

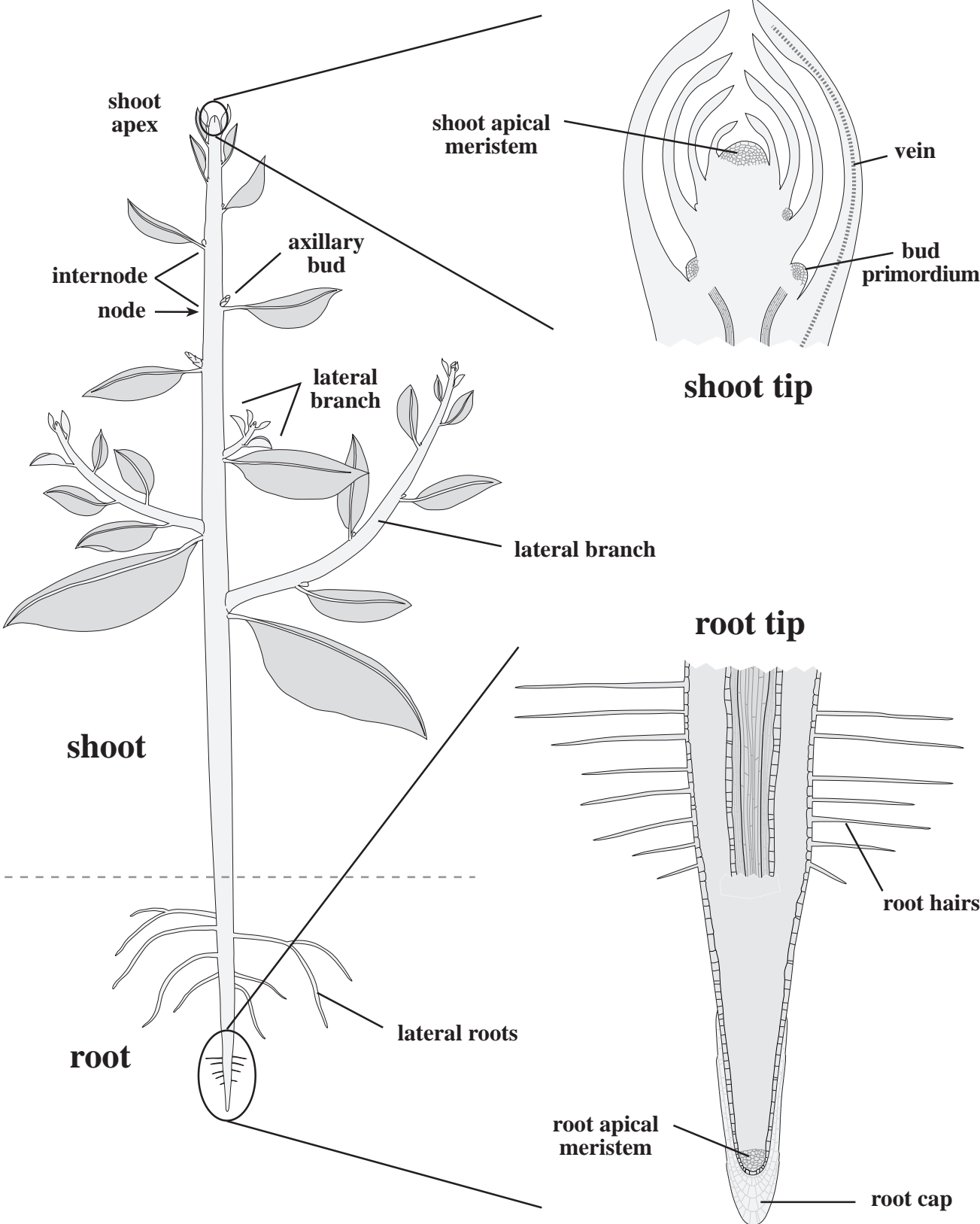
**PLANT MORPHOLOGICAL TERMS**

**PLANT PARTS**

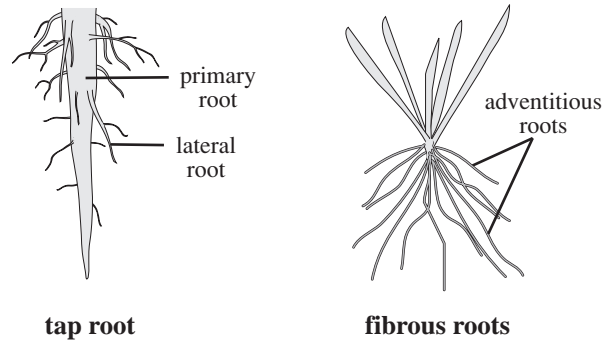
- bud** - an immature shoot, vegetative or reproductive or both, the outer leaves of which may be modified as protective scales; may be gametophytic or sporophytic.
- capsule** - the spore-producing components of the sporophytes of liverworts, hornworts, and mosses. [Note: the term “capsule” is also used for a specific fruit type of angiosperms; see below.]
- cone / strobilus** - a modified, determinate, reproductive shoot system of many non-flowering vascular plants, consisting of a stem axis bearing either sporophylls (in “simple” cones) or modified shoot systems (in “compound” cones).
- flower** - the reproductive organ of flowering plants; a modified, determinate shoot bearing sporophylls (stamens and/or carpels), with or without outer modified leaves (the perianth).
- fruit** - the mature ovary of flowering plants, consisting of the pericarp (mature ovary wall), seeds, and (if present) accessory parts.
- inflorescence** - an aggregate of one or more flowers, the boundaries of which generally occur with the presence of vegetative leaves; may be composed of two or more unit inflorescences.
- leaf** - a generally dorsio-ventrally flattened organ, usually functioning in photosynthesis and transpiration; derived from a leaf primordium in the shoot apex; in vascular plants containing one to many vascular bundles (veins); often variously modified.
- ovule** - a megasporangium enveloped by one or more protective integuments; the immature seed.
- rhizoids** - uniseriate chains of cells arising typically from the base of the gametophytes of liverworts, hornworts, and mosses that function in water and mineral absorption.
- root** - a cylindrical organ of virtually all vascular plants, consisting of an apical meristem that gives rise to a protective root cap, a central endodermis-bounded vascular system, absorptive epidermal root hairs, and endogenously developed lateral roots; usually functioning in anchorage and absorption of water and minerals; initially derived from the radicle of the embryo and typically growing downward.
- shoot** - a stem plus associated, derivative leaves; initially formed by an apical meristem that gives rise to the stem and external (exogenous) leaf primordia; may be gametophytic or sporophytic.
- sporangium** - the spore-producing part of a plant; sporangia are of two types - male (microsporangium) or female (megasporeangium) - in all heterosporous plants, including all of the seed plants.
- stem** - a generally cylindrical organ that bears leaves, typically functioning in support and elevation of the leaves and reproductive structures and in conduction of water, minerals, and sugars; in vascular plants initially derived from the epicotyl of the embryo and generally growing upward.
- thallus** - the flattened (dorsi-ventral) gametophyte of some liverworts and all hornworts.
- vein** - the discrete vascular bundles of the leaves of vascular plants.

**PLANT HABIT** (= general form of plant, including stem duration, branching pattern, development, and texture)

- herb** - a plant with annual aboveground shoots (including a flower or inflorescence); the plant itself may be annual, biennial, or perennial
- geophyte** - a perennial herb, typically with a bulb, corm, rhizome, or tuber at the underground stem
- shrub** - a perennial, woody plant having several main stems arising at ground level
- subshrub** - a short shrub that is woody only at the base and that seasonally bears new, non-woody, annual shoots above
- tree** - a generally tall, perennial, woody plant having one main stem (the trunk) arising at ground level
- vine** - a plant with elongate, weak stems, supported by means of scrambling, twining, tendrils, or roots; may be annual or perennial, herbaceous or woody
- liana** - a woody, perennial vine, in tropical forests often a component of the tree canopy layer



## ROOTS



### ROOT TYPE

**adventitious roots** - a root arising from an organ other than a root, usually from a stem

**aerial roots** - adventitious roots that absorb moisture and minerals from the air or runoff; common in some epiphytic plants, e. g., of Araceae and Orchidaceae

**fibrous roots** - lacking a taproot, having adventitious roots that are typically fine and numerous

**prop root** - above-ground, adventitious roots that function in supporting the stem

**buttress roots** - enlarged, horizontally spreading and often vertically thickened roots at the base of trees that aid in mechanical support

**lateral [secondary] root** - roots that are derived endogenously from the pericycle of an existing root

**primary root** - the root derived from the original radicle of the embryo

**radicle** - the first root of the embryo

**storage root [root tuber]** - a swollen taproot containing concentrations of high energy compounds such as starch

**taproot** - a persistent, well-developed primary root

### STEM / SHOOT PARTS

**leaf primordium** - an immature leaf of the shoot

**epicotyl** - the first shoot of a seed plant, derived from the embryo of the seed

**node** - the point of attachment of a leaf to a stem

**internode** - the region between two adjacent nodes

**bud primordium** - an immature bud of the shoot, typically located in the axil, the upper (adaxial) junction of leaf and stem

**vascular strands** - vascular tissue, composed of xylem and phloem, functioning in fluid transport

**bud** - an immature shoot system, often surrounded by protective scale leaves, developing into a lateral branch, a flower, or an inflorescence

**bark** - tissues external to vascular cambium in stem (and roots) of woody plants, consisting of secondary phloem (inner bark) and derivatives of cork cambium (outer bark or periderm)

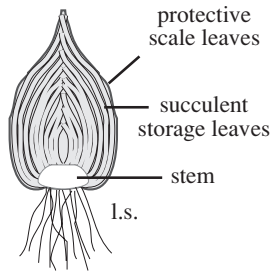
**cortex** - outer, mostly parenchymatous tissue, external to vasculature

**ground meristem** - mostly parenchymatous tissue surrounding vascular bundles in atactostele

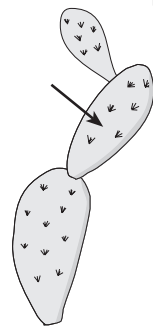
**pith** - central, mostly parenchymatous tissue, internal to vasculature of siphonosteles and eusteles

**wood** - secondary xylem tissue, derived from vascular cambium of woody vascular plants

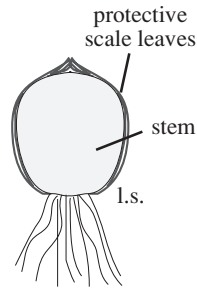
**STEM TYPES**



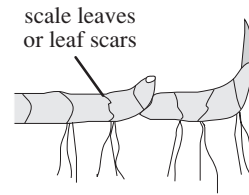
**bulb**



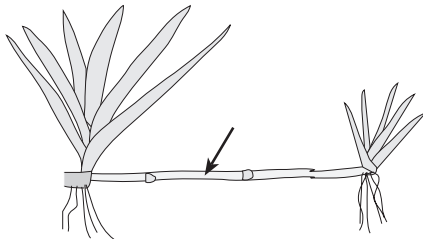
**cladodes**



**corm**



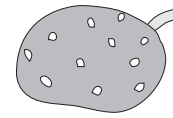
**rhizome**



**stolon**



**thorn**



**tuber**

**STEM / SHOOT TYPES**

**cladode** - a flattened photosynthetic stem, functioning as and resembling a leaf [cladophyll, phylloclad]

**rootstock** - a general term for an underground stem or shoot; these generally give rise to aerial shoots either by direct conversion of the terminal apical meristem or via lateral buds

**bulb** - a short, erect, underground stem surrounded by fleshy leaves

**corm** - an enlarged, solid underground storage stem or stem base, with outer, protective scales

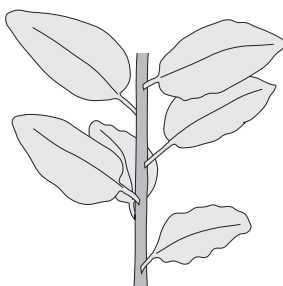
**rhizome** - a horizontal, underground stem, generally with short internodes and scale-like leaves; term also used for horizontal stems of ferns that are at ground level

**tuber** - a thick, underground storage stem, usually not upright, typically bearing outer buds and lacking surrounding storage leaves or protective scales

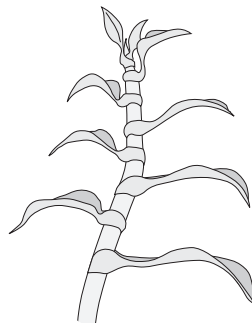
**stolon / runner** - an indeterminate, elongate, slightly underground or aboveground propagative stem, with long internodes, rooting at the tip forming new plants

**thorn** - a sharp-pointed stem or shoot (cf. prickle, spine)

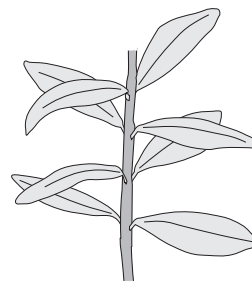
**Arrangement**



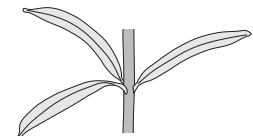
**alternate-spiral**



**distichous**



**opposite**



**whorled**

**LEAF ARRANGEMENT** (= placement with respect to similar parts)

**alternate** - one leaf or other structure per node

**distichous** - alternate leaves or other structures two-ranked, in one plane

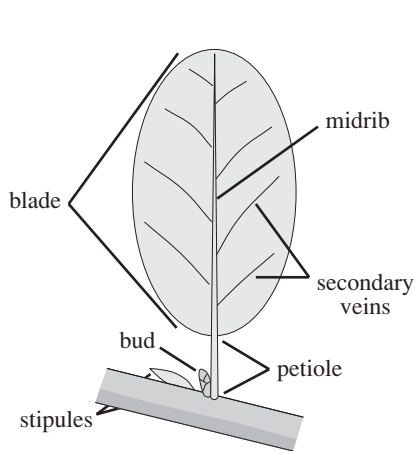
**spiral** - alternate leaves or other structures in more than two rows [polystichous]

**opposite** - two leaves or other structures per node, on opposite sides of stem or central axis

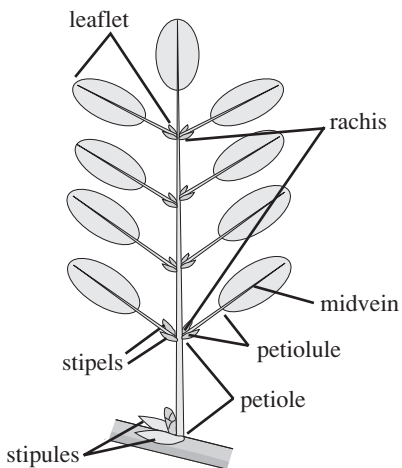
**decussate** - opposite leaves or other structures at right angles to preceding pair

**whorled** - three or more leaves or other structures per node [verticillate]

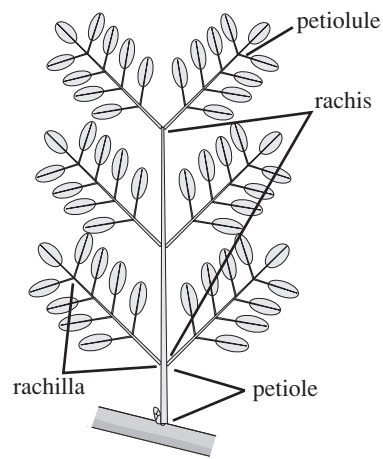
**LEAF TYPES**



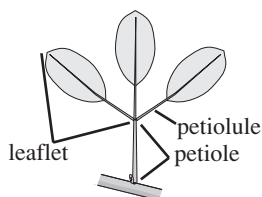
**simple**



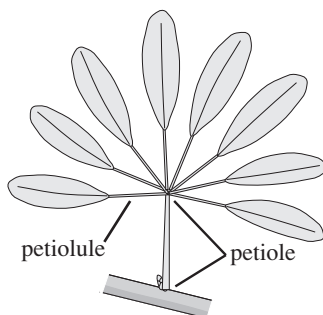
**pinnately compound**



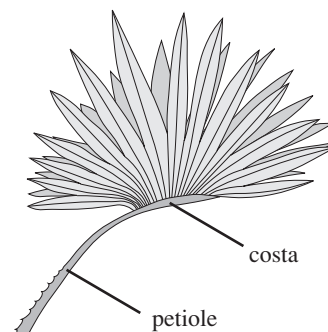
**bipinnately compound**



**ternate**



**palmately compound**



**costa-palmate**

**LEAF PARTS**

**blade / lamina** - the flat, expanded portion of leaf

**leaflet** - a distinct and separate segment of a leaf

**petiole / stipe** - a leaf stalk; the term "stipe" used for ferns

**petiolule** - a leaflet stalk

**pinna** - the first divisions of a leaf, usually applied to ferns

**pinnule** - the ultimate divisions or leaflets of a leaf, usually applied to ferns

**rachilla** - a lateral or secondary axis of a bipinnate leaf (plural, "rachillae")

**rachis** - the main axis of a pinnately compound leaf

**sheath** - a flattened leaf base or petiole that partially or wholly clasps the stem; e. g., Poaceae and many Apiaceae

**stipules** - paired leaf-like structures, which may be modified as spines or glands, at either side of the base of a petiole

**stipulate** - with stipules

**extipulate** - without stipules

**vein / nerve** - the vascular bundle of a leaf, containing the conductive tissues

**LEAF TYPE**

**compound** - with leaf divided into two or more discrete leaflets

**bipinnately comp.** - with two orders of leaflets, each pinnately compound (bipinnate)

**costapalmate** - essentially palmately lobed to compound but with an elongate, rachis-like extension of the petiole, as in some palms

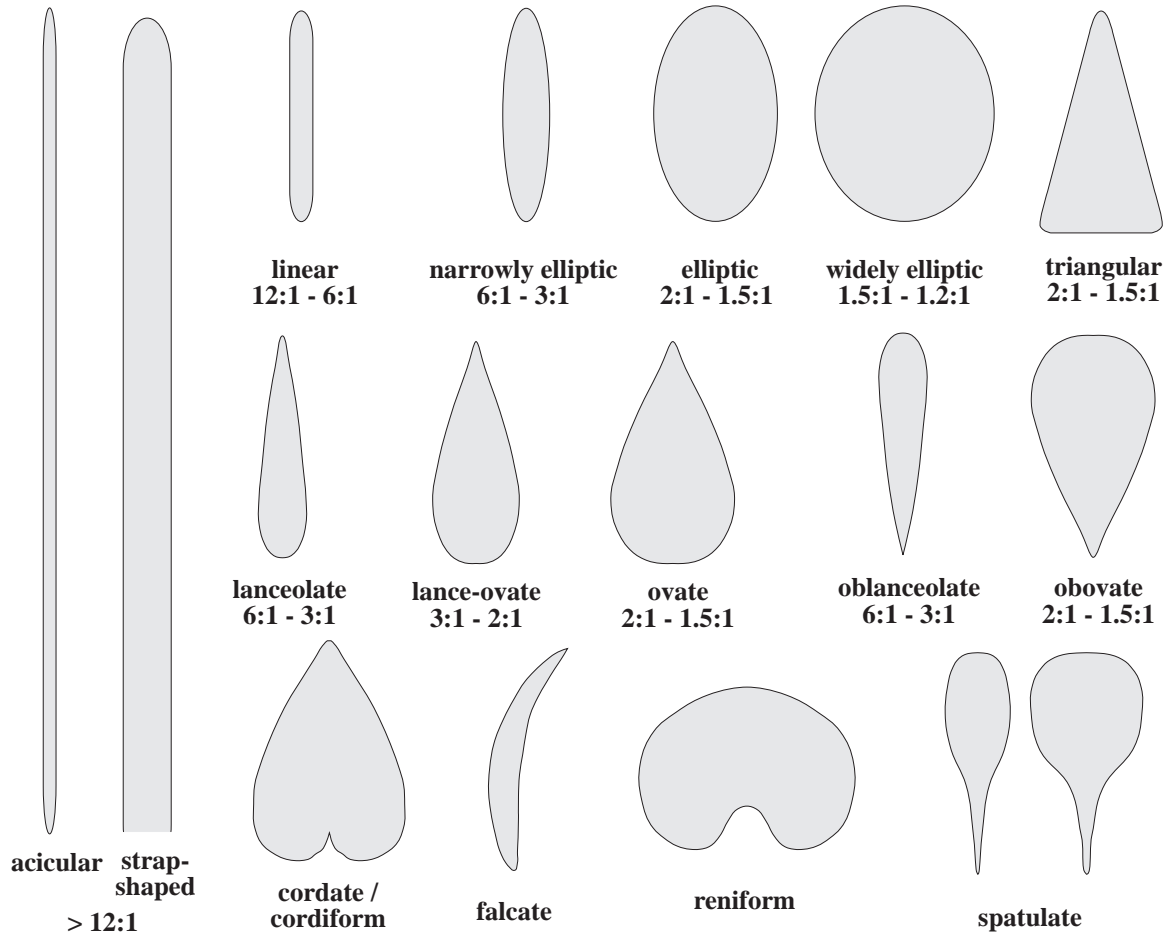
**palmately compound** - with 4 or more leaflets arising from a common point, usually at the end of the petiole (palmate)

**pinnately compound** - with leaflets arranged oppositely or alternately along a central axis, the rachis (pinnate)

**trifoliolate / ternate** - with three leaflets (ternately compound) [trifoliolate]

**simple** - with leaf not divided into leaflets, bearing a single blade

## Shape: Plane



**SHAPE: PLANE** [Note: generally after Taxon 11(5): 145-156 (1962)]

**acicular** - needlelike, often round in cross-section; margins straight, parallel, length:width ratio > 12:1

**cordate** - heart-shaped; approximately ovate with a cordate base (see “**Base**”) [cordiform]

**elliptic** - margins curved, widest at midpoint, length:width ratio between 2:1 and 3:2

**falcate** - lanceolate to linear and curved to one side; scimitar-shaped [falciform]

**lanceolate** - margins curved, widest near base, length:width ratio between 6:1 and 3:1

**lance-ovate** - margins curved, widest near base, length:width ratio between 3:1 and 2:1

**linear** - margins straight, parallel, length:width ratio between 12:1 and 6:1

**narrowly elliptic** - margins curved, widest near midpoint, length:width ratio between 6:1 and 3:1

**oblanceolate** - margins curved, widest near apex, length:width ratio between 6:1 and 3:1

**oblance-ovate** - margins curved, widest near apex, length:width ratio between 3:1 and 2:1

**oblong** - margins straight, parallel, length:width ratio 2:1 and 3:2

**obovate** - margins curved, widest near apex, length:width ratio between 2:1 and 3:2

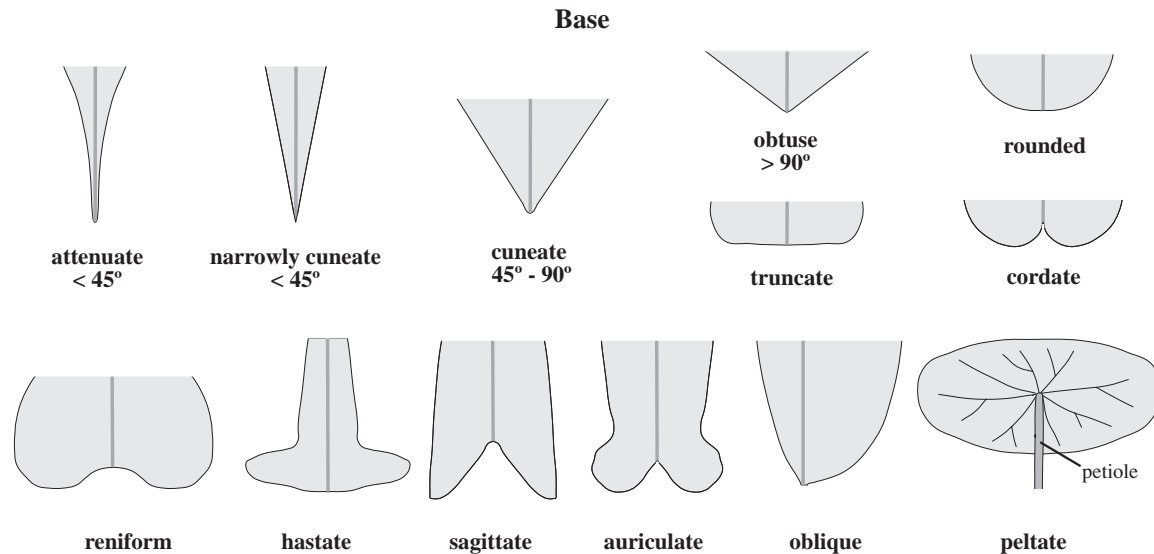
**ovate** - margins curved, widest near base, length:width ratio between 2:1 and 3:2

**reniform** - kidney-shaped; wider than long with a rounded apex and reniform base (see “**Base**”)

**spatulate** - oblong, obovate, or oblanceolate with a long attenuate base

**subulate** - awl-shaped; approximately narrowly oblong to narrowly triangular

**triangular** - three-sided, length:width ratio between 2:1 and 3:2



**BASE**

**attenuate** - basal margins abruptly incurved (concave), basal intersection angle  $< 45^\circ$

**auriculate** - with two rounded, basal lobes, margins above lobes concave

**cordate** - with two rounded, basal lobes intersecting at sharp angle, margins above lobes rounded

**cuneate** - basal margins approximately straight, intersection angle  $45^\circ - 90^\circ$

**hastate** - with two basal lobes, more or less pointed and oriented outwardly, approximately  $90^\circ$  relative to central axis

**narrowly cuneate** - basal margins approximately straight, intersection angle  $< 45^\circ$

**oblique** - with an asymmetrical base

**obtuse** - basal margins approximately straight, intersection angle  $> 90^\circ$

**peltate** - having petiole attached away from the margin, on the underside of blade

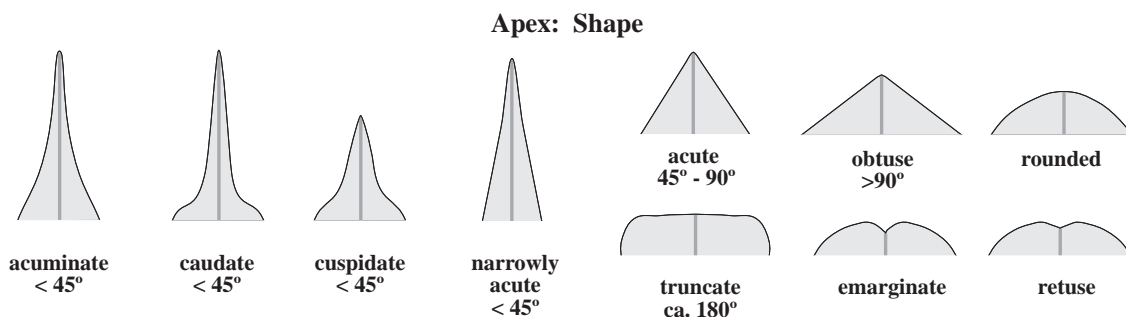
**reniform** - with two rounded, basal lobes, smoothly concave at intersection of lobes

**rounded** - basal margins convex, forming a single, smooth arc

**sagittate** - with two basal lobes, more or less pointed and oriented downward, away from apex

**sheathing** - having a basal, clasping leaf sheath

**truncate** - basal margin cut straight across, angle approximately  $180^\circ$



**APEX** (plural, "Apices")

**acuminate** - apical margins abruptly incurved (concave), apical intersection angle  $< 45^\circ$

**acute** - apical margins approximately straight, intersection angle  $45^\circ - 90^\circ$

**caudate** - abruptly acuminate into a long, narrowly triangular (tail-like) apical region

**cuspidate** - abruptly acuminate into a triangular, stiff or sharp apex

**emarginate** - having an apical incision, cut  $\frac{1}{16} - \frac{1}{8}$  distance to midrib, midvein, or junction of primary veins

**narrowly acute** - apical margins approximately straight, intersection angle  $< 45^\circ$

**oblique** - with an asymmetrical apex (see **Base**)

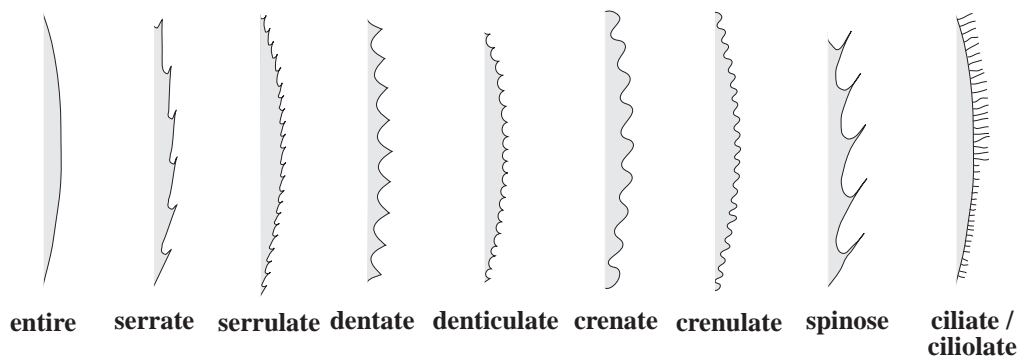
**obtuse** - apical margins approximately straight, intersection angle  $> 90^\circ$

**retuse** - having an apical incision, cut up to  $\frac{1}{16}$  distance to midrib, midvein, or junction of main veins

**rounded** - apical margins convex, forming a single, smooth arc

**truncate** - apical margin cut straight across, angle approximately  $180^\circ$

## Margin

**MARGIN**

**ciliate** - with trichomes protruding from margins

**ciliolate** - with minute trichomes protruding from margins; minutely ciliate

**crenate** - with rounded to obtuse, shallowly ascending teeth, cut  $1/16$  -  $1/8$  distance to midrib, midvein, or junction of primary veins

**crenulate** - diminutive of crenate, teeth cut to  $1/16$  distance to midrib, midvein, or junction of primary veins

**dentate** - with sharp, coarse teeth that point outward at right angles to margin outline, cut  $1/16$  -  $1/8$  distance to midrib, midvein, or junction of primary veins

**denticulate** - diminutive of dentate, cut to  $1/16$  distance to midrib, midvein, or junction of primary veins

**doubly serrate** - with large, serrate teeth having along the margin smaller, serrate teeth

**eciliate** - without trichomes protruding from margins, regardless of presence or absence of teeth

**entire** - without teeth on margins; locally smooth (Note, however, that surface may be divided.)

**serrate** - saw-toothed; teeth sharp and ascending, lower side longer, cut  $1/16$  -  $1/8$  distance to midrib, midvein, or junction of primary veins

**serrulate** - diminutive of serrate, teeth cut to  $1/16$  distance to midrib, midvein, or junction of primary veins

**spinose** - margins with teeth bearing sharp, stiff, spine-like processes

**EPIDERMAL EXCRESCENCE** (from structural outgrowths or secretions of epidermis)

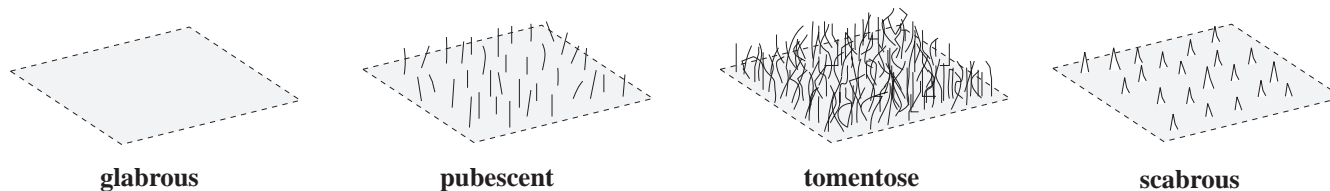
**farinaceous** - finely mealy, covered with small granules [granular, scurfy]

**glaucous** - covered with a smooth, usually whitish, waxy coating (that can be rubbed off with touch)

**prickly** - with prickles = sharp non-spine, non-thorn appendages

**scabrous** - having a rough surface, like that of sandpaper (also treated under “**Vestiture**”)

## Vestiture

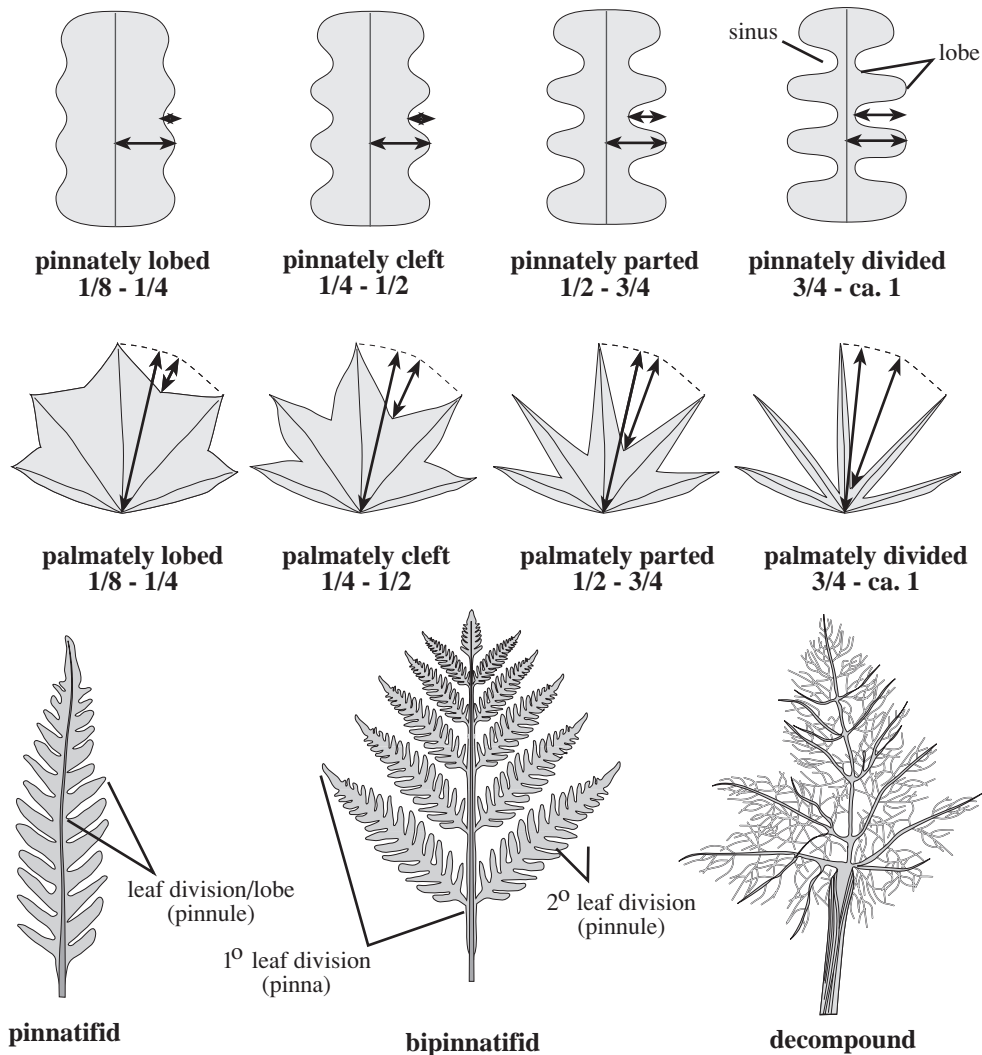
**VESTITURE** (=trichome cover, a combination of type, length, strength, shape, density, and color)

**glabrous** - without trichomes

**pubescent** - with straight, short, soft, somewhat scattered, slender trichomes (Note: This can be a general term = “having trichomes.”)

**tomentose** - covered with dense, interwoven trichomes

**DIVISION**



**DIVISION** (=nature of sinuses (incisions), these defining lobes or segments; often treated as “**Margin**”)

**lobed** - sinuses extending (pinnately or palmately)  $1/8 - 1/4$  distance to midrib, midvein, or vein junction

**cleft** - sinuses extending (pinnately or palmately)  $1/4 - 1/2$  distance to midrib, midvein, or vein junction

**parted** - sinuses extending (pinnately or palmately)  $1/2 - 3/4$  distance to midrib, midvein, or vein junction

**divided** - sinuses extending (pinnately or palmately)  $3/4$  - almost to midrib, midvein, or vein junction

**bipinnatifid** - bipinnately lobed to divided

**decompound** - deeply divided into numerous segments such that leaflets not clearly defined

**pinnatifid** - pinnately lobed to divided