*This is the **Higher Separate** version — includes all Higher Tier content (marked ★) and all Separate Science content.*

Cells become specialised through differentiation — switching specific genes on or off.

- Red blood cells: no nucleus, biconcave, haemoglobin — carry O■
- Root hair cells: large surface area — absorb water and minerals
- Nerve cells: long, many dendrites, myelin sheath — rapid signal transmission
- Sperm: flagellum, acrosome, many mitochondria — fertilisation
- Guard cells: control stomatal opening — regulate gas exchange
- In multicellular organisms: cells → tissues → organs → organ systems → organism

Key Terms

Differentiation	Process by which a cell becomes specialised for a specific function

■ **Exam Tip:** When describing a specialised cell, name the adaptation AND explain how it helps the cell perform its function — both parts are needed for marks.