

Year 2, Unit 10 HL Topic 9 Plants

Content Area: **Science**
Course(s): **IB Biology, HL**
Time Period: **First Marking Period**
Length: **4 weeks**
Status: **Published**

Unit Overview

Students will learn about the microbiotic parts of plants that lead to the formation of the complex systems that plants have. Students will analyze the emergent properties of different types of plants to learn how plants are capable of survival and change.

STAGE 1- DESIRED RESULTS

9.1 Use models as representations of the real world—mechanisms involved in water transport in the xylem can be investigated using apparatus and materials that show similarities in structure to plant tissues.

9.2 Developments in scientific research follow improvements in apparatus—experimental methods for measuring phloem transport rates using aphid stylets and radioactively-labelled carbon dioxide were only possible when radioisotopes became available.

9.3 Developments in scientific research follow improvements in analysis and deduction—improvements in analytical techniques allowing the detection of trace amounts of substances has led to advances in the understanding of plant hormones and their effect on gene expression.

9.4 Paradigm shift—more than 85% of the world’s 250,000 species of flowering plant depend on pollinators for reproduction. This knowledge has led to protecting entire ecosystems rather than individual species.

Standards

2020 New Jersey Student Learning Standards- Science

Science and Engineering Practices

- Analyzing and Interpreting Data
- Developing and Using Models
- Obtaining, Evaluating, and Communicating Information

- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

Cross Cutting Concepts

- Cause and Effect
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Stability and Change
- Structure and Functions
- Systems and System Models

Disciplinary Core Ideas

Life Sciences

- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS2A: Interdependent Relationships in Ecosystems
- LS2B: Cycles of Matter and Energy Transfer in Ecosystems
- LS4C: Adaptation

Engineering. Technology. and Applications of Science

- ETS1A: Defining and Delimiting an Engineering Problem

Essential Questions

9.1 How are structure and function correlated in the xylem of plants?

9.2 How are structure and function correlated in the phloem of plants?

9.3 How do plants adapt their growth to environmental conditions?

9.4 What is the importance of reproduction in flowering plants and how is it influenced by the biotic and abiotic environment?

Enduring Understanding

Students will have a lasting understanding of the importance of plants to their environment. Students will learn and appreciate the intricate structures of plants and how the internal anatomy allows plants to produce oxygen that is essential to the survival of many other species.

Students will know...

9.1

- Transpiration is the inevitable consequence of gas exchange in the leaf.
- Plants transport water from the roots to the leaves to replace losses from transpiration.
- The cohesive property of water and the structure of the xylem vessels allow transport under tension.
- The adhesive property of water and evaporation generate tension forces in leaf cell walls.
- Active uptake of mineral ions in the roots causes absorption of water by osmosis.

9.2

- Plants transport organic compounds from sources to sinks.
- Incompressibility of water allows transport along hydrostatic pressure gradients.
- Active transport is used to load organic compounds into phloem sieve tubes at the source.
- High concentrations of solutes in the phloem at the source lead to water uptake by osmosis.
- Raised hydrostatic pressure causes the contents of the phloem to flow towards sinks.

9.3

- Undifferentiated cells in the meristems of plants allow indeterminate growth.
- Mitosis and cell division in the shoot apex provide cells needed for extension of the stem and development of leaves.
- Plant hormones control growth in the shoot apex.
- Plant shoots respond to the environment by tropisms.
- Auxin efflux pumps can set up concentration gradients of auxin in plant tissue.
- Auxin influences cell growth rates by changing the pattern of gene expression.

9.4

- Flowering involves a change in gene expression in the shoot apex.
- The switch to flowering is a response to the length of light and dark periods in many plants.
- Success in plant reproduction depends on pollination, fertilization and seed dispersal.
- Most flowering plants use mutualistic relationships with pollinators in sexual reproduction.

Students will be able to...

9.1

- Analyze the adaptations of plants in deserts and in saline soils for water conservation.
- Design models of water transport in xylem using simple apparatus including blotting or filter paper, porous pots and capillary tubing.

9.2

- Explain the structure–function relationships of phloem sieve tubes.

9.3

- Experiment using micropropagation of plants using tissue from the shoot apex, nutrient agar gels and growth hormones.
- Explain the use of micropropagation for rapid bulking up of new varieties, production of virus-free strains of existing varieties and propagation of orchids and other rare species.

9.4

- Analyze the methods used to induce short-day plants to flower out of season.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- Debriefing
- Hand Signals
- Journal Entry
- Observation
- Questions & Answers
- Quiz
- Web or Concept Map

Authentic Assessments

9.1

- Skill: Drawing the structure of primary xylem vessels in sections of stems based on microscope

images.

- Skill: Measurement of transpiration rates using potometers.
- Skill: Design of an experiment to test hypotheses about the effect of temperature or humidity on transpiration rates.

9.2

- Skill: Identification of xylem and phloem in microscope images of stem and root.
- Skill: Analysis of data from experiments measuring phloem transport rates using aphid stylets and radioactively-labelled carbon dioxide.

9.4

- Skill: Drawing internal structure of seeds.
- Skill: Drawing of half-views of animal-pollinated flowers.
- Skill: Design of experiments to test hypotheses about factors affecting germination.

Laboratories will be used for assessment

Quizzes will be given.

Benchmark Assessments

Chapter tests will be given.

STAGE 3- LEARNING PLAN

Instructional Map

Guidance to help implement the IB Biology curriculum

9.3

- Auxin is the only named hormone that is expected.

9.4

- Students should understand the differences between pollination, fertilization and seed dispersal but are not required to know the details of each process.
- Flowering in so-called short-day plants such as chrysanthemums, is stimulated by long nights rather

than short days.

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments

- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion

- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits

- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Repeated Drill and Practice
- Tutorials
- Use of Additional Reference Materials

Differentiation Strategies

High Preparation

- Group Investigations
- Independent Research / Project
- Varying Graphic Organizers

Low Preparation

- Flexible Grouping
- Open-ended Activities
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Intergration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

Previous courses

6th grade – Diversity of life

7th grade – Populations and Ecosystems

8th grade – Human Systems Interactions and Heredity and Adaptations

9th grade – Honors Biology

10th grade – Honors Chemistry

Possible next courses

Honors Physics

Anatomy & Physiology

IB Physics

Zoology

Forensics

Additional Materials

Videos used through McGraw Hill, Crash Course and Howard Hughes Medical Institute.

Current Research articles supplied through Newsela.