

The Stem

Know the general anatomy of the stem and its parts. Recognize the node, internode, apical bud, axillary bud, leaf axil, leaf scar.

Know the locations and significance of the apical meristems, and the three primary meristems, as well as what tissues arise from each primary meristem.

Recognize the anatomical structures of the monocot and dicot stems in cross sections, and their significance. What structures are different between root and stem?

Know the meaning/significance/function of: lateral meristem, vascular cambium, cork cambium, secondary growth, annual growth rings, springwood, summerwood, heartwood, sapwood, determinate vs. indeterminate growth, annual versus perennial plants, true wood, herbaceous, lenticel

Know the components of the bark, and be able to differentiate between bark, periderm, phloem, cork, cork cambium (and know which of these is a part of which).

Know the various types of stem specializations, and be able to recognize even unfamiliar examples, if they are described.

The Root

Know the various functions of the root.

Know the meaning/significance of: primary root, taproot, lateral roots, fibrous roots.

Know the general characteristics of roots and how root morphology and function can vary with environmental conditions and species.

Know the basic structure of a growing root tip, and be able to identify and know the significance and function(s) of: root cap, apical meristem, ground meristem, procambium, protoderm, zone of cell division, zone of cell elongation, zone of maturation, endodermis, pericycle, Casparian strip, pith, cortex, epidermis, trichome, root hair, quiescent center, mucilage/mucigel, columella, promeristem

Know the anatomy of a root in cross section, and be able to identify the layers and their function.

Know the general characteristics and morphology of both V.A.M. and ectomycorrhizae. What is their relationship to the plant symbiont? **Know** the meaning/structure/significance of: vesicle, arbuscule, hyphae, Hartig net, cortex cell

Know and understand the three general routes of water movement across plant cells: apoplastic, symplastic, and tonoplastic.

Know the general anatomy of the stele, and the different forms it can take.

Know the different types of root specializations, and be able to recognize examples of them, even if you haven't heard the specific examples before.

Understand the process of root colonization by nitrogen-fixing bacteria, and know the meaning/significance of: nodules, leghemoglobin, infection thread, *Rhizobium*, crop rotation, and refer to the diagram of the Nitrogen Cycle in Lecture Six (a new link) to review the Nitrogen Cycle and its steps. **Know** the meaning of nitrogen fixer, denitrifier, nitrate, nitrite, ammonia.

Water Movement

Know the meaning/significance of: bulk flow, water potential, solvent, solute, hydration shell, hypertonic, hypotonic, isotonic (=osmotic) solutions, diffusion, osmosis, dialysis

Know what is meant by the cohesive and adhesive properties of water.

Understand what may make a plant cell turgid or plasmolyze it.

Know the general processes involved in transpiration.

Know the meaning/significance of: shoot tension, root pressure, guttation, xylem & phloem sap.
Know the roles played by each of the following in water movement through plants: Root hair, tonoplast, symplast, apoplast, plasmodesmata, endodermis, Casparian strips, stele, xylem, phloem, stomate, spongy mesophyll

Know the meanings of embolism and cavitation.

Know the meaning/significance of active transport, facilitated diffusion, proton pump, cotransport, source, sink

Photosynthesis and Respiration

Understand how the Laws of Thermodynamics apply to photosynthesis, and the energy transductions that take place during carbon fixation.

Know the meaning/significance (in terms of photosynthesis) of: enzyme, catalyst, substrate, active site, endergonic vs. exergonic reactions, catabolic vs. anabolic reactions, oxidation/reduction reactions.

Know the characteristics of the electromagnetic spectrum, and particularly the wavelengths that drive photosynthesis.

Know the meaning/significance of: pigment, chlorophylls, carotenoids, accessory pigments, antenna pigments, primary electron acceptor, cytochromes, ATP, NADP+, NADP-H, transmission/absorption/reflection of photons

Understand the general workings of photosystems I and II and their associated pigments, cyclic and non-cyclic electron flow and their products.

Recall the general overall reactions of photosynthesis and cellular respiration and understand their relationships to each other.

Know the general process of photorespiration and its significance.

Know the general workings of both C4 and CAM metabolism, and what type of plants you'd expect to see doing these.

Plant Nutrition and Soil

Know the meaning/significance of: essential nutrient, macronutrient, micronutrient (and the identities of the last two in plants).

Know the general functions of the macronutrients and micronutrients in plants from Table 29-2 in your text.

Know the names and characteristics of the soil horizons, and which are the largest (or not even present!) in new, young, maturing, and mature soils.

Know the main differences between organic and inorganic (a.k.a., "conventional") farming. What are the risks and benefits of each?

Know the meaning/significance of sand, clay, silt, humus. Which ones hold water? Which are negatively charged? What is the result of the negative charge of inorganic soil particles, especially in very wet soils?

What does the "N-P-K" on the label of your commercial plant fertilizer mean? Which of the three promotes lush, vegetative growth?

Know the Nitrogen Cycle, and the general pathway by which Rhizobium bacteria enter the root. How is this related to mycorrhizal symbioses? Which is the older association?

Know the Phosphorus Cycle, and how it is similar to all other elemental/inorganic nutrient cycles.