

Water uptake

Revision notes • How root hair cells take in water and mineral ions, the route water takes through the plant, and how to trace it with a stain.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

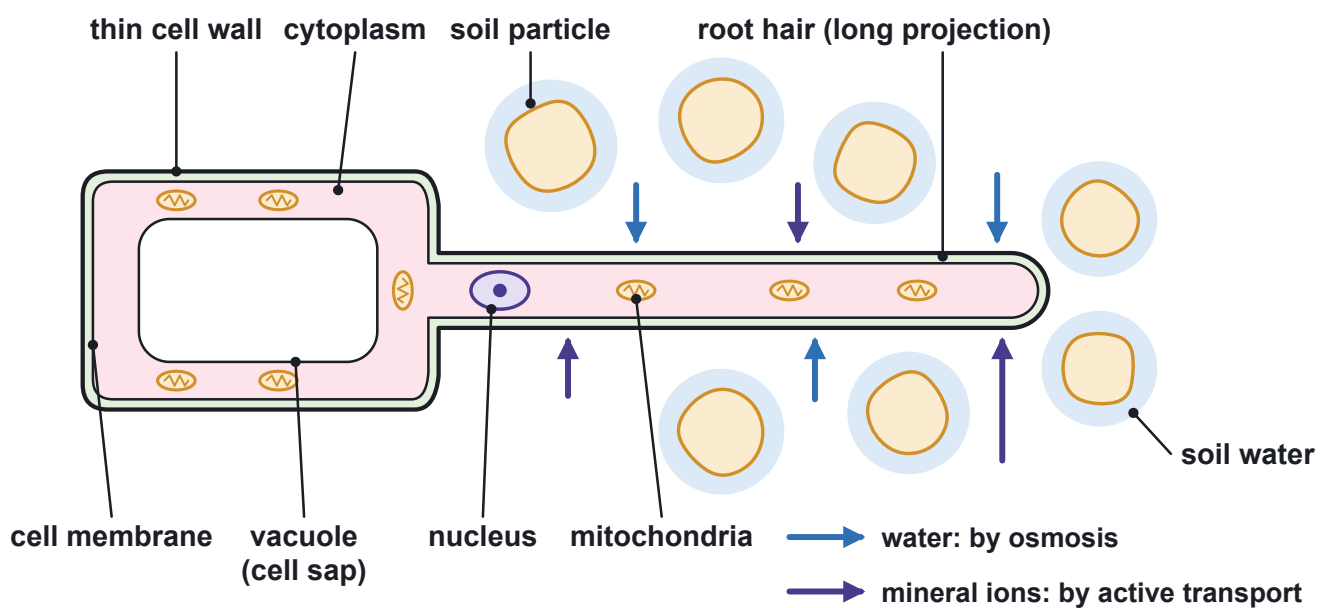
Water uptake Spec 8.2

Root hair cells and the pathway of water Spec 8.2.1, 8.2.2, 8.2.3

Root hair cells

A **root hair cell** is a cell in the outer layer of the root that has a long, thin extension called the root hair. Its functions are to absorb water from the soil and to absorb mineral ions from the soil.

The root hair gives the cell a **large surface area**, which increases the uptake of water and mineral ions.

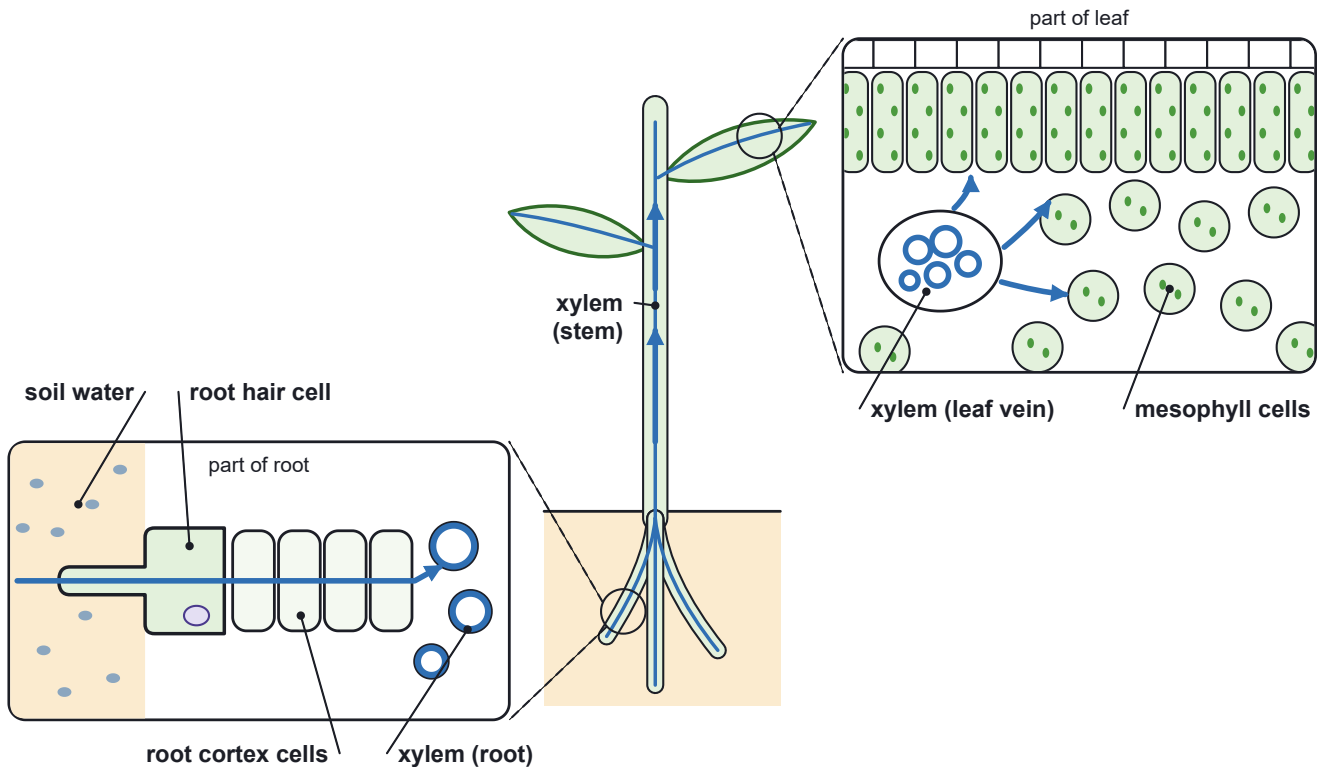


A root hair cell. Its long extension gives a large surface area for absorbing water and mineral ions.

The pathway of water

Water takes the same route from the soil to the air. You need to be able to outline it.

1. Water enters the **root hair cells** from the soil.
2. It passes through the **root cortex cells**.
3. It enters the xylem and moves up the root and stem.
4. It leaves the xylem in the leaf and reaches the **mesophyll cells**.



Water moves from the soil into the **root hair cells**, across the **root cortex cells**, up the **xylem** and into the **mesophyll cells**.

Exam tip: Give the cells in the right order: **root hair cells, root cortex cells, xylem, mesophyll cells**.

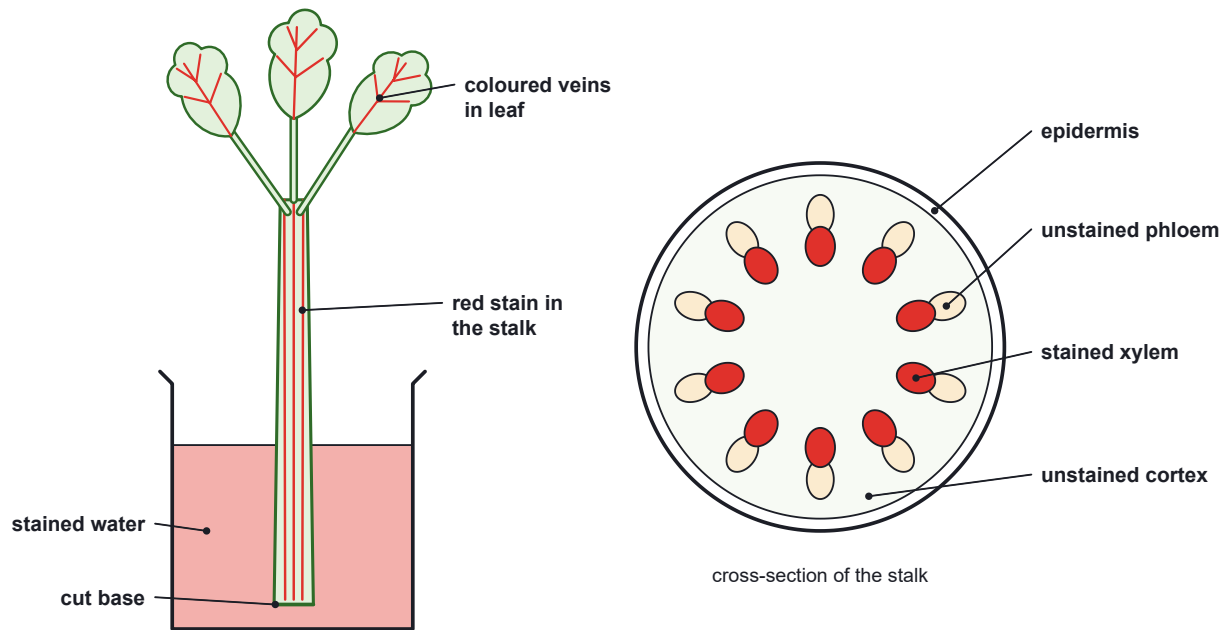
Writing 'roots to leaves' alone will not score.

Investigating the pathway of water with a stain Spec 8.2.4

You can show where water travels in a plant by putting the cut stem in water that contains a coloured stain (dye), such as red food colouring or eosin. The stain is carried in the water, so it shows the route.

1. Fill a beaker with water and add a few drops of the stain.
2. Cut the base of a stem (for example celery, or a white flower) so that it has a fresh end, and stand it in the stained water.
3. Leave the plant in a warm, light place for several hours, or overnight.
4. Look for stain in the veins of the leaves or the petals.
5. Cut a thin cross-section (transverse section) of the stem with a sharp blade and look at it with a hand lens or microscope. Cut away from your fingers.

The stain is found in the **xylem**. In a cross-section of the stem, only the xylem in the **vascular bundles** is coloured, in a ring of small dots. This shows that water travels up the stem in the xylem. In a longitudinal section, the stain appears as coloured lines.



The stain travels with the water, so only the **xylem** is coloured.

Practical skill: Control the variables if you are comparing plants: same type of plant, same volume and concentration of stain, same time, same light and temperature. Write what you see, not just what you expect.

Quick check

1. What do root hair cells absorb?
2. Why does a root hair increase uptake?
3. Give the pathway of water in order.
4. Where is a stain found after a stem stands in stained water?

Quick check answers

Water uptake

1. Water and mineral ions.
2. It gives the cell a large surface area.
3. Root hair cells, root cortex cells, xylem, mesophyll cells.
4. In the xylem.