

Geneva CUSD 304
Content-Area Curriculum Frameworks
Grades 6-12
Science

<p><i>Mission Statement</i></p>	<p><u>The Mission of Science Education Is:</u></p> <ol style="list-style-type: none"> 1) To nurture an active interest in science that continues throughout life. 2) To teach the learning skills and concepts necessary for the scientific process. 3) To develop student understanding of the interrelationships between science, society, and the environment 4) To encourage students to discover and develop their talent in science.
<p><i>Course Sequence</i> (Grades 6-12)</p>	<p>6th grade: Earth Science</p> <p>7th grade: Life Science</p> <p>8th grade: Physical Science</p> <p>9th grade: General Science Earth Science Biology Biology Honors</p> <p>10th, 11th, 12th grade: Chemistry Chemistry Honors Physics Astronomy Natural Disasters Anatomy and Physiology I and II Horticulture I and II AP Chemistry AP Biology AP Environmental Science</p>

Course Framework

Course Title Grade Level Semesters (1-2-3-4) Prerequisite	Horticulture I 10 th /11 th /12 th 2 Biology
Course Description	Horticulture is an upper level laboratory science course with a moderate to high challenge level. Horticulture is the study of plants in relation to their use for food, shelter, medicine and aesthetic value. Areas of study include botany, landscape design, soils, growing environment, propagation, plant identification, tissue culture, agriculture and pest management. Hands on experimentation is stressed throughout the course.
District-approved Materials and/or Resources	Horticulture Publisher: Delmar/Thompson ISBN: 0-7668-1576-6 Copy write: 2002

Unit Frameworks

<p>Unit of Study: major topics</p>	<p>Introduction To Horticulture</p> <ul style="list-style-type: none"> • Controlled Experiments • The Horticulture Industry • Using Plants In The Landscape • Greenhouse Management 	<p>Resources that will support instruction</p> <ul style="list-style-type: none"> • Current supplemental readings • Videos • Greenhouse
<p>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</p>	<p>A. Know and apply the concepts, principles and processes of scientific inquiry.</p> <p>11.A.4a Formulate hypotheses referencing prior research and knowledge.</p> <p>11.A.4b Conduct controlled experiments or simulations to test hypotheses.</p> <p>11.A.4c Collect, organize and analyze data accurately and precisely.</p> <p>11.A.4d Apply statistical methods to the data to reach and support conclusions.</p> <p>11.A.4e Formulate alternative hypotheses to explain unexpected results.</p> <p>11.A.4f Using available technology, report, display and defend to an audience conclusions drawn from investigations.</p> <p>11.A.5a Formulate hypotheses referencing prior research and knowledge.</p> <p>11.A.5b Design procedures to test the selected hypotheses</p> <p>11.A.5c Conduct systematic controlled experiments to test the selected hypotheses.</p> <p>A. Know and apply the accepted practices of science.</p> <p>13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities.</p> <p>13.A.4b Assess the validity of scientific data by analyzing the results, sample set, sample size, similar previous experimentation, possible misrepresentation of data presented and potential sources of error.</p> <p>13.A.4c Describe how scientific knowledge, explanations and technological designs may change with new information over time (e.g., the understanding of DNA, the design of computers).</p> <p>13.A.4d Explain how peer review helps to assure the accurate use of data and improves the scientific process.</p> <p>13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.</p> <p>13.A.5b Explain criteria that scientists use to evaluate the validity of scientific claims and theories.</p> <p>13.A.5c Explain the strengths, weaknesses and uses of research methodologies including observational studies, controlled laboratory experiments, computer modeling and statistical studies.</p>	

	<p>13.A.5d Explain, using a practical example (e.g., cold fusion), why experimental replication and peer review are essential to scientific claims.</p> <p>B. Know and apply concepts that describe the interaction between science, technology and society.</p> <p>13.B.4a Compare and contrast scientific inquiry and technological design as pure and applied sciences.</p> <p>13.B.4b Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science.</p> <p>13.B.4c Analyze ways that resource management and technology can be used to accommodate population trends.</p> <p>13.B.5b Analyze and describe the processes and effects of scientific and technological breakthroughs.</p> <p>13.B.5d Analyze the costs, benefits and effects of scientific and technological policies at the local, state, national and global levels (e.g., genetic research, Internet access).</p> <p>13.B.5e Assess how scientific and technological progress has affected other fields of study, careers and job markets and aspects of everyday life.</p>
<p>Objectives</p> <ul style="list-style-type: none"> ○ Conceptual ○ Factual ○ Procedural 	<p><u>Student Learning Objectives:</u></p> <ol style="list-style-type: none"> 1. Define and explain the importance of scientifically controlled experiments. 2. Identify the components of a scientifically controlled experiment. 3. Design and carry out a controlled experiment. 4. Define horticulture and describe its relationship to science and technology. 5. Explain the economic importance of the horticulture industry in the United States. 6. Identify the four major segments of the horticulture industry. 7. Identify and define activities included in the ornamental horticulture industry. 8. Identify different characteristics for the following types of plants landscape plants: Annuals, Perennials, Narrow Leaf Evergreens, Broad Leaf Evergreens, Deciduous Trees, Deciduous Shrubs, Ground Covers and Bulbs. 9. Identify different uses in the landscape for the different groups of plants listed in objective #8. 10. Identify the names of some common types of landscape plants from each of the groups listed in objective #8. 11. Identify several environmental factors that are important in greenhouse production. 12. Describe the various greenhouse design styles. 13. Describe the different types of irrigation systems used in greenhouse production.

	<p>14. Describe the different practices of greenhouse pest management.</p> <p>15. Explain and demonstrate proper greenhouse safety.</p>	
<p>Assessments</p>	<p>Performance Tasks</p> <p>Homework completion</p> <p>Contribution to classroom discussion</p> <p>Lab work and reports</p> <p>Quizzes</p> <p>Exam</p>	<p>Other Evidence</p>

Unit of Study: major topics	Landscape Design	Resources that will support instruction <ul style="list-style-type: none"> • Current supplemental readings • Videos
Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit	<p>A. Know and apply the accepted practices of science.</p> <p>13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities.</p> <p>13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.</p> <p>B. Know and apply concepts that describe the interaction between science, technology and society.</p> <p>13.B.4b Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science.</p> <p>13.B.4c Analyze ways that resource management and technology can be used to accommodate population trends.</p> <p>13.B.5b Analyze and describe the processes and effects of scientific and technological breakthroughs.</p> <p>13.B.5e Assess how scientific and technological progress has affected other fields of study, careers and job markets and aspects of everyday life.</p>	
Objectives <ul style="list-style-type: none"> ○ Conceptual ○ Factual ○ Procedural 	<p><u>Student Learning Objectives:</u></p> <ol style="list-style-type: none"> 1. List and describe the steps involved in the landscape design process. 2. Identify the purpose of a base plan. 3. Identify the purpose of a site analysis plan. 4. Describe the 5 main components of a site analysis plan 5. Identify the major areas of the residential landscape. 6. Explain how to create rooms in the outdoor landscape. 7. Demonstrate the use of scale. 8. Describe how activities can be organized into goose egg plans. 9. Identify the types of planting bed patterns. 10. Explain how to use the basic principles of art in landscape design. 11. List the different categories of landscape plants. 12. Identify the different components of a scientific name including cultivars or variety. 13. Identify factors to consider when selecting woody plant material. 14. Explain how environmental factors such as, temperature, moisture and pH affects plant selection. 15. Design and install a landscape from beginning to end. 	

Assessments	Performance Tasks	Other Evidence
	Homework completion Contribution to classroom discussion Lab work and reports Landscape design project Quizzes Exam	

Unit Frameworks

<p>Unit of Study: major topics</p>	<p>Plant Anatomy and Physiology</p>	<p>Resources that will support instruction</p> <ul style="list-style-type: none"> • Current supplemental readings • Videos
<p>Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit</p>	<p>A. Know and apply the concepts, principles and processes of scientific inquiry. 11.A.4a Formulate hypotheses referencing prior research and knowledge. 11.A.4b Conduct controlled experiments or simulations to test hypotheses. 11.A.4c Collect, organize and analyze data accurately and precisely.</p> <p>A. Know and apply concepts that explain how living things function, adapt and change. 12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie basic life functions including nutrition, respiration, cellular transport, biosynthesis and reproduction.</p> <p>A. Know and apply the accepted practices of science. 13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities. 13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.</p>	
<p>Objectives</p> <ul style="list-style-type: none"> ○ Conceptual ○ Factual ○ Procedural 	<p><u>Student Learning Objectives:</u></p> <ol style="list-style-type: none"> 1. Identify the four major groups of plants and the characteristics specific to each group 2. List the function of roots in plants. 3. Identify the two major types of root systems 4. Identify the function of the root hairs. 5. Identify characteristics of a healthy root system. 6. Describe the four functions of the stem. 7. Identify the eight external structures of a typical stem 8. Name the three types of internal stem tissue and their function 9. Distinguish between the different types of specialized stems 10. What is the function of the xylem and phloem. 11. Describe the main parts of a leaf 12. Identify and explain the function of the internal parts of a leaf. 13. Compare the palisade layer with the spongy layer. 14. Explain the process of photosynthesis 15. Explain the purpose of a flower 16. Describe the different parts of a flower. 17. How is pollination different from fertilization? 	

Assessments	Performance Tasks	Other Evidence
	Homework completion Contribution to classroom discussion Lab work and reports Quizzes Exam	

Unit of Study: major topics	Growing Environment	Resources that will support instruction <ul style="list-style-type: none"> • Current supplemental readings • Videos • Greenhouse
Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit	<p>A. Know and apply the concepts, principles and processes of scientific inquiry. 11.A.4a Formulate hypotheses referencing prior research and knowledge. 11.A.4b Conduct controlled experiments or simulations to test hypotheses. 11.A.4c Collect, organize and analyze data accurately and precisely.</p> <p>B. Know and apply concepts that describe how living things interact with each other and with their environment. 12.B.4a Compare physical, ecological and behavioral factors that influence interactions and interdependence of organisms. 12.B.5a Analyze and explain biodiversity issues and the causes and effects of extinction.</p> <p>C. Know and apply concepts that describe properties of matter and energy and the interactions between them. 12.C.4b Analyze and explain the atomic and nuclear structure of matter.</p> <p>D. Know and apply concepts that describe force and motion and the principles that explain them. 12.D.5b Analyze the effects of gravitational, electromagnetic and nuclear forces on a physical system.</p> <p>A. Know and apply the accepted practices of science. 13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities. 13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.</p>	
Objectives <ul style="list-style-type: none"> ○ Conceptual ○ Factual ○ Procedural 	<ol style="list-style-type: none"> 1. Describe different types of growing media. 2. Explain the function of growing media. 3. Describe the 4 major soil components. 4. Identify the relative size of the components of soil. 5. Explain the role of each of the 3 major plant macronutrients N, P, K. 6. Identify soil types using a soil triangle. 7. Explain the major uses of a soilless growing media. 8. Explain the common components of a soilless growing media. 9. Explain advantages and disadvantages of using a soilless growing media. 10. Explain the role soil plays in maintaining water quality. 11. Describe how pH value of soil affects plant growth. 	

	<p>12. Explain the different types of water in soil and how each affects plant growth.</p> <p>13. Explain the relationship of soil porosity and permeability.</p>	
<p>Assessments</p>	<p>Performance Tasks</p> <p>Homework completion</p> <p>Contribution to classroom discussion</p> <p>Lab work and reports</p> <p>Quizzes</p> <p>Exam</p>	<p>Other Evidence</p>

Unit of Study: major topics	Tissue Culture	Resources that will support instruction <ul style="list-style-type: none"> • Current supplemental readings • Videos
Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit	<p>A. Know and apply the concepts, principles and processes of scientific inquiry. 11.A.4a Formulate hypotheses referencing prior research and knowledge. 11.A.4b Conduct controlled experiments or simulations to test hypotheses. 11.A.4c Collect, organize and analyze data accurately and precisely.</p> <p>A. Know and apply concepts that explain how living things function, adapt and change. 12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie basic life functions including nutrition, respiration, cellular transport, biosynthesis and reproduction.</p> <p>C. Know and apply concepts that describe properties of matter and energy and the interactions between them. 12.C.5a Analyze reactions (e.g., nuclear reactions, burning of fuel, decomposition of waste) in natural and man-made energy systems.</p> <p>A. Know and apply the accepted practices of science. 13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities. 13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.</p> <p>B. Know and apply concepts that describe the interaction between science, technology and society. 13.B.4a Compare and contrast scientific inquiry and technological design as pure and applied sciences. 13.B.4b Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science. 13.B.5b Analyze and describe the processes and effects of scientific and technological breakthroughs. 13.B.5d Analyze the costs, benefits and effects of scientific and technological policies at the local, state, national and global levels (e.g., genetic research, Internet access). 13.B.5e Assess how scientific and techno-logical progress has affected other fields of study, careers and job markets and aspects of everyday life.</p>	

<p>Objectives</p> <ul style="list-style-type: none"> ○ Conceptual ○ Factual ○ Procedural 	<ol style="list-style-type: none"> 1. Compare / contrast asexual and sexual propagation. 2. Define tissue culture 3. Explain the advantages of tissue culture propagation. 4. Identify the steps involved in the tissue culture process. 5. Identify the biggest obstacle to tissue culture 6. Investigate the extent to which the laboratory environment is contaminated with microorganisms. 7. Demonstrate how to effectively surface sterilize seeds. 8. Explain the necessary components of the in vitro environment for tissue culture. 9. Propagate an African violet plant by tissue culture. 	
<p>Assessments</p>	<p>Performance Tasks Homework completion Contribution to classroom discussion Lab work and reports Quizzes Exam</p>	<p>Other Evidence</p>

Unit of Study: major topics	Propagation	Resources that will support instruction <ul style="list-style-type: none"> • Current supplemental readings • Videos • Greenhouse
Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit	<p>A. Know and apply the concepts, principles and processes of scientific inquiry. 11.A.4a Formulate hypotheses referencing prior research and knowledge. 11.A.4b Conduct controlled experiments or simulations to test hypotheses. 11.A.4c Collect, organize and analyze data accurately and precisely.</p> <p>A. Know and apply concepts that explain how living things function, adapt and change. 12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie basic life functions including nutrition, respiration, cellular transport, biosynthesis and reproduction.</p> <p>A. Know and apply the accepted practices of science. 13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities. 13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.</p>	
Objectives <ul style="list-style-type: none"> ○ Conceptual ○ Factual ○ Procedural 	<p><u>Student Learning Objectives:</u></p> <ol style="list-style-type: none"> 1. Identify the importance of plant propagation 2. Explain the difference between sexual and asexual plant propagation 3. Identify the major parts of a seed 4. List the function of each part of the seed 5. Identify the basic requirements of seed germination. 6. Identify special requirements of seed germination 7. Describe the process of seed germination 8. Explain why plants are propagated asexually 9. Compare and contrast the benefits of seed propagation verses vegetative propagation. 10. Identify the basic environmental requirements for cuttings 11. Identify the four basic types of stem cuttings (Hardwood, Semi-Hardwood, Softwood and Herbaceous) 12. Describe the process of separation and division and explain the major difference between the two 13. Identify five specialized plant structures that help plants propagate by separation and division (bulbs, corms, tubers, tuberous roots and rhizomes) 	

	<p>14. Explain the propagation method of layering 15. Identify the different methods of layering plants for propagation 16. Discuss the importance of tissue culture 17. Explain the steps involved tissue culture.</p>	
<p>Assessments</p>	<p>Performance Tasks</p> <p>Homework completion Contribution to classroom discussion Lab work and reports Quizzes Exam</p>	<p>Other Evidence</p>

Unit of Study: major topics	Integrated Pest Management	Resources that will support instruction <ul style="list-style-type: none"> • Current supplemental readings • Videos
Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit	<p>A. Know and apply the concepts, principles and processes of scientific inquiry. 11.A.4a Formulate hypotheses referencing prior research and knowledge. 11.A.4b Conduct controlled experiments or simulations to test hypotheses. 11.A.4c Collect, organize and analyze data accurately and precisely.</p> <p>A. Know and apply concepts that explain how living things function, adapt and change. 12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4c Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry.</p> <p>B. Know and apply concepts that describe how living things interact with each other and with their environment. 12.B.4a Compare physical, ecological and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns). 12.B.5a Analyze and explain biodiversity issues and the causes and effects of extinction. 12.B.5b Compare and predict how life forms can adapt to changes in the environment by applying concepts of change and constancy (e.g., variations within a population increase the likelihood of survival under new conditions).</p> <p>A. Know and apply the accepted practices of science. 13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities. 13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.</p>	
Objectives <ul style="list-style-type: none"> ○ Conceptual ○ Factual ○ Procedural 	<ol style="list-style-type: none"> 1. Explain what a pest is. 2. Distinguish between abiotic and biotic plant diseases. 3. Define integrated pest management 4. Explain the historical significance of chemical pesticides in the development of IPM 5. Define the green revolution and its relation to the Indonesian rice problem of the 1970's. 6. Define and give specific examples of cultural control 	

	<ol style="list-style-type: none"> 7. Define and give specific examples of biological control 8. Define and give specific examples of chemical control 9. Compare / contrast action threshold and economic injury level. 10. Explain the role of Best Management Practices in IPM. 11. Define insect degree-day. 12. Calculate insect degree-days. 13. Explain the key to an effective IPM program. 14. Explain the role that GMOs play in pest management. 15. Describe the problem of pest resistance with IPM controls. 	
Assessments	<p>Performance Tasks</p> <p>Homework completion Contribution to classroom discussion Lab work and reports Quizzes Exam</p>	<p>Other Evidence</p>

Unit of Study: major topics	Agriculture / Crop Study	Resources that will support instruction <ul style="list-style-type: none"> • Current supplemental readings • Videos
Illinois Learning Standards, Benchmarks, National Standards Assessment Frameworks, or other standards that will be taught in this unit	<p>A. Know and apply concepts that explain how living things function, adapt and change.</p> <p>12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms.</p> <p>B. Know and apply concepts that describe how living things interact with each other and with their environment.</p> <p>12.B.4a Compare physical, ecological and behavioral factors that influence interactions and interdependence of organisms.</p> <p>12.B.5a Analyze and explain biodiversity issues and the causes and effects of extinction.</p> <p>12.B.5b Compare and predict how life forms can adapt to changes in the environment by applying concepts of change and constancy (e.g., variations within a population increase the likelihood of survival under new conditions).</p> <p>A. Know and apply the accepted practices of science.</p> <p>13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities.</p> <p>13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.</p> <p>B. Know and apply concepts that describe the interaction between science, technology and society.</p> <p>13.B.4b Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science.</p> <p>13.B.4c Analyze ways that resource management and technology can be used to accommodate population trends.</p> <p>13.B.5b Analyze and describe the processes and effects of scientific and technological breakthroughs.</p> <p>13.B.5d Analyze the costs, benefits and effects of scientific and technological policies at the local, state, national and global levels (e.g., genetic research, Internet access).</p> <p>13.B.5e Assess how scientific and technological progress has affected other fields of study, careers and job markets and aspects of everyday life.</p>	

<p>Objectives</p> <ul style="list-style-type: none"> ○ Conceptual ○ Factual ○ Procedural 	<ol style="list-style-type: none"> 1. Define agriculture and the agriculture industry 2. Define plant domestication. 3. Describe the process of early plant domestication 4. Explain the major technological developments (4 total). 5. Explain historical events leading to the development of the modern agricultural industry. 6. Compare / contrast an 18th century farmer with a 21st century farmer. 7. Define sustainable agriculture. 8. Define organic agriculture. 9. Explain how modern technology has changes agriculture. 10. Research information on an agricultural crop. 	
<p>Assessments</p>	<p>Performance Tasks</p> <p>Homework completion Contribution to classroom discussion Lab work and reports Quizzes Exam</p>	<p>Other Evidence</p>