campbell biology chapter 35 glossary us

campbell biology chapter 35 glossary us is your essential guide to understanding the complex vocabulary presented in this pivotal chapter of Campbell Biology. This comprehensive resource aims to demystify the key terms related to plant structure and growth, providing clear definitions and contextual explanations to enhance your learning experience. We will delve into the fundamental concepts of plant anatomy, tissue types, and the various processes that drive plant development. Whether you are a student preparing for an exam or an enthusiast seeking a deeper understanding of the botanical world, this glossary will serve as an invaluable companion. Prepare to explore the intricate details of how plants build themselves and respond to their environment.

Table of Contents

Introduction to Plant Structure and Growth

Understanding the fundamental principles of plant structure and growth is crucial for comprehending the life cycles and ecological roles of these vital organisms. Campbell Biology's Chapter 35 provides a detailed exploration of these topics, introducing a wealth of specialized terminology. This article aims to serve as an exhaustive glossary for the key terms found within this chapter, offering clear definitions and context. We will explore the various tissue systems that constitute a plant, from the protective dermal layers to the supportive ground tissues and the vital vascular networks. Furthermore, we will examine the distinct functions of the primary plant organs—roots, stems, and leaves—and the intricate processes by which plants elongate and increase in girth. Ultimately, this glossary is designed to equip you with

the precise language needed to master the concepts of plant anatomy and development as presented in Campbell Biology.

Plant Tissues: The Building Blocks of Plants

Plants, much like animals, are multicellular organisms composed of specialized cells organized into tissues. These tissues perform specific functions, contributing to the overall survival and reproduction of the plant. Campbell Biology Chapter 35 introduces three main tissue systems: the dermal, ground, and vascular tissue systems. Each system is further differentiated into various cell types and performs a unique set of roles essential for plant life.

Meristematic Tissues: The Sites of Cell Division

Meristematic tissues are regions of active cell division in plants, responsible for generating new cells that can differentiate into various specialized cell types. These tissues are analogous to stem cells in animals, providing the raw material for growth and development. The continuous production of new cells by meristems allows plants to grow throughout their lives.

- **Apical Meristems:** Located at the tips of roots and shoots, these meristems are responsible for primary growth, leading to an increase in length.
- **Lateral Meristems:** Found in woody plants, these include the vascular cambium and the cork cambium. They are responsible for secondary growth, leading to an increase in girth or diameter.
- **Intercalary Meristems:** Present in some monocots, these are located at the base of leaf blades or nodes, allowing for rapid regrowth after being cut or grazed.

Dermal Tissue System: The Plant's Protective Outer Layer

The dermal tissue system forms the outermost protective layer of the plant body, analogous to the skin in animals. It serves to prevent water loss, protect against pathogens, and regulate gas exchange. In non-woody plants, this system is typically the epidermis, while in woody plants, it is replaced

by periderm.

- **Epidermis:** A single layer of cells covering the non-woody parts of a plant, including leaves, young stems, and roots. It is often covered by a waxy cuticle.
- **Stomata:** Pores, typically on the surface of leaves and stems, surrounded by guard cells, which regulate gas exchange (CO_2 uptake and O_2 release) and transpiration (water vapor release).
- **Trichomes:** Hair-like outgrowths of epidermal cells that can serve various functions, including protection from herbivores, reducing water loss, or reflecting sunlight.
- **Periderm:** The protective outer layer of woody stems and roots, consisting primarily of cork cells, cork cambium, and phelloderm. It replaces the epidermis as the plant undergoes secondary growth.

Ground Tissue System: The Plant's Metabolic and Storage Hub

The ground tissue system constitutes the bulk of a plant's body and is involved in photosynthesis, storage, and structural support. It fills the spaces between the dermal and vascular tissues. Three main types of ground tissue are found in plants.

- **Parenchyma:** The most abundant type of plant cell, characterized by thin, flexible primary walls. Parenchyma cells are metabolically active and can perform photosynthesis, storage, and secretion. They are totipotent, meaning they can dedifferentiate and divide to form other cell types.
- **Collenchyma:** These cells have unevenly thickened primary walls and provide flexible mechanical support to growing stems and leaves, particularly in regions of elongation.
- **Sclerenchyma:** These cells have rigid secondary walls, often containing lignin, which makes them strong and supportive. They are typically found in mature plant parts and include fibers and sclereids. Sclerenchyma cells are often dead at maturity.

Vascular Tissue System: The Plant's Transport Network

The vascular tissue system is responsible for the long-distance transport of water, minerals, and sugars throughout the plant. It is composed of two principal types of tissues: xylem and phloem.

- **Xylem:** Transports water and dissolved minerals from the roots to the rest of the plant. It also provides mechanical support. Key cell types include tracheids and vessel elements, which are dead at maturity and form continuous tubes.
- **Phloem:** Transports sugars (produced during photosynthesis) from the leaves to other parts of the plant where they are needed for growth or storage. It is composed of sieve-tube elements and companion cells. Sieve-tube elements are living but lack a nucleus at maturity.

Plant Organs: Roots, Stems, and Leaves

Plants are organized into three basic organs: roots, stems, and leaves. Each organ has specialized structures and functions that contribute to the plant's overall survival. These organs are composed of the three tissue systems previously discussed.

Root Systems: Anchoring and Absorption

Roots are typically subterranean organs that anchor the plant, absorb water and minerals from the soil, and store food reserves. Root systems can vary greatly in structure, but they generally consist of the root tip, root cap, and root hairs.

- **Root Cap:** A protective layer of cells covering the root apical meristem, which lubricates the passage of the root through the soil.
- **Root Hairs:** Tiny, hair-like extensions of epidermal cells in the root zone of maturation that greatly increase the surface area for absorption of water and minerals.
- **Taproot System:** A system where a single, large, central root (the taproot) grows vertically downward, with smaller lateral roots branching off.

- **Fibrous Root System:** A system characterized by a dense network of thin roots arising from the base of the stem, common in monocots.

Stems: Support, Transport, and Photosynthesis

Stems are generally aerial organs that support leaves, flowers, and fruits. They also serve as conduits for water and nutrients moving between the roots and the leaves, and can be involved in photosynthesis if they are green.

- **Nodes:** The points on a stem where leaves are attached.
- **Internodes:** The stem segments between nodes.
- **Apical Bud (Terminal Bud):** A bud at the tip of a stem or branch, responsible for primary growth.
- **Axillary Bud (Lateral Bud):** A bud that arises in the axil of a leaf (the upper angle between the leaf and the stem) and can develop into a branch or flower.

Leaves: The Powerhouses of Photosynthesis

Leaves are the primary sites of photosynthesis, the process by which plants convert light energy into chemical energy in the form of sugars. They are typically flattened structures adapted for maximum light absorption and gas exchange.

- **Blade:** The broad, flattened part of a leaf.
- **Petiole:** The stalk that attaches the leaf blade to the stem.
- **Veins:** Vascular bundles within the leaf blade that transport water and nutrients and provide structural support.
- **Stoma (plural: stomata):** Pores on the leaf surface, surrounded by guard cells, that regulate gas exchange and transpiration.
- **Mesophyll:** The internal tissue of a leaf, containing chloroplasts for photosynthesis, typically divided into palisade mesophyll (tightly packed cells) and spongy mesophyll (loosely packed cells with air spaces).

Plant Growth: From Embryo to Mature Organism

Plant growth is a complex process involving cell division, cell expansion, and cell differentiation. Campbell Biology Chapter 35 distinguishes between primary and secondary growth, and highlights the critical role of hormones in regulating these processes.

Primary Growth: Elongation and Development

Primary growth is the process of elongation that occurs at the apical meristems of shoots and roots. This growth results in the development of the primary plant body, including the herbaceous parts of the plant and the root system.

The root apical meristem is protected by the root cap, and the shoot apical meristem produces leaf primordia and bud primordia, which develop into leaves and branches, respectively. Cell division in the meristems is followed by cell elongation in the zone of elongation, pushing the root tip further into the soil or the shoot upwards.

Secondary Growth: Widening and Thickening

Secondary growth is responsible for the increase in girth or diameter of stems and roots in woody plants. It is brought about by the activity of lateral meristems: the vascular cambium and the cork cambium.

- **Vascular Cambium:** A layer of meristematic cells located between the xylem and phloem. It produces secondary xylem (wood) to the inside and secondary phloem to the outside, increasing the diameter of the stem or root.
- **Cork Cambium:** A lateral meristem that produces cork cells to the outside, forming the protective outer bark of woody plants. It also produces phelloderm to the inside.
- **Secondary Xylem (Wood):** Composed of tracheids, vessel elements, and parenchyma cells, it provides structural support and transports water.
- **Secondary Phloem:** Composed of sieve-tube elements, companion cells, and parenchyma, it transports sugars.

Hormonal Regulation of Plant Growth

Plant growth and development are finely tuned by a group of chemical messengers known as plant hormones. These hormones, produced in small amounts, have profound effects on various aspects of plant life, from germination and flowering to fruit development and response to stimuli.

- **Auxins:** Primarily involved in cell elongation, root formation, fruit development, and apical dominance.
- **Gibberellins:** Promote stem elongation, seed germination, and flowering.
- **Cytokinins:** Stimulate cell division and differentiation, and delay senescence (aging).
- **Abscisic Acid (ABA):** Inhibits growth, promotes dormancy in seeds and buds, and plays a role in stomatal closure during water stress.
- **Ethylene:** A gaseous hormone involved in fruit ripening, senescence, and the triple response in seedlings under stress.

Environmental Influences on Plant Development

Plant growth and development are also significantly influenced by environmental factors. These include light, temperature, water availability, and gravity. Plants have evolved sophisticated mechanisms to perceive and respond to these cues, optimizing their growth and survival in diverse conditions.

For instance, phototropism (growth towards light) is mediated by auxins, and gravitropism (growth in response to gravity) allows roots to grow downwards and shoots upwards. Temperature and light duration can trigger developmental transitions like flowering, a phenomenon known as photoperiodism. Water stress, perceived through hormonal signals like ABA, can lead to stomatal closure and other adaptive responses.

FAQ: Campbell Biology Chapter 35 Glossary US

Q: What is the primary function of the dermal tissue system in plants?

A: The primary function of the dermal tissue system is to provide a protective outer covering for the plant body. This includes preventing water loss, protecting against pathogens and herbivores, and regulating gas exchange through structures like stomata.

Q: Can you explain the difference between primary and secondary growth in plants?

A: Primary growth is the increase in length of a plant, occurring at the apical meristems in the tips of roots and shoots. Secondary growth is the increase in girth or diameter of stems and roots, primarily in woody plants, and is caused by the activity of lateral meristems like the vascular cambium and cork cambium.

Q: What are the main components of the vascular tissue system, and what do they transport?

A: The vascular tissue system consists of xylem and phloem. Xylem transports water and dissolved minerals from the roots to the rest of the plant, while phloem transports sugars produced during photosynthesis from the leaves to other parts of the plant.

Q: What role do meristematic tissues play in plant growth?

A: Meristematic tissues are regions of actively dividing cells that are responsible for producing new cells. These new cells can then differentiate into specialized cell types, enabling the plant to grow in length (apical meristems) and girth (lateral meristems).

Q: How do plant hormones regulate growth and development?

A: Plant hormones act as chemical messengers, produced in small amounts, that influence various growth and developmental processes. They can promote or inhibit cell division, elongation, and differentiation, and are involved in responses to environmental stimuli such as light and gravity.

Q: What is the significance of stomata in plant

biology?

A: Stomata are small pores, typically found on the surface of leaves, surrounded by guard cells. Their primary function is to regulate gas exchange, allowing carbon dioxide to enter for photosynthesis and oxygen to exit. They also control the release of water vapor through transpiration.

Q: What are the three basic types of ground tissue in plants, and what are their general functions?

A: The three main types of ground tissue are parenchyma, collenchyma, and sclerenchyma. Parenchyma cells are involved in photosynthesis, storage, and secretion. Collenchyma cells provide flexible support to growing regions. Sclerenchyma cells provide strong structural support and are often found in mature plant parts.

Q: What is the function of root hairs in a plant?

A: Root hairs are microscopic extensions of epidermal cells in the root zone of maturation. Their primary function is to significantly increase the surface area of the root, thereby enhancing the absorption of water and essential minerals from the soil.

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