Laboratory work

1. Anatomy of leaf.

2. To explain the anatomical structure of stem of monocot and dicot plants.

Anatomy of leaf

Material:
Permanent preparations of the cross-section the leaf of camellia, iris, pine needles.

Objective: to investigate the morpho-anatomical structure of leaves of various types.

Tasks of work:
1. to analyze the anatomical structure of bifacial and unifacial leaves on samples of leaf of camellia, iris, pine needles.

Bifacial, Unifacial, and Equifacial Leaves

There are three main leaf types based on their adaxial–abaxial structure: **bifacial, unifacial, and equifacial.** In conventional, **bifacial leaves**, the adaxial (upper) domain of the leaf consists of an epidermis with a relatively thick cuticle and densely packed palisade mesophyll cells, which optimize light capture. The abaxial (lower) domain of the leaf consists of an epidermis with abundant stomata and spongy mesophyll cells, which function in gas exchange and the regulation of transpiration.

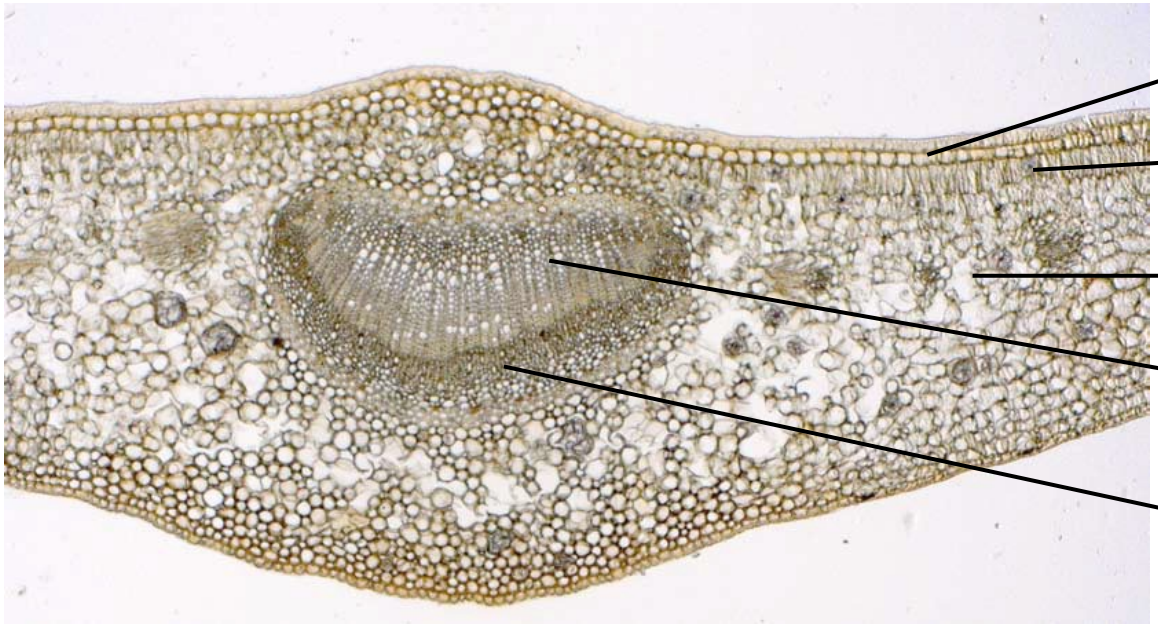
ISOBILATERAL LEAF:

It is equally illuminated on both sides, (isos = equal, bio = two, lateris = side).

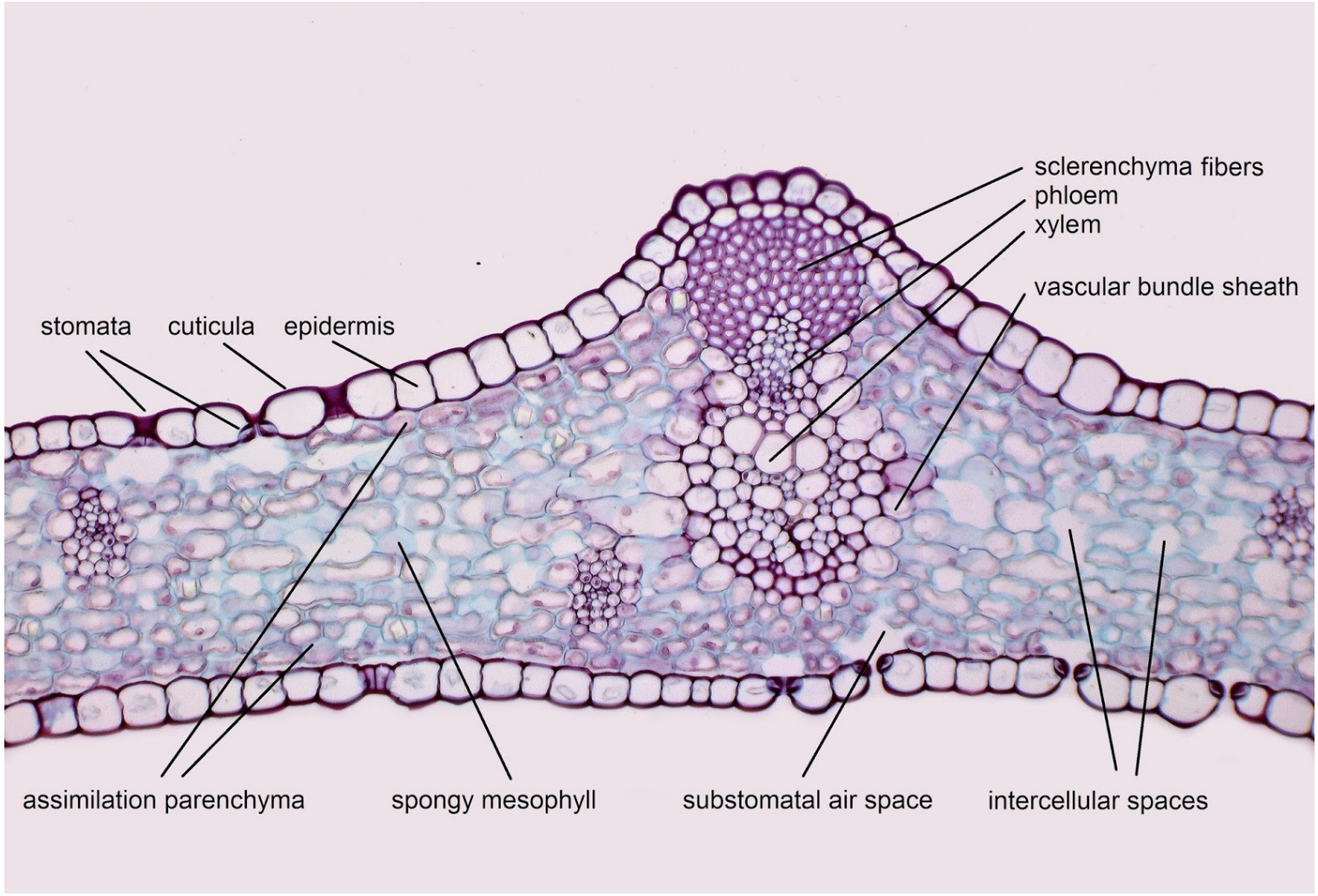
It is also called unifacial or isolateral leaf. Stomata are present in both the epidermal layers and may be called amphistomal leaf. Mesophyll is not differentiated into palisade and spongy tissue but consists of parenchyma cells with chloroplast and inter cellular spaces e.g. maize.

To analyze and draw the microscopic structure of the leaves: camellias (dorsoventral), iris (isolateral), pine (radial).

In the figure, label the upper and lower epidermis, mesophyll (it has a columnar and spongy parenchyma), a vascular fibrous bundle, elements of mechanical tissue.

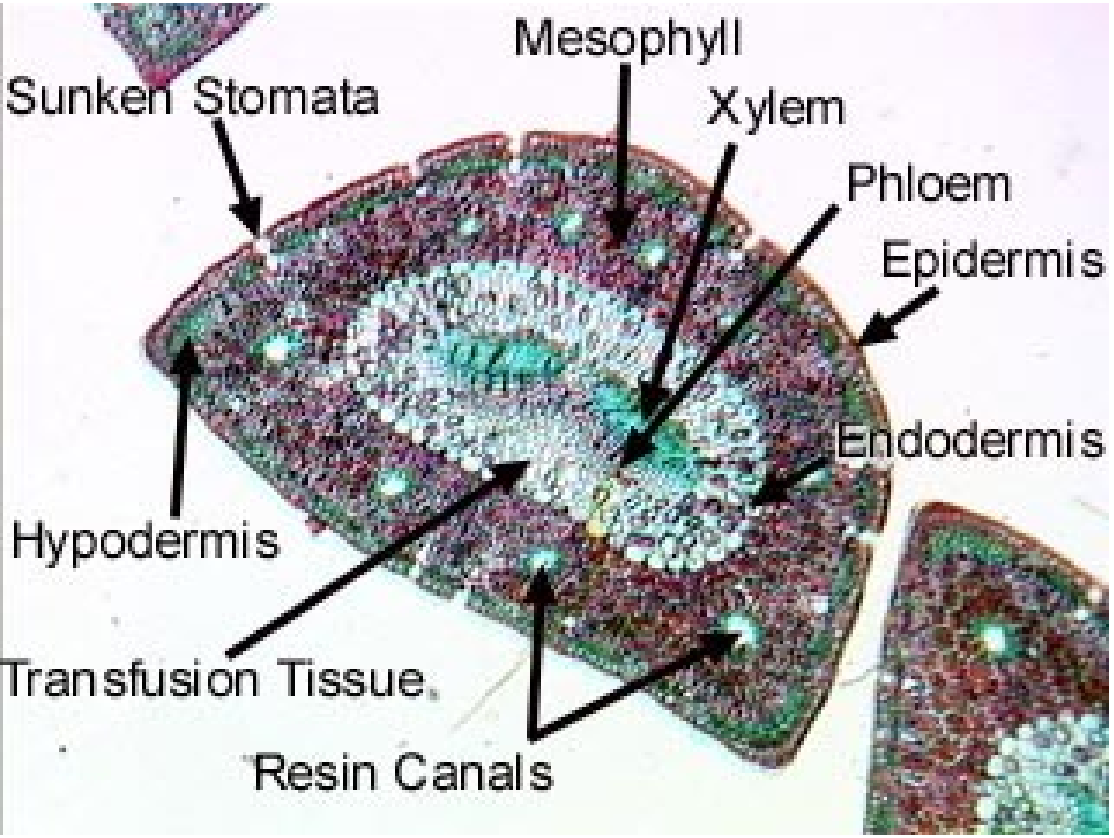


Cross section of camellia leaf



Cross section of iris leaf

Features of the structure of pine needles. The cuticle is thick, then the epidermis, under which is a layer of cells with lignified shells. The stomata are located across the entire surface of the needle. The driving beam is clearly visible.



Pine anatomy. Some things we learned specifically with pine needles (I'm not sure if they also apply to some other plants, sorry) are the **resin duct** with **epithelium**, **hypodermal sclerenchyma**, and **transfusion tissue**. The outermost layer surrounding the resin duct is the epithelium. **Hypodermal sclerenchyma** is below ("hypo") the outermost layer of cells or dermis.

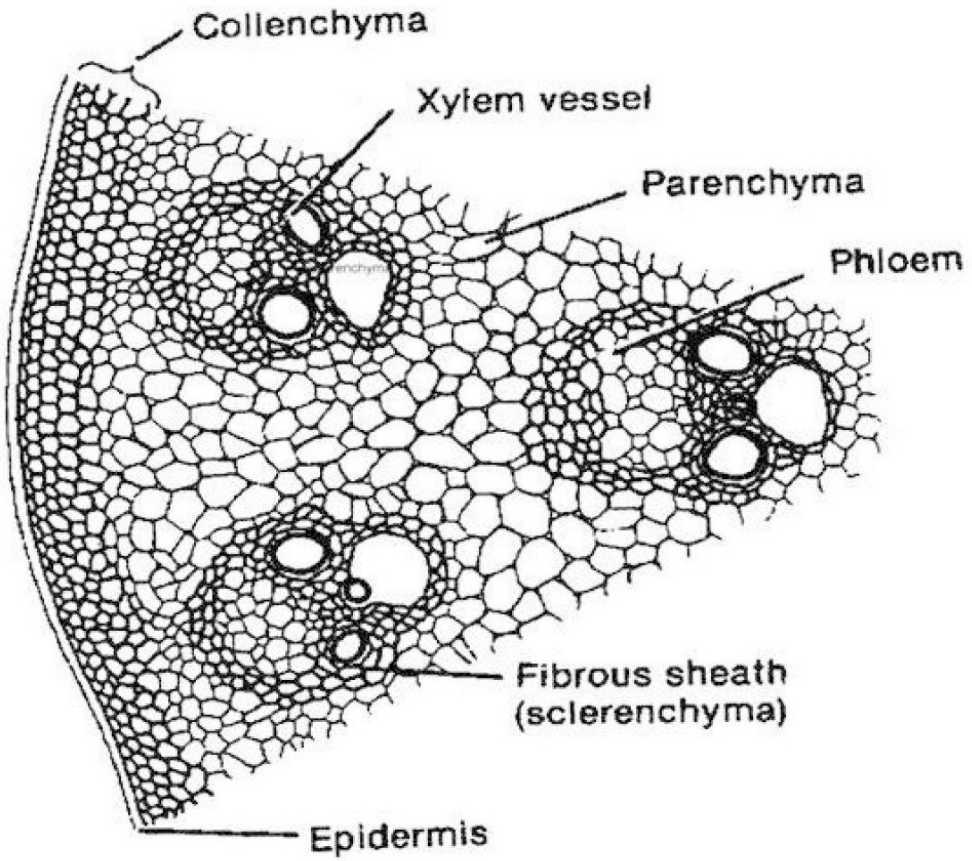
These have thick secondary cell walls which add to the strength of a pine needle, as you have probably tested yourself many times when you got poked with one. In this repeat picture you can see the hypodermal sclerenchyma with the thick red-stained walls, on either side of the sunken stomate.

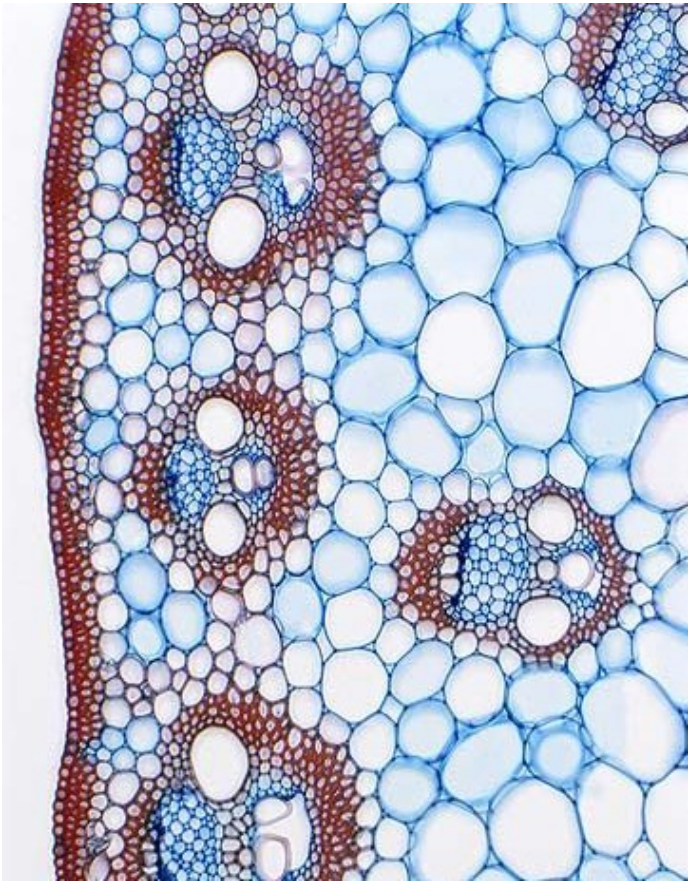
To explain the anatomical structure of stem of monocot and dicot plants

Material:
Permanent preparations of the cross-section of the stem of maize (*Zea mays* L.), Solomon's Seal stem (*Polygonatum* sp), the stem of rye (*Secale* sp.), pondweed (*Potamogeton* sp.), sunflower (*Helianthus annuus* L.), Dutchman's Pipe Stem (*Aristolochia* sp.), clover (*Trifolium* sp.), linden (*Tilia cordata* Mill.), .

Objective: to investigate the structural features of the stems in various plants

Tasks of work:
1.To analyze the structure of the stem of maize, Solomon's Seal stem, (primary structure). To draw and label the epidermis, primary cortex, pericycle, vascular bundles, pith.
2.To analyze the structure of the stem pondweed. Draw and label primary cortex with aerenchyma.
2. To analyze the structure of the stem of sunflower (primary structure). Draw and label the epidermis, primary cortex, pericycle, vascular bundles, pith.
3. To analyze the structure of the stem of Dutchman's Pipe Stem (*Aristolochia* sp.), draw and label.
4. To analyze the structure of the wood stems. Draw and label the main elements.





Cross-section of the stem of maize

A cross section of the stem of corn (**Zea mays**) showing parenchyma tissue and scattered vascular bundles. The large cells in the vascular bundles are vessels.

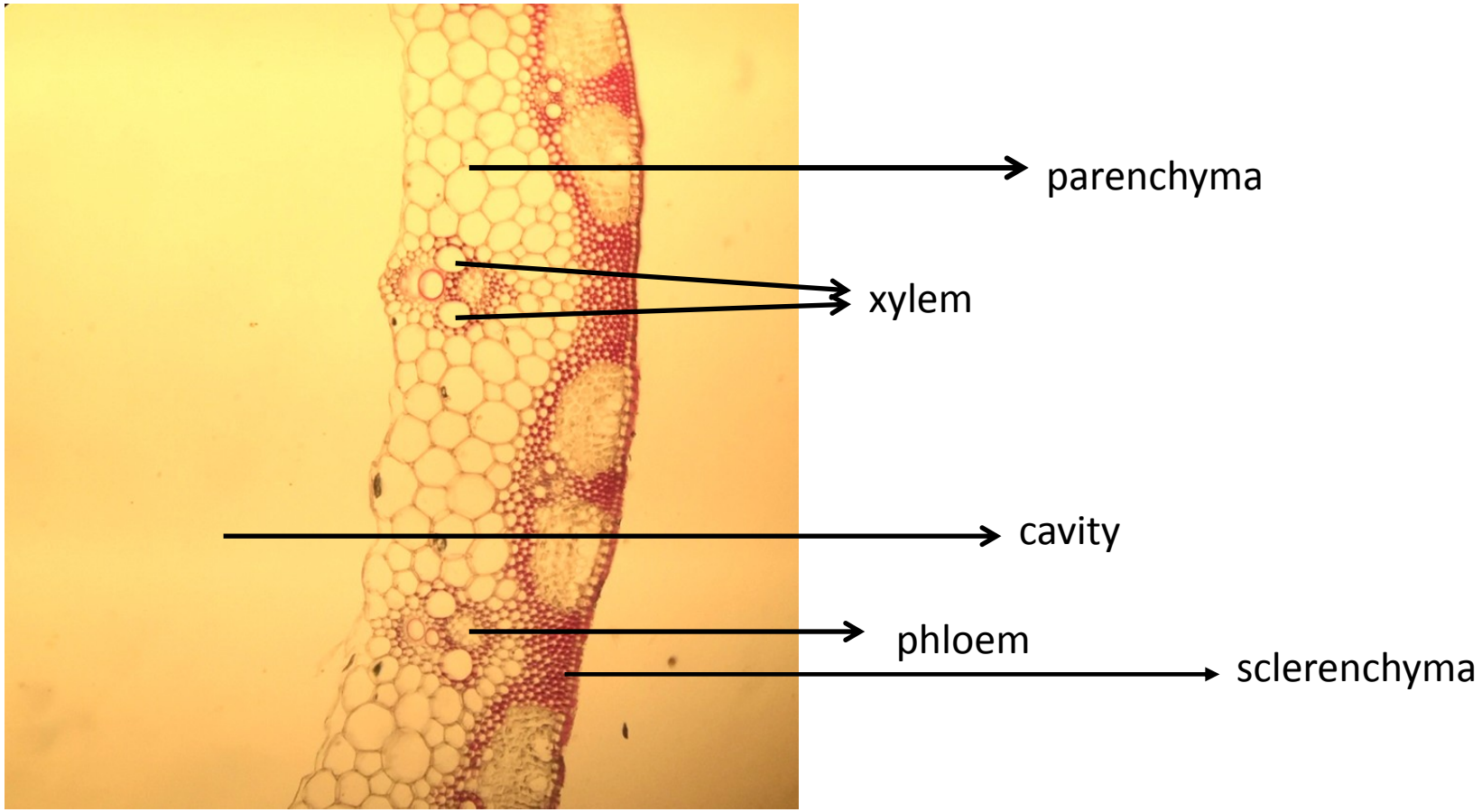
To draw and label the epidermis, primary cortex, pericycle, vascular bundles, pith.

Cross-section of a Solomon's Seal stem
(Polygonatum sp) showing vascular bundles

Stem with many scattered bundles

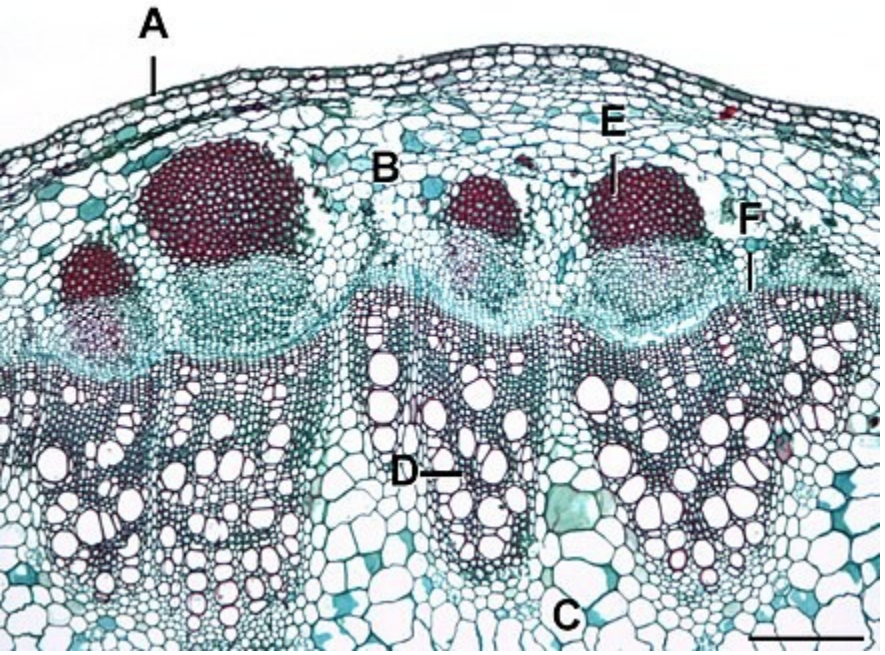
To draw and label the epidermis, primary cortex, pericycle, vascular bundles, pith.

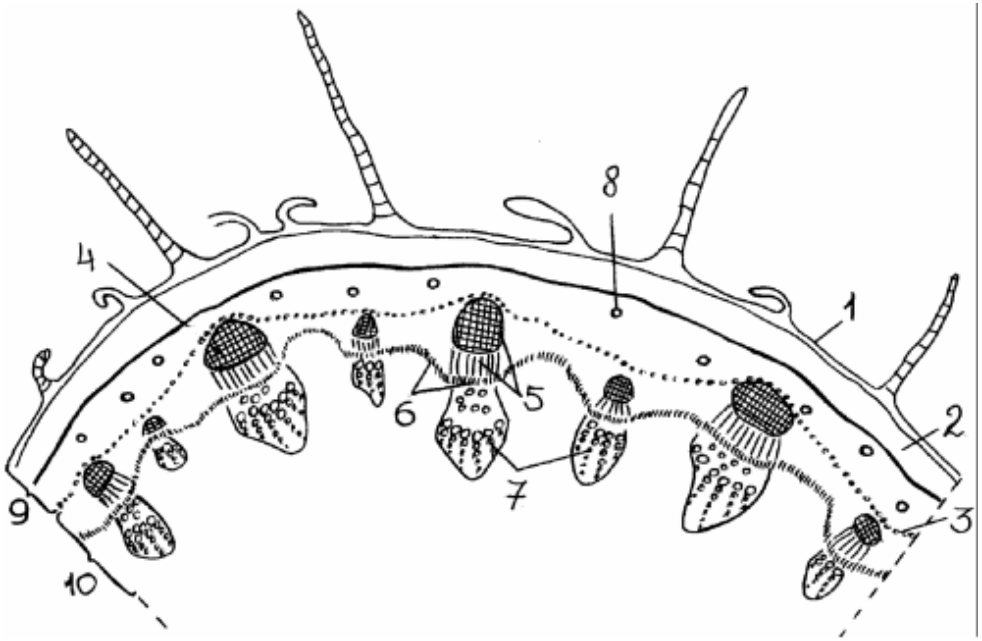
Analyze a cross section of the stem of rye. Draw and label the sclerenchyma, vascular bundles.



The stem of rye

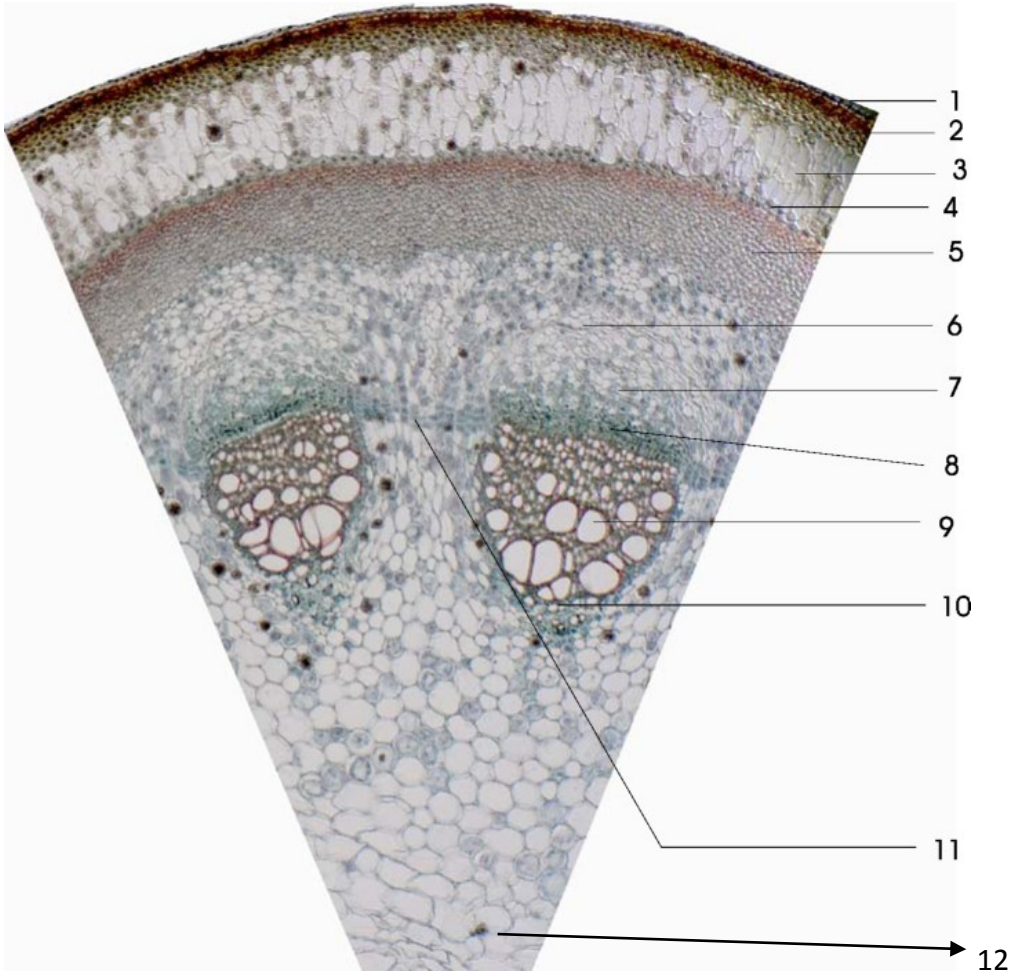
To analyze the structure of the stem of sunflower (primary structure). To draw and label.





The cells of the vascular cambium (F) divide to form phloem on the outside,
seen located beneath the bundle cap (E), and xylem (D) on the inside.
Most of the vascular cambium is here in vascular bundles (ovals of phloem and xylem together) but it is starting to join these up as at point F between the bundles.

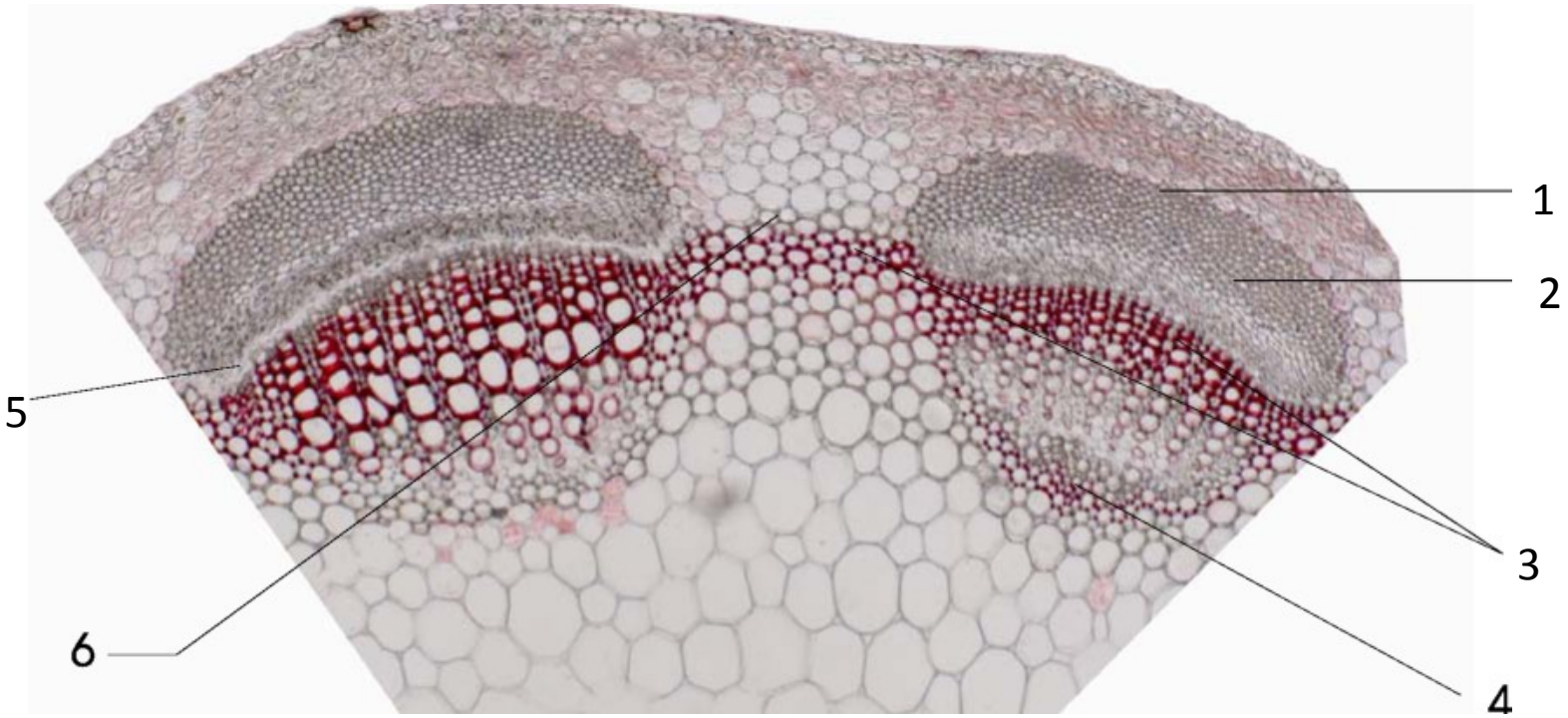
The structure of the stem of a (*Helianthus annuus*):
1 - the epidermis; 2 - collenchyme; 3 - endoderm; 4 - pericycle; 5 - phloem (primary and secondary); 6 - cambium bundle and interstitular; 7 - secondary xylem; 8 - resin passages; 9 - primary bark; 10 - the central cylinder; 11 - hair



The stem of Dutchman's Pipe Stem (*Aristolochia* sp.),

1 - epidermis; 2 - collenchyma; 3 - bark parenchyma; 4 - endoderm; 5 - pericycle sclerenchyma; 6 - primary phloem; 7 - secondary phloem; 8 - intrafascicular cambium; 9 - secondary xylem; 10 - primary xylem; 11 - interfascicular cambium; 12 - pith

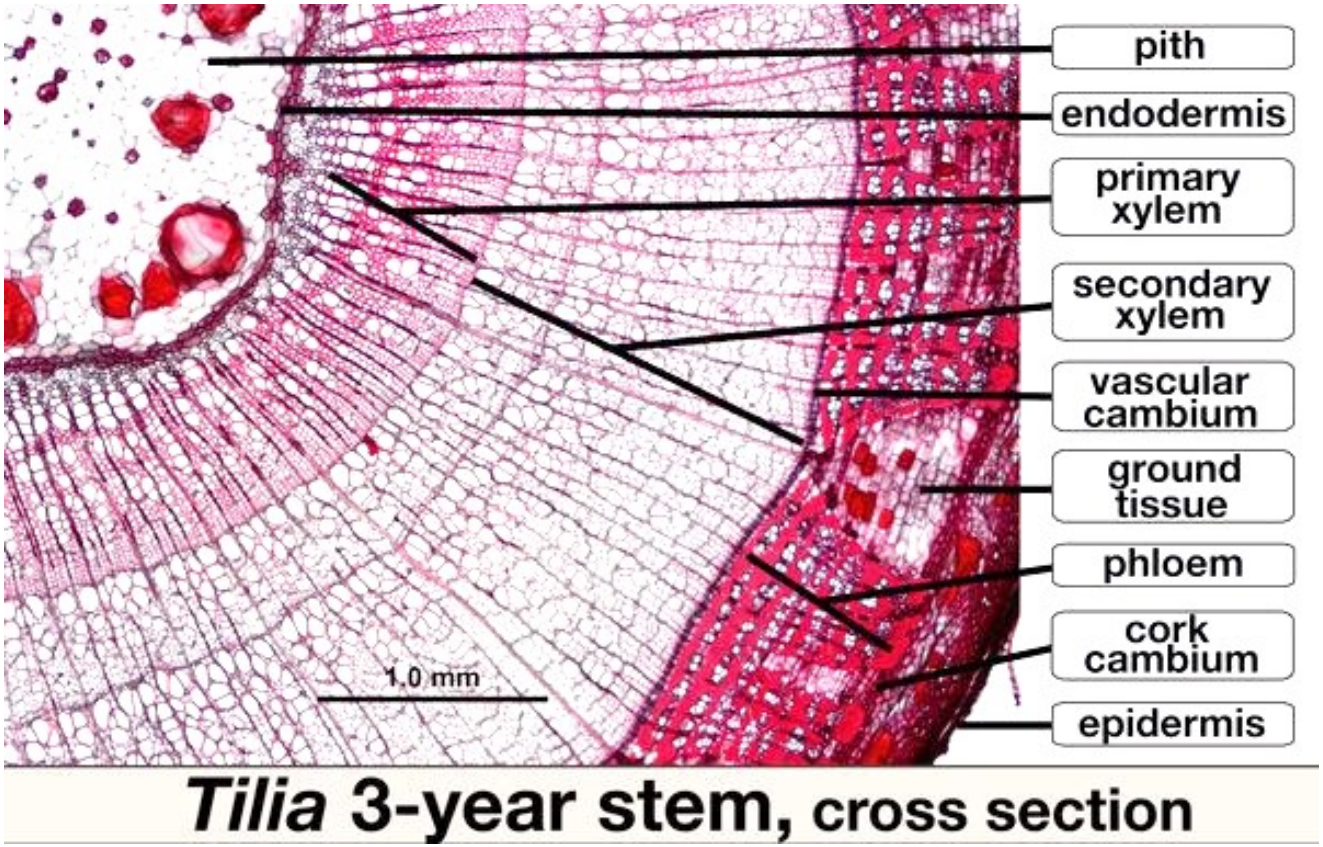
Analyze a preparation of the of stem of clover . Draw and label.



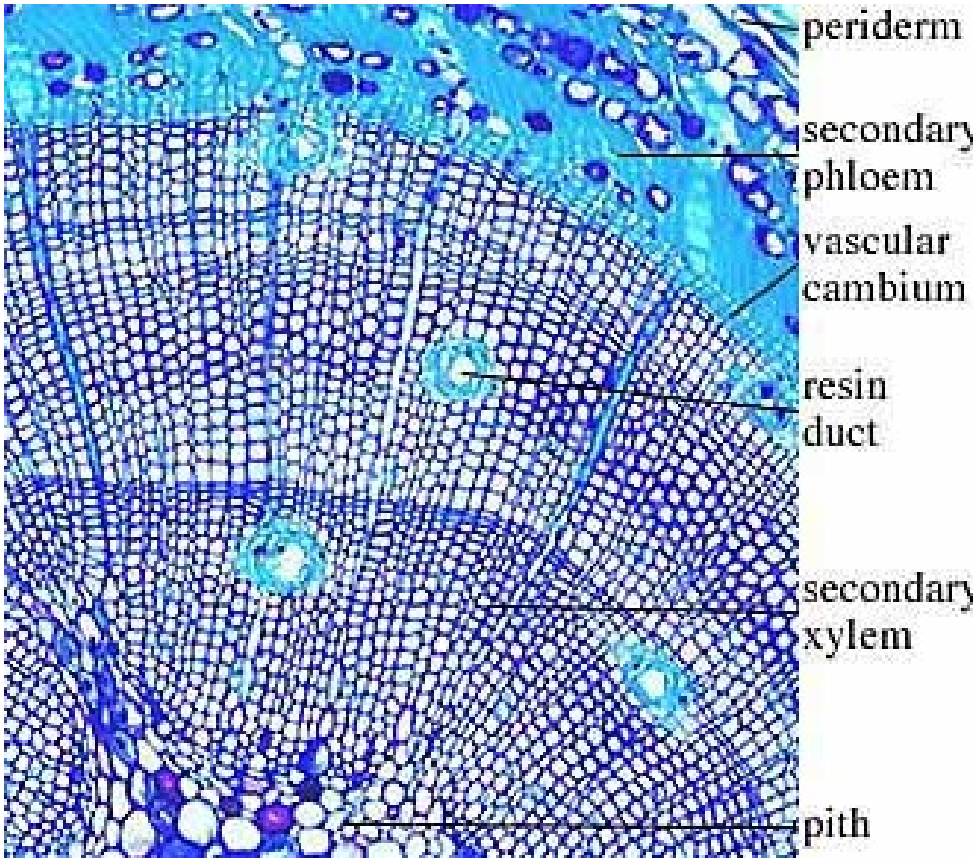
The stem of clover with vascular bundles.

1 - primary phloem;
2 - secondary phloem; 3 - secondary xylem; 4 - primary xylem;
5 - intrafascicula cambium; 6 - interfascicular cambium

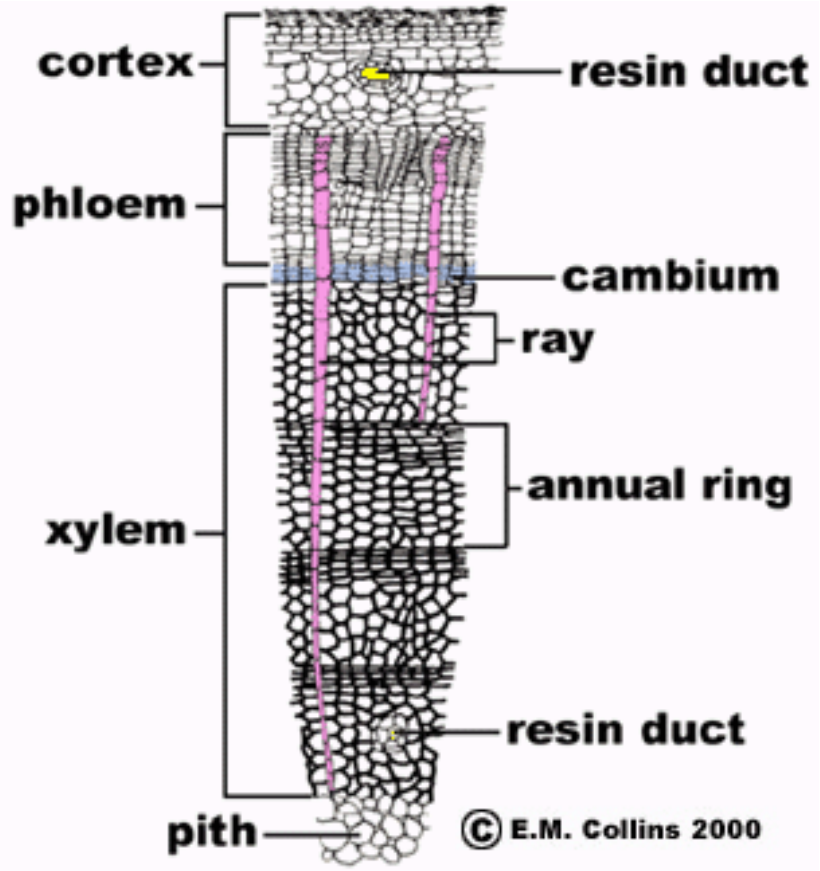
To analyze the structure of the stalk of linden (non-knob structure). To draw one sector and label.

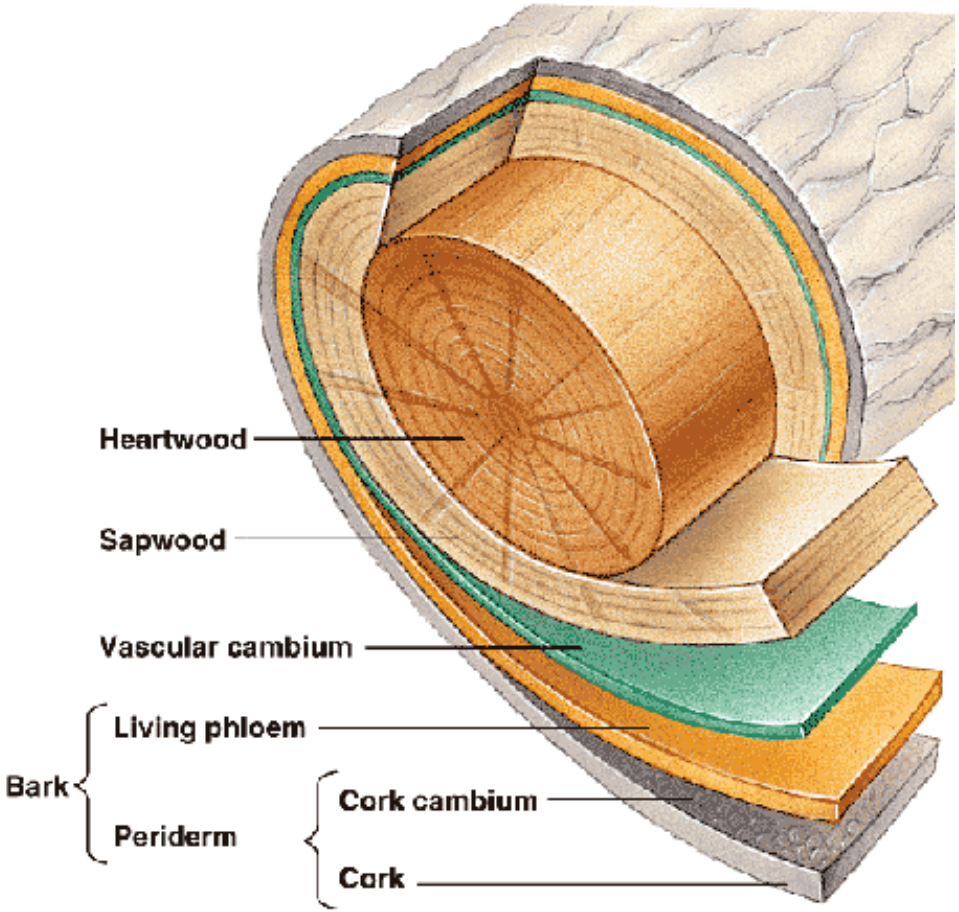


To draw and label the periderm, cortex, annual ring, vascular bundles, pith.



Draw and label the main elements of pine wood





heartwood: dead center of the woody stem in which conducting elements of xylem are clogged with tannins and resin, and no longer function to conduct fluids.
sapwood: external ring of xylem still conducting fluids.