

AS 90928: Demonstrate understanding of biological ideas relating to the life cycle of flowering plants

(Some more KEY IDEAS).

GROWTH

**Growth occurs @ meristems**

Plant growth occurs in areas called meristems – site of repeated cell division (lots of mitosis) of unspecialised cells.

These cells then elongate (get longer) and differentiate (become specialised for the function they will perform).

**Primary growth** ⇕ occurs at **apical meristems** – actively dividing cells near tips of roots and stems – which lengthen stems and roots. The shoot apical meristem is found at the tip of the plant stem so growth extends upward from the top of the stem and NOT the bottom. If you carve your name in a tree trunk, it is at the same place many years later.

The root system also has an apical meristem – acts much the same way as the shoot apical meristem – causing extension growth that goes down! As roots travel downward through the soil, dodging rocks and other obstacles, the root cap protects the root apical meristem. It also secretes slimy ooze to lubricate the soil around the tip of the root, helping the root on its journey.

**Secondary growth** ⇔ growth produced by **lateral meristems** – thickens the roots and shoots of woody plants / perennial plants that grow year after year to give greater support. Even a tree with an enormous trunk started out as a puny little seedling. The increased width of a plant (girth) is called secondary growth. The lateral meristems producing secondary growth are called **cambium**. The thickening occurs in the **vascular cambium and cork cambium** of the plant.

**Vascular cambium** is only one cell thick and forms a ring around the stem of a plant. The cambium divides making new cells which differentiate on its interior, to become secondary xylem (providing support in addition to transporting water) and cells to its exterior, which become secondary phloem (to carry food).

In trees, the layers of secondary xylem form **wood**. The width of the wood gets bigger over time. As secondary xylem forms on the inside of the vascular cambium, as the plant gets wider, the vascular cambium gets further and further away from the centre of the plant. The layers of secondary phloem formed to the outside get crushed with only a thin layer of phloem cells remaining to carry the food. (That's why if you ring bark a tree you can kill it!)

**Cork cambium** makes cork, a tough, insulating layer of cells. These cells have wax, which helps protect the stem from water loss and insects, fungi and bacteria. Over time, the tree sheds older layers of bark and replaces them with newer layers, so the bark always remains a narrow band.

**Annual Rings.** In summer the growth is much faster by the plant. Summer provides more daylight hours and the temperature is warmer, allowing more photosynthesis to occur. Cells are visible, more developed, and more elongated etc. The opposite occurs in autumn and winter, when conditions are less favourable, and less cell growth occurs. This cycle of growth repeats every year and forms annual tree rings.

## SUMMARY

- vascular cambium - layer of tissue between xylem and phloem responsible for secondary growth
- secondary xylem (wood) - new xylem cells formed on the surface of the cambium towards the centre of the stem
- secondary phloem - new phloem cells formed on the surface of the cambium that faces the outside of the stem
- cork cambium - cambium that produces bark layer