# Specialised cells and stem cells

Student activity • observation and reasoning

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## The question

**How does cell structure support a specialised function?**

Observe prepared specimens and compare cell adaptations. Use evidence to discuss the potential and limits of stem-cell treatments.

## Equipment

- Microscope and permanent prepared slide set; writing tools
- Reference profiles in this booklet; no fresh human samples

Carry microscopes with two hands. Handle glass slides by the edges; report cracks and breakages. Keep lenses clear of the slide and use fine focus at high power.

Course coverage: Shared: 2.1 organisation. Biology-only extension: 2.5B–2.6B differentiation and stem cells.

## Plan, model or apparatus sketch

**Draw and label the apparatus or biological model; identify one limitation.**

# Method and reasoning

Read the whole sequence before starting

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**1.** At low power, focus a prepared plant or animal slide. Centre a suitable region before changing objective; use fine focus at higher power.

**2.** Make a clear line drawing of one visible cell or tissue. Record the slide identity and total magnification; label only structures actually resolved.

**3.** Compare a root hair, palisade cell and muscle cell using prepared slides or the supplied written profiles. Distinguish observed features from inferred functions.

**4.** Arrange organelle, cell, tissue, organ and organ system in order, using mitochondrion, muscle cell, muscle tissue, heart and circulatory system.

**5.** Biology extension: explain how differentiation produces specialised cells through changes in gene expression rather than routine loss of all unused genes.

**6.** Compare embryonic and adult stem cells. Balance potential tissue repair against rejection, uncontrolled division and ethical questions; do not claim a cure from a model.

## Cleanup

- Return equipment and wash hands after practical work.

# Record your evidence

Blank spaces are for your own work

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## Reference and task data

Profiles: root hairs increase the surface for uptake; palisade cells contain many chloroplasts; muscle cells contain contractile proteins and mitochondria. These are reference descriptions, not observations from your slide. Embryonic stem cells can produce many body-cell types; adult stem cells generally have a more limited range.

| Example / trial | Observation / evidence | Explanation / limit |
|---|---|---|
| Prepared slide: identity / magnification | | |
| Root hair / palisade / muscle comparison | | |
| Stem-cell evidence and limitations | | |

**Show your calculations, labelled model or correction here.**

# Explain and evaluate

Use evidence and show calculation steps where relevant

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**1.** Calculate total magnification for a ×10 eyepiece and ×40 objective.

**2.** Why begin with the lowest-power objective?

**3.** Distinguish an observed structure from its inferred function.

**4.** Place the five levels of organisation in order.

**5.** Biology: what is differentiation?

**6.** Biology: give one potential benefit and two concerns about stem cells.