science**

### **Influence of Engineering, Technology, and Science, on Society and the Natural World**

#### **Connections to Nature of Science**

- Scientific Investigations Use a Variety of Methods Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<p>designs that are supported by multiple and independent student generated sources of evidence consistent with scientific ideas, principles, and theories.</p> <p>--Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)</p> <p>--Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)</p>	<p>organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)</p> <p><b>LS1.C: Organization for Matter and Energy Flow in Organisms</b></p> <ul style="list-style-type: none"> <li>● The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)</li> <li>● The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)</li> </ul>	
--	---	--

<b>Social and Emotional Learning Standards</b>	
<b>Self-Awareness</b>	<ul style="list-style-type: none"> <li>● Recognize one's personal traits, strengths, and limitations</li> <li>● Recognize the importance of self-confidence in handling daily tasks and challenges</li> </ul>
<b>Self-Management</b>	<ul style="list-style-type: none"> <li>● Recognize the skills needed to establish and achieve personal and educational goals</li> <li>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals</li> </ul>
<b>Social Awareness</b>	<ul style="list-style-type: none"> <li>● Demonstrate an understanding of the need for mutual respect when viewpoints differ</li> </ul>
<b>Responsible Decision-Making</b>	<ul style="list-style-type: none"> <li>● Develop, implement and model effective problem solving and critical thinking skills</li> </ul>

## Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<u>Interdisciplinary Connections</u>	
<b>ELA Standards</b>	
<ul style="list-style-type: none"> <li>● <b>RST.11-12.1</b></li> </ul>	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.
<ul style="list-style-type: none"> <li>● <b>WHST.11-12.8</b></li> </ul>	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 over reliance on any one source and following a standard format for citation.
<ul style="list-style-type: none"> <li>● <b>SL.II.11-12.2</b></li> </ul>	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.
<ul style="list-style-type: none"> <li>● <b>L.SS.11-12.1</b></li> </ul>	Demonstrate command of the system and structure of the English language when writing or speaking.
<b>Math Standards</b>	
<ul style="list-style-type: none"> <li>● <b>HSF-IF.C.7</b></li> </ul>	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
<ul style="list-style-type: none"> <li>● <b>HSF-BF.A.1</b></li> </ul>	Write a function that describes a relationship between two quantities.

<u>Computer Science &amp; Design Thinking</u>	
<b>8.1 Computer Science</b>	
<ul style="list-style-type: none"> <li>● 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.</li> <li>● 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects</li> </ul>	
<b>8.2 Design Thinking</b>	
<ul style="list-style-type: none"> <li>● 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.</li> <li>● 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).</li> <li>● 8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.</li> <li>● 8.2.12.NT.2: Redesign an existing product to improve form or function.</li> </ul>	

<u>Career Readiness, Life Literacies &amp; Key Skills</u>	
<b>9.1 Personal Financial Literacy</b>	

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- 9.1.12.CDM.3: Determine ways to leverage debt beneficially
- 9.1.12.EG.6: Analyze the rights and responsibilities of buyers and sellers under consumer protection laws

### **9.2 Career Readiness, Life Literacies, and Key Skills**

- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.

### **9.3 Career & Technical Education (CTE)**

- 9.3.12.AG.1: Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.
- 9.3.12.AG.3: Examine and summarize the importance of health, safety and environmental management systems in AFNR businesses.
- 9.3.12.AG-BIZ.5: Use sales and marketing principles to accomplish AFNR business objectives.
- 9.3.12.AG-ENV.3: Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.
- 9.3.12.AG-FD.1: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.
- 9.3.12.AG-FD.3: Select and process food products for storage, distribution and consumption.
- 9.3.12.AG-PL.1: Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- 9.3.12.AG-PL.4: Apply principles of design in plant systems to enhance an environment (e.g., floral, forest, landscape and farm).

### **9.4 Life Literacies & Key Skills**

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).

## Evidence of Student Learning

### **Formative Tasks:**

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers
- Teacher Observation
- DOL
- Quiz Classwork
- NJSLA Released questions
- Problem of the Day

### **Alternative Assessments:**

- Teacher-Created Projects
- <https://www.khanacademy.org/>
- Completion of webquests
- On-Line Laboratory activities
- Online assessment activities example:
  - Kahoot
  - Quizizz

Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<b>Summative Assessments:</b>	<b>Benchmark Assessments:</b>
<ul style="list-style-type: none"> <li>● Unit Tests</li> <li>● Midterm Exam</li> <li>● Final Exam</li> </ul>	<ul style="list-style-type: none"> <li>● Quarterly Benchmarks</li> <li>● Beginning/End of Year Assessment</li> <li>● Unit Common Assessment</li> </ul>

**Knowledge & Skills**

<p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>● The structure of DNA directs protein production that influences flower color, fragrance, growth patterns, and longevity.</li> <li>● Specialized plant cells and tissues work together to support flowering, water transport, and structural integrity in cut flowers and arrangements.</li> <li>● Homeostasis in plants helps regulate water balance, nutrient movement, and cellular function, all of which affect floral freshness and quality. Photosynthesis provides the stored chemical energy that supports flower development before harvest.</li> <li>● Sugars produced through photosynthesis serve as the foundation for carbon-based molecules that build and maintain floral tissues.</li> <li>● Cellular respiration allows flowers to access stored energy needed for continued metabolism after being cut.</li> </ul> <p>Energy transformations within plant cells continue even after harvest, influencing vase life and overall floral performance.</p> <p>Understanding plant biological processes supports effective floral design practices that preserve plant health, appearance, and durability.</p>	<p><b>Essential Questions:</b></p> <ul style="list-style-type: none"> <li>● What are the appropriate tools/supplies used for experimentation in floral design ?</li> <li>● Which flower forms are best used to fulfill specific functions?</li> <li>● How can mathematical expertise be applied to pricing floral work?</li> <li>● What methods can be used to solve numerical operations?</li> <li>● How do we perform estimations and assess them for error and tolerable limits?</li> <li>● How are tools and equipment safely used?</li> <li>● What are the principles of design?</li> <li>● What academic and job skills are needed for a career in floral design?</li> </ul>
--	--

<p><b>Content</b></p> <p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>● Learn and apply terminology</li> <li>● Learn the tools and supplies used in floral design</li> <li>● Practice design techniques to create centerpieces, arrangements, boutonnieres and corsages</li> <li>● Design and create 4 floral arrangements (2 living, 2 fresh) for the Holiday fundraising sale and</li> </ul>	<p><b>Skills</b></p> <p><i>Students will be able to ...</i></p> <ul style="list-style-type: none"> <li>● The uses of tools and supplies used for floral design</li> <li>● Common cut flowers and classify them according to their use/shape</li> <li>● The techniques used to prepare and preserve cut flowers</li> <li>● The principles and elements of design and their use</li> </ul>
---	--

## Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<p>school grounds beautification</p> <ul style="list-style-type: none"> <li>● The student will design and create a composition related to a particular theme, incorporating an itemized price sheet for supply, labor and mark-up costs</li> <li>● The student is the flower designer, arranger, and salesperson, for his/her arrangement</li> <li>● Student work will be displayed and judged by peer based panels using rubric</li> <li>● The student will use a checklist to self-assess progress during the design process</li> <li>● The teacher will use a checklist to assess progress throughout the design process</li> <li>● Judging guidelines for the NJ FFA Horticulture Expo will be applied by the student to his/her own work and the work of others</li> </ul>	<ul style="list-style-type: none"> <li>● The shapes of various styles of design</li> <li>● Proper techniques in the creation of holiday arrangements, centerpieces, boutonnieres and corsages</li> <li>● Estimation in the number of form, filler, and focal flowers needed in the arrangement</li> <li>● Calculation of the cost, mark-up of value, and profit of a floral arrangement</li> <li>● Exploration of careers in floriculture and design</li> </ul>
---	---

<b>Core Instructional &amp; Supplemental Materials</b>
--

<p><b>Suggested Activities/Resources:</b></p> <ul style="list-style-type: none"> <li>● Lecture</li> <li>● Terminology flash cards (pictorial and definitional)</li> <li>● Show photo examples of previous student work and professional designs</li> <li>● Use live examples of flowers to practice identification students draw and describe the flowers/flower journal</li> <li>● Guest speaker – Florist, floral wholesaler</li> <li>● Estimation/purchasing activity</li> <li>● Profit calculation activity</li> <li>● Create floral arrangements on paper first or with materials such as pasta, pipe cleaners, clay, etc. to practice designs</li> <li>● Use a variety of floral books and magazines to search for ideas for floral arrangements</li> <li>● Conduct a class for teachers or community members, teaching them how to create floral designs</li> <li>● Create “how to” demonstrations for construction of the various shapes of floral designs</li> <li>● Use <a href="http://www.csatracker.com">www.csatracker.com</a> (on-line quizzing) to practice identification skills of flowers</li> <li>● Floral design checklist</li> <li>● Floral design notebook</li> </ul>	<p><b>Supplemental resources:</b></p> <ul style="list-style-type: none"> <li>● Text</li> <li>● Powerpoint presentations</li> <li>● Smartboard Presentations</li> <li>● Horticultural tools and supplies</li> <li>● Lab Practical stations</li> <li>● Pesticide containers with labels</li> <li>● Seed packages with labels</li> <li>● Calculators</li> <li>● Chromebooks</li> <li>● Flash card templates</li> <li>● Class specific email list for communication</li> <li>● Stationery supplies</li> <li>● Various job site scenarios</li> <li>● Field experience</li> <li>● Team inspection practice</li> <li>● Google Classroom and Suite</li> <li>● Greenhouses</li> <li>● Guest speakers</li> <li>● Live specimens</li> <li>● <a href="#">Race &amp; Social Justice Teacher Resources</a></li> </ul>
--	---

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- Project Planning
- Create a powerpoint identifying cutting methods for branches, flowers, and preservation techniques
- Plan and execute a holiday floral sale

### Suggested Accommodations

#### English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

#### Special Education/Students with Disabilities:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

**504 Plans:**

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

**Gifted and Talented:**

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

**Students at Risk of Failure:**

- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Tiered Activities
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- Visual Cues
- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

**Economically Disadvantaged:**

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

### Unit 3: Greenhouse Production

**40 days**

[New Jersey Learning Standards-Science](#)

<b>HS-LS1-1</b>	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
<b>HS-LS1-2</b>	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
<b>HS-LS1-3</b>	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
<b>HS-LS1-5</b>	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
<b>HS-LS1-6</b>	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
<b>HS-LS1-7</b>	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Science - Horticulture

Science and Engineering Practices	Discipline Core Ideas/Unit Enduring Understandings	Crosscutting Concepts
<p><b>Developing and Using Models</b> Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. --Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) -- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HSL1-4), (HS-LS1-5), (HS-LS1-7)</p> <p><b>Planning and Carrying Out Investigations</b> Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. --Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)</p>	<p><b>LS1.A: Structure and Function</b></p> <ul style="list-style-type: none"> <li>• Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)</li> <li>• All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3- 1.)</li> <li>• Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)</li> <li>• Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)</li> </ul> <p><b>LS1.B: Growth and Development of Organisms</b></p> <ul style="list-style-type: none"> <li>• In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing</li> </ul>	<p><b>Systems and System Models</b></p> <ul style="list-style-type: none"> <li>• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)</li> </ul> <p><b>Energy and Matter</b></p> <ul style="list-style-type: none"> <li>• Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)</li> <li>• Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)</li> </ul> <p><b>Structure and Function</b></p> <ul style="list-style-type: none"> <li>• Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)</li> </ul> <p><b>Stability and Change</b></p> <ul style="list-style-type: none"> <li>• Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)</li> </ul> <p><b>Connections to Engineering, Technology, and Applications of Science</b></p> <p><b>Influence of Engineering, Technology, and Science, on Society and the Natural World</b></p> <ul style="list-style-type: none"> <li>• Scientific Investigations Use a Variety of Methods Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)</li> </ul>

Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<p><b>Constructing Explanations and Designing Solutions</b>          Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student generated sources of evidence consistent with scientific ideas, principles, and theories.          --Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)          --Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)</p>	<p>identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)</p> <p><b>LS1.C: Organization for Matter and Energy Flow in Organisms</b></p> <ul style="list-style-type: none"> <li>● The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)</li> <li>● The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)</li> </ul>	
---	--	--

<b>Social and Emotional Learning Standards</b>	
<b>Self-Awareness</b>	<ul style="list-style-type: none"> <li>● Recognize one’s personal traits, strengths, and limitations</li> <li>● Recognize the importance of self-confidence in handling daily tasks and challenges</li> </ul>
<b>Self-Management</b>	<ul style="list-style-type: none"> <li>● Recognize the skills needed to establish and achieve personal and educational goals</li> <li>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one’s goals</li> </ul>
<b>Social Awareness</b>	<ul style="list-style-type: none"> <li>● Demonstrate an understanding of the need for mutual respect when viewpoints differ</li> </ul>
<b>Responsible Decision-Making</b>	<ul style="list-style-type: none"> <li>● Develop, implement and model effective problem solving and critical thinking skills</li> </ul>

## Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<u>Interdisciplinary Connections</u>	
<b>ELA Standards</b>	
<ul style="list-style-type: none"> <li>● <b>RST.11-12.1</b></li> </ul>	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.
<ul style="list-style-type: none"> <li>● <b>WHST.11-12.8</b></li> </ul>	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 over reliance on any one source and following a standard format for citation.
<ul style="list-style-type: none"> <li>● <b>SL.II.11-12.2</b></li> </ul>	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.
<ul style="list-style-type: none"> <li>● <b>L.SS.11-12.1</b></li> </ul>	Demonstrate command of the system and structure of the English language when writing or speaking.
<b>Math Standards</b>	
<ul style="list-style-type: none"> <li>● <b>MP.4</b></li> </ul>	Model with mathematics.
<ul style="list-style-type: none"> <li>● <b>HSF-BF.A.1</b></li> </ul>	Write a function that describes a relationship between two quantities.

<u>Computer Science &amp; Design Thinking</u>	
<b><u>8.1 Computer Science</u></b>	
<ul style="list-style-type: none"> <li>● 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.</li> <li>● 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects</li> </ul>	
<b><u>8.2 Design Thinking</u></b>	
<ul style="list-style-type: none"> <li>● 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.</li> <li>● 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).</li> <li>● 8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.</li> <li>● 8.2.12.NT.2: Redesign an existing product to improve form or function.</li> </ul>	

<u>Career Readiness, Life Literacies &amp; Key Skills</u>	
<b><u>9.1 Personal Financial Literacy</u></b>	
<ul style="list-style-type: none"> <li>● 9.1.12.CDM.3: Determine ways to leverage debt beneficially</li> </ul>	

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

9.1.12.EG.6: Analyze the rights and responsibilities of buyers and sellers under consumer protection laws

### **9.2 Career Readiness, Life Literacies, and Key Skills**

- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.

### **9.3 Career & Technical Education (CTE)**

- 9.3.12.AG.1: Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.
- 9.3.12.AG.3: Examine and summarize the importance of health, safety and environmental management systems in AFNR businesses.
- 9.3.12.AG-BIZ.5: Use sales and marketing principles to accomplish AFNR business objectives.
- 9.3.12.AG-ENV.3: Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.
- 9.3.12.AG-FD.1: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.
- 9.3.12.AG-FD.3: Select and process food products for storage, distribution and consumption.
- 9.3.12.AG-PL.1: Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- 9.3.12.AG-PL.4: Apply principles of design in plant systems to enhance an environment (e.g., floral, forest, landscape and farm).

### **9.4 Life Literacies & Key Skills**

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).

## Evidence of Student Learning

### **Formative Tasks:**

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers
- Teacher Observation
- DOL
- Quiz Classwork
- NJSLA Released questions
- Problem of the Day

### **Alternative Assessments:**

- Teacher-Created Projects
- <https://www.khanacademy.org/>
- Completion of webquests
- On-Line Laboratory activities
- Online assessment activities example:
  - Kahoot
  - Quizizz

## Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<b>Summative Assessments:</b> <ul style="list-style-type: none"> <li>● Unit Tests</li> <li>● Midterm Exam</li> <li>● Final Exam</li> </ul>	<b>Benchmark Assessments:</b> <ul style="list-style-type: none"> <li>● Quarterly Benchmarks</li> <li>● Beginning/End of Year Assessment</li> <li>● Unit Common Assessment</li> </ul>
--	--

<b>Knowledge &amp; Skills</b>
-------------------------------

<b>Enduring Understandings:</b> <ul style="list-style-type: none"> <li>● Genetic information stored in DNA controls protein production that influences plant growth rate, structure, and response to greenhouse conditions.</li> <li>● Specialized plant cells, tissues, and organ systems interact to support water transport, nutrient uptake, and photosynthesis in greenhouse-grown plants.</li> <li>● Plants maintain homeostasis through feedback mechanisms that regulate temperature response, transpiration, and nutrient balance.</li> <li>● Photosynthesis converts light energy into stored chemical energy, making light intensity and duration critical factors in greenhouse production.</li> <li>● Sugars produced through photosynthesis are used to form complex carbon-based molecules that support plant structure, growth, and reproduction.</li> <li>● Cellular respiration releases usable energy from stored sugars, enabling plants to grow, repair tissues, and respond to environmental changes.</li> <li>● Energy transformations in plants depend on environmental conditions that can be monitored and adjusted in a greenhouse system.</li> <li>● Effective greenhouse production relies on understanding plant biological processes to optimize growth while maintaining plant health and safety.</li> </ul>	<b>Essential Questions:</b> <ul style="list-style-type: none"> <li>● How can skills in spelling, definitions, and word recognition help prepare students careers in horticulture?</li> <li>● Why is reading comprehension an important skill to use in identifying the needs in greenhouse crop production?</li> <li>● How important is precision and accuracy?</li> <li>● What new outcomes can be produced by experimenting with genetics?</li> <li>● What types of calculations must be used in greenhouse crop production?</li> <li>● What types of plants will be used for the different methods of propagation?</li> <li>● How can geometric models and designs help in planning growing schedules for specific plants?</li> <li>● What safety procedures should be followed when working in the greenhouse?</li> <li>● What are the best cultural requirements, for optimum growth, of different species?</li> </ul>
--	---

<b>Content</b> <i>Students will know...</i> <ul style="list-style-type: none"> <li>● Learn and apply terminology</li> <li>● The proper regulations of light water and fertilizer for optimum growth of different species in a greenhouse</li> <li>● Growing methods/schedules for various crops</li> <li>● Careers in the Greenhouse Industry</li> </ul>	<b>Skills</b> <i>Students will be able to ...</i> <ul style="list-style-type: none"> <li>● The importance and scope of the greenhouse industry</li> <li>● Various propagation and pinching processes</li> <li>● The process of hydroponics crop production</li> <li>● A growing schedule for a specific plant incorporating the proper cultural requirements</li> <li>● Production methods on foliage, bedding,</li> </ul>
---	---

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- Correct spelling and word recognition are needed when following directions in greenhouse crop production
- Reading comprehension and context clues are important in identifying the needs in greenhouse crop production
- When performing mathematical operations with measured quantities, answers should reflect the degree of precision and accuracy of the input data.
- Detail the principles and methods genetic material can be altered by natural and/or artificial means; mutations and new gene combinations may have positive, negative, or no effect on organisms or species.
- The propagation of plants involves the use and understanding of numbers and that measurements need to be accurate
- Geometric models and designs can help in planning crop production
- Apply proper safety procedures when working in the greenhouse
- Plants are very diverse and have different cultural requirements

- vegetable, and potted flowering plants
- Common and scientific names for foliage, bedding, vegetable, and potted flowering plants
  - Production practices used in forcing bulbs and plants to flower
  - The maintenance of proper environmental conditions in the greenhouse
  - A self designed balanced fertilizer program for a plant that is grown commercially to the greenhouse
  - setting
  - Transplanting techniques for rooted cuttings and potted plants
  - The addition of soil amendments in drainage and moisture retention in soil
  - The control and monitoring of light,(both natural and artificial) used in crop production
  - Monitoring techniques and research in watering needs of plants
  - Knowledge of growth stimulants, retardants, and rooting hormones control plant growth and the situations that merit usage
  - Perform calculations associated with crop production
  - Knowledge of careers associated with greenhouse management

### Core Instructional & Supplemental Materials

**Suggested Activities/Resources:**

- Lecture
- Show slides or pictures of different types of plants and the methods used to propagate and divide
- Discussion of safety procedures that need to be followed and steps involved in successful crop growth
- Vocabulary
- Practice cuttings and plantings
- Cooperative Learning and Group Work
- Research genetic plant engineers to see how they have used these techniques to produce new species
- Students can develop growing schedules for different plants to be grown in the greenhouse
- Force bulbs and create a bulb fundraiser
- Raise and sell bedding plants
- Self- Assessment
- Observe the growth of sample and determine if

**Supplemental resources:**

- Text
- Powerpoint presentations
- Smartboard Presentations
- Horticultural tools and supplies
- Lab Practical stations
- Pesticide containers with labels
- Seed packages with labels
- Calculators
- Chromebooks
- Flash card templates
- Class specific email list for communication
- Stationery supplies
- Various job site scenarios
- Field experience
- Team inspection practice

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- designed growing schedule was successful
- Record data and compare results to the rest of class; What was done right? What was wrong?
- Self and Peer Assessment
- Research careers in the greenhouse industry and decide which ones would best fit personal strengths
- Project Planning
- Develop a Entrepreneurial greenhouse crop production plan

- Google Classroom and Suite
- Greenhouses
- Guest speakers
- Live specimens
- [Race & Social Justice Teacher Resources](#)
- [System Designs](#)

### Suggested Accommodations

#### English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

#### Special Education/Students with Disabilities:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups

- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

**504 Plans:**

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

**Gifted and Talented:**

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

**Students at Risk of Failure:**

- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Tiered Activities
- Manipulatives/Concrete Models

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues
- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

**Economically Disadvantaged:**

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

<b>Unit 4: Fruit and Vegetable Production</b>		<b>40 days</b>
<a href="#"><u>New Jersey Learning Standards-Science</u></a>		
<b>HS-LS1-1</b>	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.	
<b>HS-LS1-2</b>	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	
<b>HS-LS1-3</b>	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	
<b>HS-LS1-5</b>	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	

Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<b>HS-LS1-6</b>	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
<b>HS-LS1-7</b>	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

<b>Science and Engineering Practices</b>	<b>Discipline Core Ideas/Unit Enduring Understandings</b>	<b>Crosscutting Concepts</b>
<p><b>Developing and Using Models</b> Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. --Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) -- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4), (HS-LS1-5), (HS-LS1-7)</p> <p><b>Planning and Carrying Out Investigations</b> Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. --Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the</p>	<p><b>LS1.A: Structure and Function</b></p> <ul style="list-style-type: none"> <li>● Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)</li> <li>● All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3- 1.)</li> <li>● Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)</li> <li>● Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)</li> </ul> <p><b>LS1.B: Growth and Development of Organisms</b></p> <ul style="list-style-type: none"> <li>● In multicellular organisms individual cells grow and then divide via a process called mitosis,</li> </ul>	<p><b>Systems and System Models</b></p> <ul style="list-style-type: none"> <li>● Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)</li> </ul> <p><b>Energy and Matter</b></p> <ul style="list-style-type: none"> <li>● Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)</li> <li>● Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)</li> </ul> <p><b>Structure and Function</b></p> <ul style="list-style-type: none"> <li>● Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)</li> </ul> <p><b>Stability and Change</b></p> <ul style="list-style-type: none"> <li>● Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)</li> </ul> <p><b>Connections to Engineering, Technology, and Applications of Science</b></p> <p><b>Influence of Engineering, Technology, and Science, on Society and the Natural World</b></p>

Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<p>precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)</p> <p><b>Constructing Explanations and Designing Solutions</b> Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student generated sources of evidence consistent with scientific ideas, principles, and theories.</p> <p>--Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)</p> <p>--Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)</p>	<p>thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)</p> <p><b>LS1.C: Organization for Matter and Energy Flow in Organisms</b></p> <ul style="list-style-type: none"> <li>● The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)</li> <li>● The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)</li> </ul>	<p><b>Connections to Nature of Science</b></p> <ul style="list-style-type: none"> <li>● Scientific Investigations Use a Variety of Methods Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)</li> </ul>
---	--	---

**Social and Emotional Learning Standards**

<b>Self-Awareness</b>	<ul style="list-style-type: none"> <li>● Recognize one’s personal traits, strengths, and limitations</li> <li>● Recognize the importance of self-confidence in handling daily tasks and challenges</li> </ul>
<b>Self-Management</b>	<ul style="list-style-type: none"> <li>● Recognize the skills needed to establish and achieve personal and educational goals</li> <li>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one’s goals</li> </ul>

## Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<b>Social Awareness</b>	<ul style="list-style-type: none"> <li>● Demonstrate an understanding of the need for mutual respect when viewpoints differ</li> </ul>
<b>Responsible Decision-Making</b>	<ul style="list-style-type: none"> <li>● Develop, implement and model effective problem solving and critical thinking skills</li> </ul>

<u>Interdisciplinary Connections</u>	
<b>ELA Standards</b>	
● <b>RST.11-12.1</b>	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.
● <b>WHST.11-12.8</b>	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 over reliance on any one source and following a standard format for citation.
● <b>SL.II.11-12.2</b>	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.
● <b>L.SS.11-12.1</b>	Demonstrate command of the system and structure of the English language when writing or speaking.
<b>Math Standards</b>	
● <b>MP.4</b>	Model with mathematics.
● <b>HSF-IF.C.7</b>	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

<u>Computer Science &amp; Design Thinking</u>	
<b><u>8.1 Computer Science</u></b>	
<ul style="list-style-type: none"> <li>● 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.</li> <li>● 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects</li> </ul>	
<b><u>8.2 Design Thinking</u></b>	
<ul style="list-style-type: none"> <li>● 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.</li> <li>● 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).</li> <li>● 8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.</li> <li>● 8.2.12.NT.2: Redesign an existing product to improve form or function.</li> </ul>	

## Lakewood School District Curriculum Guide

Grade: High School

Content Area: Science - Horticulture

### Career Readiness, Life Literacies & Key Skills

#### 9.1 Personal Financial Literacy

- 9.1.12.CDM.3: Determine ways to leverage debt beneficially
- 9.1.12.EG.6: Analyze the rights and responsibilities of buyers and sellers under consumer protection laws

#### 9.2 Career Readiness, Life Literacies, and Key Skills

- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.

#### 9.3 Career & Technical Education (CTE)

- 9.3.12.AG.1: Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.
- 9.3.12.AG.3: Examine and summarize the importance of health, safety and environmental management systems in AFNR businesses.
- 9.3.12.AG-BIZ.5: Use sales and marketing principles to accomplish AFNR business objectives.
- 9.3.12.AG-ENV.3: Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.
- 9.3.12.AG-FD.1: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.
- 9.3.12.AG-FD.3: Select and process food products for storage, distribution and consumption.
- 9.3.12.AG-PL.1: Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- 9.3.12.AG-PL.4: Apply principles of design in plant systems to enhance an environment (e.g., floral, forest, landscape and farm).

#### 9.4 Life Literacies & Key Skills

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).

### **Evidence of Student Learning**

#### **Formative Tasks:**

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers
- Teacher Observation
- DOL

#### **Alternative Assessments:**

- Teacher-Created Projects
- <https://www.khanacademy.org/>
- Completion of webquests
- On-Line Laboratory activities
- Online assessment activities example:
  - Kahoot
  - Quizizz

## Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<ul style="list-style-type: none"> <li>● Quiz Classwork</li> <li>● NJSLA Released questions</li> <li>● Problem of the Day</li> </ul>	
<b>Summative Assessments:</b> <ul style="list-style-type: none"> <li>● Unit Tests</li> <li>● Midterm Exam</li> <li>● Final Exam</li> </ul>	<b>Benchmark Assessments:</b> <ul style="list-style-type: none"> <li>● Quarterly Benchmarks</li> <li>● Beginning/End of Year Assessment</li> <li>● Unit Common Assessment</li> </ul>

<b>Knowledge &amp; Skills</b>
-------------------------------

<b>Enduring Understandings:</b> <ul style="list-style-type: none"> <li>● Genetic information stored in DNA influences traits such as fruit size, flavor, color, disease resistance, and yield.</li> <li>● Specialized plant cells, tissues, and organ systems work together to support flowering, fruit development, and nutrient transport.</li> <li>● Plants maintain homeostasis through feedback mechanisms that regulate water balance, nutrient uptake, and internal energy use.</li> <li>● Photosynthesis provides the stored chemical energy necessary for fruit and vegetable growth and productivity.</li> <li>● Sugars produced during photosynthesis are used to build complex carbon-based molecules essential for plant structure and edible tissues.</li> <li>● Cellular respiration releases usable energy from stored sugars to support growth, ripening, and maintenance of fruits and vegetables.</li> <li>● Environmental conditions influence energy transformation processes that directly affect crop quality and yield.</li> <li>● Successful fruit and vegetable production relies on applying plant biological principles to support healthy growth and sustainable practices.</li> </ul>	<b>Essential Questions:</b> <ul style="list-style-type: none"> <li>● What are the basic requirements for growth and maintenance of fruits and vegetables?</li> <li>● How can you calculate the correct amount of fertilizer to use?</li> <li>● What is the best layout design for a vegetable bed?</li> <li>● How can different fruits and vegetables be distinguished from each other?</li> <li>● How can you analyze a Hardiness Zone map?</li> <li>● What steps are needed in preparation before growing fruits and vegetables?</li> </ul>
---	---

<b>Content</b> <i>Students will know...</i> <ul style="list-style-type: none"> <li>● Learn and apply terminology</li> <li>● Basic requirements for growth and maintenance</li> <li>● Aesthetic knowledge is important in creating visually pleasing landscape designs</li> <li>● Reading and following directions will ensure</li> </ul>	<b>Skills</b> <i>Students will be able to ...</i> <ul style="list-style-type: none"> <li>● The concept of hardiness, tenderness, annual, biennial and perennial</li> <li>● The steps in developing a garden plan</li> <li>● Selection of an appropriate garden site for fruit and vegetable production</li> <li>● The methods used in production of fruit crops</li> </ul>
---	---

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

proper care and maintenance of fruits and vegetables.

- Land measurement and calculating pesticide usage require accuracy and precision.
- Identification of common fruits and vegetables will aid in their care and growth.
- Only certain plants can be grown in specific areas and that the identification of these areas will ensure a successful crop.
- Care and maintenance is crop specific.
- Fertilizer is to be used with care and safety procedures in mind.
- Proper design of planting beds will ensure a successful crop.
- It is important to differentiate between the structure, characteristics and basic needs of plants to be used in specific designs.
- Seasonal changes must be taken into account when designing outdoor projects

- Determination of what type and how much of a crop to grow
- The appropriate selection of crops needing direct seeding vs. transplanting
- Differentiating varieties of fruits and vegetables
- Differentiating common fruits and vegetables grown in New Jersey
- Proper watering techniques used in fruit and vegetable production
- Analysis of a Hardiness Zone Map
- Various types of fertilizers and the appropriate times to use
- Compare various methods of weed control (Chemical and Mechanical)
- The guidelines of when and how to harvest
- Identify careers in fruit and vegetable production

### Core Instructional & Supplemental Materials

**Suggested Activities/Resources:**

- Lecture
- Demonstrations of tools and techniques
- Slides of common fruits and vegetables
- Textbook reading and questions
- Guest speaker – vegetable grower, master gardener, etc.
- Field Trips – Farmers Against Hunger
- Cooperative Learning and Group Work...
- Design and plant a fruit and vegetable garden for the courtyard
- Hold a plant sale of herbs and vegetables
- Hold a “Five A Day” week, encouraging others to eat fruits and vegetables
- Labs – experiments with fertilizers, water, insect/weed control
- Weekly log/scrapbook of plant maintenance tasks and observations of change
- [www.csatracker.com](http://www.csatracker.com) – online quizzing of fruit and vegetable ID

**Supplemental resources:**

- Text
- Powerpoint presentations
- Smartboard Presentations
- Horticultural tools and supplies
- Lab Practical stations
- Pesticide containers with labels
- Seed packages with labels
- Calculators
- Chromebooks
- Flash card templates
- Class specific email list for communication
- Stationery supplies
- Various job site scenarios
- Field experience
- Team inspection practice
- Google Classroom and Suite
- Greenhouses
- Guest speakers
- Live specimens

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- Project Planning
- Create a bulletin board of fruit and vegetable production in the United States
- Create information brochures on fruit and vegetable gardening
- Create lessons to teach the elementary school students on this topic
- Competition Practice
- Practice for the Floriculture CDE
- Practice for the Demonstration Event CDE
- Grow vegetables for sale in the class greenhouse
- Select varieties, prepare media, plant and transplant seeds, and create a marketing strategy for their crops
- This will be a class project. Small groups of students will be in charge of certain crops.
- Students will write a news article or lab report describing their project
- Progress checks for proper care will be made on a weekly or daily basis.
- The marketing strategy will be collected as a final evaluation.

- [Race & Social Justice Teacher Resources](#)
- [Sustainability](#)

### Suggested Accommodations

#### English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

**Special Education/Students with Disabilities:**

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

**504 Plans:**

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

**Gifted and Talented:**

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions

- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

**Students at Risk of Failure:**

- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Tiered Activities
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues
- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

**Economically Disadvantaged:**

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<b>Unit 5: Pest Control/ IPM</b>	<b>40 days</b>
<a href="#"><u>New Jersey Learning Standards-Science</u></a>	
<b>HS-LS1-1</b>	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
<b>HS-LS1-2</b>	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
<b>HS-LS1-3</b>	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
<b>HS-LS1-5</b>	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
<b>HS-LS1-6</b>	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
<b>HS-LS1-7</b>	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

<b>Science and Engineering Practices</b>	<b>Discipline Core Ideas/Unit Enduring Understandings</b>	<b>Crosscutting Concepts</b>
<p><b>Developing and Using Models</b> Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. --Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) -- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HSL1-4), (HS-LS1-5), (HS-LS1-7)</p> <p><b>Planning and Carrying Out Investigations</b></p>	<p><b>LS1.A: Structure and Function</b></p> <ul style="list-style-type: none"> <li>• Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)</li> <li>• All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3- 1.)</li> <li>• Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)</li> <li>• Feedback mechanisms maintain a living system’s internal conditions within certain limits</li> </ul>	<p><b>Systems and System Models</b></p> <ul style="list-style-type: none"> <li>• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)</li> </ul> <p><b>Energy and Matter</b></p> <ul style="list-style-type: none"> <li>• Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)</li> <li>• Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)</li> </ul> <p><b>Structure and Function</b></p> <ul style="list-style-type: none"> <li>• Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its</li> </ul>

Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

--Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student generated sources of evidence consistent with scientific ideas, principles, and theories.

--Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)

--Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including

and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**LS1.B: Growth and Development of Organisms**

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

**LS1.C: Organization for Matter and Energy Flow in Organisms**

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)
- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled

function and/or solve a problem. (HS-LS1-1)

**Stability and Change**

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

**Connections to Engineering, Technology, and Applications of Science**

**Influence of Engineering, Technology, and Science, on Society and the Natural World**

**Connections to Nature of Science**

- Scientific Investigations Use a Variety of Methods Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

## Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<p>students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)</p>	<p>into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)</p>	
---	--	--

<b>Social and Emotional Learning Standards</b>	
<b>Self-Awareness</b>	<ul style="list-style-type: none"> <li>● Recognize one's personal traits, strengths, and limitations</li> <li>● Recognize the importance of self-confidence in handling daily tasks and challenges</li> </ul>
<b>Self-Management</b>	<ul style="list-style-type: none"> <li>● Recognize the skills needed to establish and achieve personal and educational goals</li> <li>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals</li> </ul>
<b>Social Awareness</b>	<ul style="list-style-type: none"> <li>● Demonstrate an understanding of the need for mutual respect when viewpoints differ</li> </ul>
<b>Responsible Decision-Making</b>	<ul style="list-style-type: none"> <li>● Develop, implement and model effective problem solving and critical thinking skills</li> </ul>

<b>Interdisciplinary Connections</b>	
<b>ELA Standards</b>	
● <b>RST.11-12.1</b>	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.
● <b>WHST.11-12.8</b>	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 over reliance on any one source and following a standard format for citation.
● <b>SL.II.11-12.2</b>	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.
● <b>L.SS.11-12.1</b>	Demonstrate command of the system and structure of the English language when writing or speaking.
<b>Math Standards</b>	
● <b>HSF-BF.A.1</b>	Write a function that describes a relationship between two quantities.
● <b>HSF-IF.C.7</b>	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

**Computer Science & Design Thinking****8.1 Computer Science**

- 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
- 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects

**8.2 Design Thinking**

- 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
- 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
- 8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
- 8.2.12.NT.2: Redesign an existing product to improve form or function.

**Career Readiness, Life Literacies & Key Skills****9.1 Personal Financial Literacy**

- 9.1.12.CDM.3: Determine ways to leverage debt beneficially
- 9.1.12.EG.6: Analyze the rights and responsibilities of buyers and sellers under consumer protection laws

**9.2 Career Readiness, Life Literacies, and Key Skills**

- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.

**9.3 Career & Technical Education (CTE)**

- 9.3.12.AG.1: Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.
- 9.3.12.AG.3: Examine and summarize the importance of health, safety and environmental management systems in AFNR businesses.
- 9.3.12.AG-BIZ.5: Use sales and marketing principles to accomplish AFNR business objectives.
- 9.3.12.AG-ENV.3: Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.
- 9.3.12.AG-FD.1: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.
- 9.3.12.AG-FD.3: Select and process food products for storage, distribution and consumption.
- 9.3.12.AG-PL.1: Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
- 9.3.12.AG-PL.4: Apply principles of design in plant systems to enhance an environment (e.g., floral, forest, landscape and farm).

**9.4 Life Literacies & Key Skills**

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).

### Evidence of Student Learning

**Formative Tasks:**

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers
- Teacher Observation
- DOL
- Quiz Classwork
- NJSLA Released questions
- Problem of the Day

**Alternative Assessments:**

- Teacher-Created Projects
- <https://www.khanacademy.org/>
- Completion of webquests
- On-Line Laboratory activities
- Online assessment activities example:
  - Kahoot
  - Quizizz

**Summative Assessments:**

- Unit Tests
- Midterm Exam
- Final Exam

**Benchmark Assessments:**

- Quarterly Benchmarks
- Beginning/End of Year Assessment
- Unit Common Assessment

### Knowledge & Skills

**Enduring Understandings:**

- DNA-directed protein production influences the growth, defenses, and survival of plants as well as the development and behavior of pests.
- Specialized cells and systems within plants function together to support defense responses and recovery from pest damage.
- Homeostasis in plants involves feedback mechanisms that regulate responses to biotic stressors such as insects, pathogens, and weeds.
- Photosynthesis provides the energy necessary for plants to grow and recover from pest-related damage.

**Essential Questions:**

- What are the safety procedures that must be followed to ensure a healthy environment when applying and using pesticides?
- What steps and procedures must be followed when writing an IPM program?
- How can the optimum amounts used be calculated?
- How will the pesticide affect the environment?
- What are the different types of pesticides and how are they used?
- How is the equipment used calibrated?
- How is surplus disposed of?

## Lakewood School District Curriculum Guide

<b>Grade: High School</b>	<b>Content Area: Science - Horticulture</b>
---------------------------	---

<ul style="list-style-type: none"> <li>● Sugars produced through photosynthesis serve as the foundation for carbon-based molecules involved in plant structure and defense.</li> <li>● Cellular respiration allows plants to access stored energy needed for repair, defense, and continued growth under pest pressure.</li> <li>● Pest populations and plant health are influenced by interactions between organisms and their environment.</li> <li>● Integrated Pest Management relies on understanding biological processes to reduce harm while maintaining healthy, productive plant systems</li> </ul>	
<p><b>Content</b> <i>Students will know...</i></p> <ul style="list-style-type: none"> <li>● Learn and apply terminology</li> <li>● Beneficial Insects vs. harmful insects</li> <li>● Entry routes of pesticides</li> <li>● First aid steps for pesticide poisoning</li> <li>● Individual life cycles of each of the 4 major categories of pests             <ul style="list-style-type: none"> <li>● The most effective point of disruption in a particular organisms life cycle</li> <li>● The care and maintenance of beneficial insects as part of an IPM program</li> <li>● The physical signs of deficiency or pest damage on leaves stems and roots</li> <li>● The pathways that pesticides enter the environment and the modes for detoxification</li> <li>● The organic alternatives for every major class of pesticide and methods of application</li> </ul> </li> </ul>	<p><b>Skills</b> <i>Students will be able to ...</i></p> <ul style="list-style-type: none"> <li>● The importance of integrated pest management</li> <li>● Best management practices</li> <li>● The components of an Integrated Pest Management Program             <ul style="list-style-type: none"> <li>● How plant pests cause financial losses</li> <li>● The types of pesticides and their use</li> <li>● The identification of insects, diseases, and weeds and select a control method for each</li> <li>● Examples of successful use of biological control</li> <li>● The type of pesticide and degree of toxicity from a pesticide label and explain when it should be read</li> <li>● The recommended precautions in the mixing and handling of each pesticide</li> <li>● A first aid plan for pesticide poisoning</li> <li>● Calibration of equipment used in applying pesticides</li> <li>● Methods of applying pesticides</li> <li>● The relationship between the life cycle of insects and timing of insecticide application                 <ul style="list-style-type: none"> <li>● The environmental concerns involved with pesticide use</li> <li>● Proper disposal of surplus pesticides and empty containers</li> <li>● Methods of pest control in a greenhouse, in the landscape, and in vegetable production</li> </ul> </li> </ul> </li> </ul>

<b>Core Instructional &amp; Supplemental Materials</b>	
<p><b>Suggested Activities/Resources:</b></p> <ul style="list-style-type: none"> <li>● Lecture</li> </ul>	<p><b>Supplemental resources:</b></p> <ul style="list-style-type: none"> <li>● Text</li> </ul>

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>● Terminology flash cards (pictorial and definitional)</li> <li>● Guest speaker from NJDEP – Pesticide Licensure</li> <li>● Collect insects and diseased plants – observe under the microscope and make sketch comparisons</li> <li>● Raise beneficial insects such as ladybugs, butterflies, and praying mantis</li> <li>● Write persuasive letters and present them to the class, take a vote and evaluate presentations</li> <li>● Visit the Beneficial Insect Laboratory in Trenton</li> <li>● Write a story about the life of a pest including certain key stages</li> <li>● Use <a href="http://www.csatracker.com">www.csatracker.com</a> (online quizzing) to practice identification skills</li> <li>● Participation in a discussion about the use of pesticides and their effect on the environment</li> <li>● Create a powerpoint identifying plant pest and diseases</li> <li>● Plan a persuasive speech on the topic of pesticides and the environment</li> <li>● Create a brochure outlining safe uses of pesticides or methods of preventing pest damage</li> <li>● Students will perform a mock pesticide application</li> <li>● Students will pretend that they are asked to spray a pesticide on the job.</li> <li>● Using non-pesticide products, students will diagnose pest problems and perform calibrations, safety procedures, and application techniques</li> <li>● Students will work in teams to complete the task</li> <li>● Collect “documentation records” from student teams (similar to the paperwork that is completed on the job)</li> </ul> | <ul style="list-style-type: none"> <li>● Powerpoint presentations</li> <li>● Smartboard Presentations</li> <li>● Horticultural tools and supplies</li> <li>● Lab Practical stations</li> <li>● Pesticide containers with labels</li> <li>● Seed packages with labels</li> <li>● Calculators</li> <li>● Chromebooks</li> <li>● Flash card templates</li> <li>● Class specific email list for communication</li> <li>● Stationery supplies</li> <li>● Various job site scenarios</li> <li>● Field experience</li> <li>● Team inspection practice</li> <li>● Google Classroom and Suite</li> <li>● Greenhouses</li> <li>● Guest speakers</li> <li>● Live specimens</li> <li>● <a href="#">Race &amp; Social Justice Teacher Resources</a></li> <li>● <a href="#">Reactions to Substances</a></li> </ul> |
|---|--|

### Suggested Accommodations

**English Language Learners:**

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models

- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

**Special Education/Students with Disabilities:**

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

**504 Plans:**

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books

- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

**Gifted and Talented:**

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

**Students at Risk of Failure:**

- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Tiered Activities
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues
- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

**Economically Disadvantaged:**

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing

## Lakewood School District Curriculum Guide

**Grade: High School**

**Content Area: Science - Horticulture**

- Activate schema
- Build background knowledge

### **Culturally Diverse:**

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background