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| **9.1.U1** | **Transpiration is the inevitable consequence of gas exchange in the leaf.** |
| **9.1.U2** | **Plants transport water from the roots to the leaves to replace losses from transpiration.** |

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| **9.1.U3** | **The cohesive property of water and the structure of the xylem vessels allow transport under tension.** |
| **9.1.U4** | **The adhesive property of water and evaporation generate tension forces in leaf cell walls.** |

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| **9.1.U5** | **Active uptake of mineral ions in the roots causes absorption of water by osmosis.** |
| **9.1.A1** | **Adaptations of plants in deserts and in saline soils for water conservation.** |

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| **9.1.A2** | | **Models of water transport in xylem using simple apparatus including blotting or filter paper, porous pots and capillary tubing.** |
| **9.1.S1** | **Drawing the structure of primary xylem vessels in sections of stems based on microscope images.** | |

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| **9.1.S2** | **Measurement of transpiration rates using photometers. (Practical 7)** |
| **9.1.S3** | **Design of an experiment to test hypothesis about the effects of temperatures or humidity on transpiration rates.** |

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| **9.1.** **NOS** | **Use models as representations of the real world-mechanisms involved in water transport in the xylem can be investigated using apparatus and material that show similarities in structure to plant tissues.** | |
| **9.2.U1** | | **Plants transport organic compounds from sources to sinks.** |
| **9.2.U2** | | **Incompressibility of water allows transport along hydrostatic pressure gradients.** |

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| **9.2.U3** | **Active transport is used to load organic compounds into phloem sieve tubes at the source.** |
| **9.2.U4** | **High concentrations of solutes in the phloem at the source lead to water uptake by osmosis.** |

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| **9.2.U5** | **Raised by hydrostatic pressure causes the contents of the phloem to flow toward sinks.** |
| **9.2.A1** | **Structure-function relationships of phloem sieve tubes.** |

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| **9.2.S1** | **Identification of xylem and phloem in microscope images of stem and root.** |
| **9.2.S2** | **Analysis of date from experiments measuring phloem transport rates using aphid stylets and radioactively-labelled carbon dioxide.** |

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| **9.2** **NOS** | **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.U1** | | **Undifferentiated cells in the meristems of plants allow indeterminate growth.** |
| **9.3.U2** | | **Mitosis and cell division in the shoot apex provide cells needed for extension of the stem and development of leaves.** |

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| **9.3.U3** | **Plant hormones control growth in the shot apex.** |
| **9.3.U4** | **Plant shoots response to the environment by tropisms.** |

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| **9.3.U5** | **Auxin efflux pumps can set up concentration gradients of auxin in plants tissue.** |
| **9.3.U6** | **Auxin influences of cell growth rates by changing the pattern of gene expression.** |

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| **9.3.A1** | **Micropropagation of plants using tissue from the shoot apex nutrient agar gels and growth hormones.** |
| **9.3.A2** | **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.** |

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| **9.3** **NOS** | **Developments in scientific research follow improvements in analysis and eduction-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.U1** | | **Flowering involves a change in gene expression in the shoot apex.** |
| **9.4.U2** | | **The switch to flowering is a response to the length of light and dark periods in many plants.** |

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| **9.4.U3** | **Success in plant reproduction depends on pollination, fertilization and seed dispersal.** |
| **9.4.U4** | **Most flowering plants use mutualistic relationships with pollinators in sexual reproduction.** |

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| **9.4.A1** | | **Methods used to induce short-day plants to flower out of season.** |
| **9.4.S1** | **Drawing internal structure of seeds.** | |

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| **9.4.S2** | **Drawing of half-views of animal-pollinated flowers.** |
| **9.4.S3** | **Design of experiments to test hypothesis about factors affecting germination.** |

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| **9.4** **NOS** | **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.** |