

BOTANY COMPREHENSIVE CHEAT SHEET

Essential Concepts, Plant Physiology, Anatomy, and Taxonomy

1. Plant Anatomy Tissues

Meristematic Tissues (actively dividing cells):

- **Apical Meristems:** Primary growth, increases length (root/shoot tips).
- **Lateral Meristems:** Secondary growth, increases girth (vascular cambium, cork cambium).
- **Intercalary Meristems:** Found at nodes/internodes (e.g., grasses).

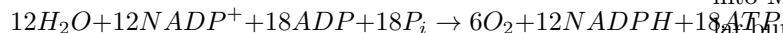
Permanent Tissues:

- **Simple:** Parenchyma (storage/photosynthesis), Collenchyma (flexible support), Sclerenchyma (rigid support, dead at maturity).
- **Complex:** Xylem (water/mineral transport: tracheids, vessels, parenchyma, fibers) and Phloem (nutrient transport: sieve tubes, companion cells, parenchyma, fibers).

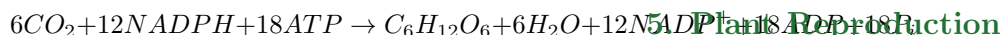
2. Plant Physiology

Photosynthesis Equations:

Light Reactions (Thylakoid Membrane):



Calvin Cycle / Dark Reactions (Stroma):



Photosynthetic Pathways:

- **C3 Plants:** First stable product is 3-PGA (3 carbons). Standard Calvin cycle.
- **C4 Plants:** First product is Oxaloacetate (4 carbons). Kranz anatomy (e.g., maize, sugar-cane).
- **CAM Plants:** Temporal separation of carbon fixation (crassulacean acid metabolism, e.g., cacti, succulents).

3. Plant Hormones (Phytohormones)

Hormone

Cell elongation, apical dominance, phototropism. Gibberellins (GA_3)

Cell division, delay senescence, lateral bud growth. Absciscic Acid (ABA)

Ripening of fruits, abscission, triple response. Ethylene

- | Plant Type | Primary Function |
|---|--|
| • Hydrophytes: Adapted to aquatic environments (reduced xylem, aerenchyma present). | Stem elongation, seed germination, bolting. Cytokinins |
| • Xerophytes: Adapted to arid climates; thick cuticles, sunken stomata, CAM pathway. | Stress hormone, stomatal closure, seed dormancy. |
| • Halophytes: Adapted to high salinity (salt glands, vivipary in mangroves). | Ethylene |

4. Plant Taxonomy Classification

Major Plant Groups:

- **Bryophytes (Non-vascular):** Mosses, liverworts. Gametophyte dominant, lack true roots/leaves.
- **Pteridophytes (Seedless Vascular):** Ferns, horsetails. Sporophyte dominant, vascular tissue present.
- **Gymnosperms (Naked Seeds):** Conifers, cycads. Seeds not enclosed in an ovary.
- **Angiosperms (Flowering Plants):** Divided into Monocots (parallel veins, scattered vascular bundles) and Dicots (reticulate veins, ringed vascular bundles).

5. Plant Reproduction

Alternation of Generations: Lifecycle alternates between a multicellular haploid **gametophyte** (n) and a diploid **sporophyte** ($2n$).

Double Fertilization in Angiosperms:

- One sperm cell (n) fuses with the egg cell (n) to form the zygote ($2n$).
- Second sperm cell (n) fuses with two polar nuclei ($2n$ total) to form the triploid primary endosperm nucleus ($3n$).