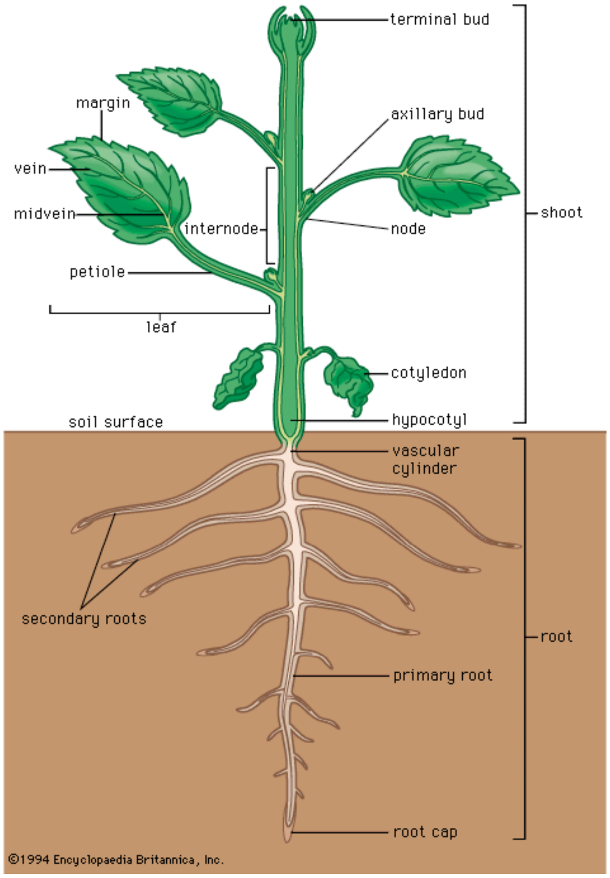
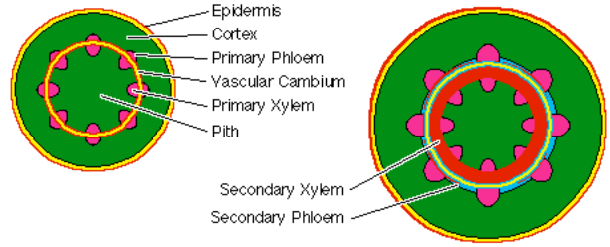
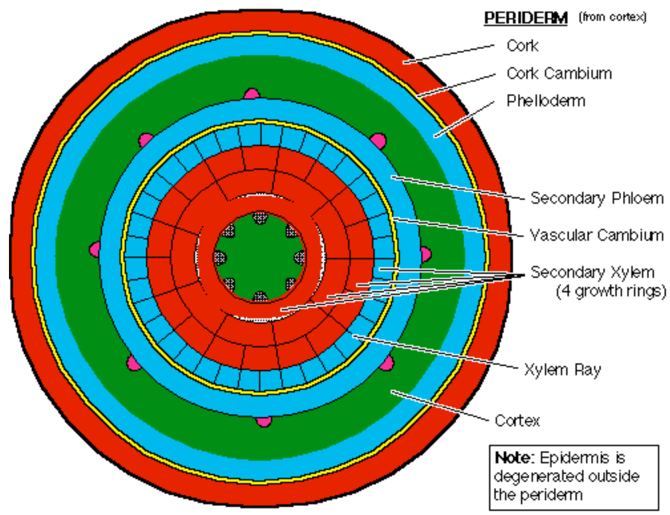
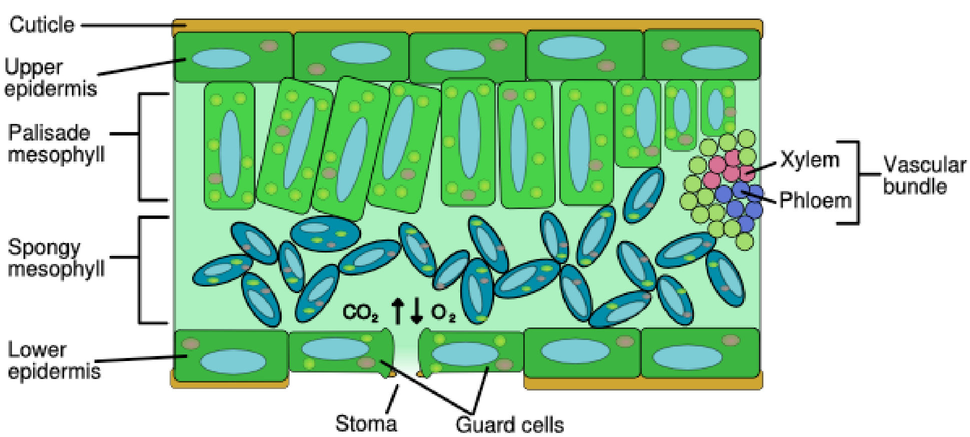
Bryophytes are non-vascular land plants that reproduce via spores. They do not flower or produce seeds. Filicinophytes are ferns tbat have vascular roots, leaves, and non-wooded stems. They grow up to 15 meters tall and reproduce via spores. Coniferophytes are conifers are wooded trees with a thick waxy cuticle that produce cones and reproduce via seeds. Angiospermophytes are flowering plants that reproduce with seeds produced from ovules in ovaries.









3.1.5 *Outline four adaptations of xerophytes.*
Plants that are adapted to grow in very dry habitats are called xerophytes.
Cereus giganteus, the saguaro or giant cactus is an example of a xerophyte. It grows in deserts in Mexico and Arizona and shows many xerophytic adaptations.

- Spines instead of leaves, to reduce transpiration
- Thick stems containing water storage tissue
- Very thick waxy cuticle covering the stem
- Vertical stems to absorb sunlight early and late in the day but not at midday when the light is most intense
- Very wide-spreading network of shallow roots to absorb water after rains
- CAM physiology, which involves opening stomata during the cool nights instead of in the intense heat of the day

3.1.6 *Outline two structural adaptations of hydrophytes.*
Plants that are adapted to grow either submerged in water or floating on the surface are called hydrophytes.
Victoria amazonica, the Amazon water lily is an example of a hydrophyte. It grows on the water surface in shallow pools at the edge of the Amazon River and shows many hydrophyte adaptations.

- Air spaces in the leaf to provide buoyancy
- Stomata in the upper epidermis of the leaf, which is in contact with the air, but not in the lower epidermis
- Waxy cuticle on the upper surface of the leaf, but not on the lower surface, which is in contact with water

➢ Small amounts of xylem in stems and leaves

3.2.1 *Explain how the root system provides a large surface area for mineral ion and water uptake by means of branching, root hairs and cortex cell walls.*
:oots have tiny root hairs on them, which increase the surface area and allow maximum uptake of water. Mineral ions are taken in the root hairs by active ·ansport. Branching allows the roots to cover a large amount of area to get a variety of nutrients and more water. The cortex cell walls allow for osmosis to occur ecause they are permeable.
Vater uptake by roots:
'he cytoplasm of root cells usually has a much higher total solute concentration than water in the surrounding soil, as a result of active transport of mineral ions. Vater therefore moves into root cells from the soil by osmosis. Most of the water absorbed by roots is eventually drawn by the transpiration pull into xylem essels in the center of the root. To reach the xylem, water has to cross the cortex. There are two possible routes. The water could move from cell to cell througl ie cytoplasm—the symplastic route. It could also move by capillary action through cortex cell walls until it reaches the endodermis—the apoplastic route.

3.2.2 *Describe the process of mineral ion uptake into roots by active transport.*
/lineral ion uptake by roots:
'lants absorb potassium, phosphate, nitrate and other mineral ions from the soil. The concentration of these ions in the soil is usually much lower than inside root ells, so they are absorbed by active transport. Root hairs provide a large surface area for mineral ion uptake. Cortex cells can absorb ions that are dissolved in ie water that is drawn by capillary action through cortex cell walls.

3.2.3 Explain the process of water uptake by root epidermis cells and its movement by the symplastic and apoplastic pathways across the root to the xylem
Water moves into the roots through osmosis, because the concentration of dissolved minerals is greater in the roots than it is in the soil. The apoplast is ie interconnected porous cell walls of a plant [‘s roots], along which water moves freely. This is mainly in the outer layers of the root, and the water does not ctually enter the cells when it moves through the apoplast. Most of the water that moves into the roots enters through this channel. However, some water also nters through the symplast, the continuum of living cytoplasm which is connected from one cell to the next by plasmodesmata. After the water is transported ırough the outer parts of the cell by these means, it passes through the next layer, the endodermis, and then into the xylem and is conducted to the rest of the lant.

3.2.4 State that terrestrial plants support themselves by means of thickened cellulose, cell turgor, and xylem.

3.2.5 Define transpiration
Transpiration- The loss of water vapour from the leaves and stems of plants.

3.2.6 Explain how water is carried by the transpiration stream, including the structure of xylem vessels, transpiration pull, cohesion and evaporation.
Limit the structure of xylem vessels to one type of primary xylem.
'hrough transpiration, water evaporates from the top of plants through the spores on leaf and stem surfaces. This draws water up through the xylem, through /hich water moves up through the plant. As water moves upward, it also draws more water from the soil into the roots, forming an unbroken column of water in ie plant’s xylem. The cohesive property of water makes sure that the column of water remains unbroken so that the water will continue to be drawn upwards. Text p. 721...) A more detailed description of xylem and pics can be found on p. 712, but the context is very important so it’s too difficult to summarize.

3.2.7 Guard Cells – they can open or close the stoma and so control the amount of transpiration.

:ole of Phloem in Active Translocation of Biochemicals

ugars, amino acids and other organic compounds produced during photosynthesis are transported out of the leaf by phloem tissue.

'hloem is located in all of the veins of the leaf.

ieve Tubes- they are the structures within phloem tissue that transport organic compounds.

'he plasma membranes in sieve pump organic compounds into the sieve tube by active transport, it involves ATP. Water enters thru osmosis.

'he transport of any biochemical in phloem whether produced by the plant or not is called **translocation**.

:xplain how the abiotic factors, light, temperature, wind and humidity, affect the rate of transpiration in a typical terrestrial mesophytic plant.

ight – guard cells close the stomata in darkness, so transpiration is much greater in the light.

'emperature – heat is needed for evaporation of water from the surface of spongy mesophyll cells. Higher temperatures also increase the rate of diffusion ırough the air spaces in spongy mesophyll, and reduce the relative humidity of the air outside the leaf.

Iumidity – The lower the humidity outside the leaf, the steeper the gradient and therefore the faster the rate of transpiration.

Vind – Wind blows the saturated air away and so increases the rate of transpiration.

3.2.10 Food Storage in Plants
/lany perennial plants develop a food storage organ in which food is stored during a dormant season and then used in the next growth season. For ex. Potato ıbers.