Summary

Unit 9 - Plant Biology Current

Subject	Year	Start date	Duration
Biology	IB1	Week 1, May	4 weeks 13 hours

Course Part

Additional

Curriculum

Aims

Appreciate scientific study and creativity within a global context through stimulating and challenging opportunities

Acquire a body of knowledge, methods and techniques that characterize science and technology

Apply and use a body of knowledge, methods and techniques that characterize science and technology

Develop an ability to analyse, evaluate and synthesize scientific information

Develop a critical awareness of the need for, and the value of, effective collaboration and communication during scientific activities

Develop experimental and investigative scientific skills including the use of current technologies

Develop and apply 21st century communication skills in the study of science

Become critically aware, as global citizens, of the ethical implications of using science and technology

Develop an appreciation of the possibilities and limitations of science and technology

Develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge

Objectives

Demonstrate knowledge and understanding of

- facts, concepts, and terminology
- methodologies and techniques
- communicating scientific information

Apply

- facts, concepts, and terminology
- methodologies and techniques
- methods of communicating scientific information

Syllabus Content

Additional higher level

9: Plant biology

9.1 Transport in the xylem of plants

Nature of science:

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.

Understandings:

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.

Applications and skills:

Application: Adaptations of plants in deserts and in saline soils for water conservation.

Application: Models of water transport in xylem using simple apparatus including blotting or filter paper, porous pots and capillary tubing.

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

Skill: Measurement of transpiration rates using potometers. (Practical 7)

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

9.2 Transport in the phloem of plants

Nature of science:

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.

Understandings:

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.

Applications and skills:

Application: Structure–function relationships of phloem sieve tubes.

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.

9.3 Growth in plants

Nature of science:

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.

Understandings:

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.

Applications and skills:

Application: Micropropagation of plants using tissue from the shoot apex, nutrient agar gels and growth hormones.

Application: 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 Reproduction in plants

Nature of science:

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.

Understandings:

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.

Applications and skills:

Application: Methods used to induce short-day plants to flower out of season.

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.

ATL Skills

Approaches to Learning

Thinking

- In this unit, we will

  ask students to formulate a reasoned argument to support their opinion or conclusion

  give students time to think through their answers before asking them for a response

  reward a new personal understanding, solution or approach to an issue

  ask open questions

  set students a task which required higher-order thinking skills (such as analysis or evaluation)

  build on a specific prior task

  help students to make their thinking more visible (for example, by using a strategy such as a thinking routine)

  require students to take an unfamiliar viewpoint into account when formulating arguments

  ask questions that required the use of knowledge from a different subject from the one you are teaching

  include a reflection activity

  make a link to TOK

Social

- In this unit, we will

  have students work in small groups

  allocate, or ask students to allocate among themselves, different roles in a classroom discussion or activity

  have students peer assess their group performance or process

  support students in resolving a conflict in a team

  give a group assessment task

  give students feedback on how they worked as a group

  have students discuss their understanding of a text or idea among themselves and come up with a shared understanding

  provide an opportunity for students to analyse the impact of their behaviour on the class or on a group performance

  encourage students to consider alternative points of view or to take the perspective of others

  provide opportunities for students to make decisions

Developing IB Learners

Learner Profile


Inquirers


Knowledgeable


Thinkers


Reflective