Subtopics:

9.1 Transport in the Xylem of Plants

9.2 Transport in the Phloem of Plants

9.3 Growth in Plants

9.4 Reproduction in Plants

**Topic 9: Plant Biology**

**EQ’s:** Plants communicate chemically both internally and externally.To what extend can plants be said to have a language?

***Major Understandings, Applications & Skills (Study Guide):***

***Transport in the Xylem of Plants (9.1)***

**Proficient:**

* Transpiration is the inevitable consequence of gas exchange in the leaf.
* 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.

**Exceeds:**

* Plants transport water from the roots to the leaves to replace losses from transpiration.
* 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 of 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 photometers (Practical 7)
* Skill: Design of an experiment to test hypotheses about the effect of temperature or humidity on transpiration rates.

***Transport in the Phloem of Plants (9.2)***

**Proficient:**

* Plants transport organic compounds from sources to sinks.
* Incompressibility of water allows transport along hydrostatic pressure gradients.
* 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.

**Exceeds:**

* Active transport is used to load organic compounds into phloem sieve tubes at the source.
* 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.

***Growth in Plants (9.3)***

**Proficient:**

* Undifferentiated cells in the meristems of plants allow indeterminate growth.
* Mitosis and cell division in the shoot apex provide cells needed for extension of stems and development of leaves.
* Plant hormones control growth in the shoot apex.
* Plant shoots respond to the environment by tropisms.
* Auxin influences cell growth rates by changing the pattern of gene expression.

**Exceeds:**

* Auxin efflux pumps can set up concentration gradients of auxin in plant tissue.
* 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.

***Reproduction in Plants (9.4)***

**Proficient:**

* Flowering involves a change in gene expression in the shoot apex.
* Most flowering plants use mutualistic relationships with pollinators in sexual reproduction.
* Skill: Drawing internal structure of seeds.
* Skill: Drawing of half-views of animal-pollinated flowers.

**Exceeds:**

* Success in plant reproduction depends on pollination, fertilization and seed dispersal.
* Application: Methods used induce short-day plants to flower out of season.
* Skill: Design of experiments to test hypotheses about factors affecting germination.
* The switch to flowering is a response to the length of light and dark periods in many plants.

**Key Terms:**

* Transpiration
* Guard cells
* Stomata
* Photosynthesis
* Potometer
* Xylem
* Cohesion
* Adhesion
* Lignin
* Passive transport
* Active transport
* Turgor pressure
* Osmosis
* Mineral ions
* Mutualistic relationship
* Apoplast
* Symplast
* Adaptations
* Xerophytes
* Halophytes
* Translocation
* Source
* Sink
* Phloem
* Sieve tubes
* Mesophyll cells
* Companion cells
* Phloem loading
* Water potential
* Phloem sieve tubes
* Undifferentiated cells
* Apical Meristems (root & shoot)
* Indeterminate growth
* Mitosis
* Dicotyledonous
* Monocotyledonous
* Auxins
* Cytokinins
* Tropisms
* Phototropism
* Gravitropism
* Intracellular pumps
* Micropropagation
* Genomics
* Vegetative structures
* Long day plants
* Short day plants
* Sexual reproduction
* Photoperiods
* Pollination
* Mutualism
* Fertilization
* Seed dispersal
* Embryo root
* Embryo shoot
* Cotyledons
* Testa
* Micropyle
* germination