# BIOLOGY IN CONTEXT

## for Cambridge International AS & A Level

**Second edition**

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**Biology in Context for Cambridge International AS & A Level** directly matches the latest syllabus, supporting comprehensive understanding of key scientific concepts. A stretching approach focuses on the development of advanced skills, for strong assessment potential.

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- **Develop advanced skills** – critical thinking and practical skills extend performance
- **Progress to the next stage** – extension material eases the transition to university study

**Empowering every learner to succeed and progress**

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- ✓ Comprehensive exam preparation
- ✓ Reviewed by subject specialists
- ✓ Embedded critical thinking skills
- ✓ Progression to the next educational stage

ASPIRE SUCCEED PROGRESS

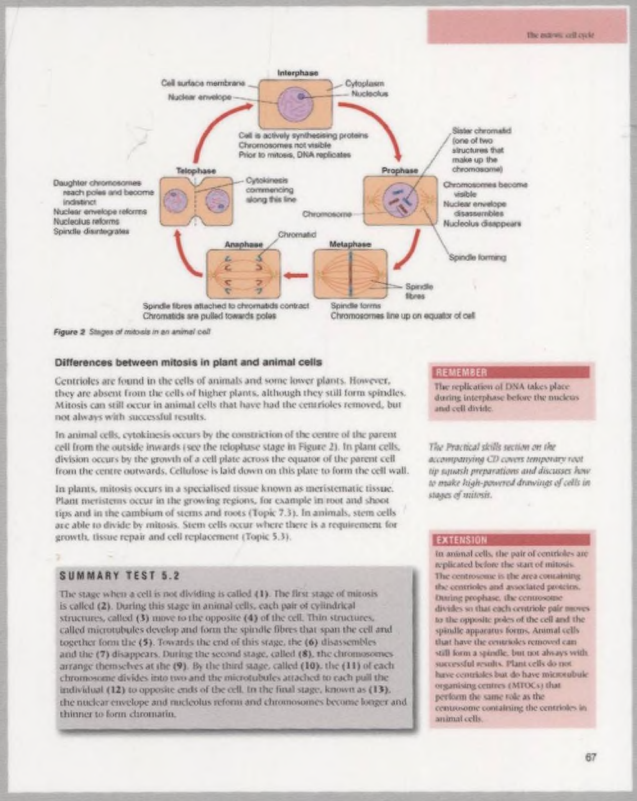


*Figure 2 Stages of mitosis in an animal cell*

**Differences between mitosis in plant and animal cells**

Centrioles are found in the cells of animals and some lower plants. However, they are absent from the cells of higher plants, although they still form spindles. Mitosis can still occur in animal cells that have had the centrioles removed, but not always with successful results.

In animal cells, cytokinesis occurs by the constriction of the centre of the parent cell from the outside inwards (see the telophase stage in Figure 2). In plant cells, division occurs by the growth of a cell plate across the equator of the parent cell from the centre outwards. Cellulose is laid down on this plate to form the cell wall.

In plants, mitosis occurs in a specialised tissue known as meristematic tissue. Plant meristems occur in the growing regions, for example in root and shoot tips and in the cambium of stems and roots (Topic 7.3). In animals, stem cells are able to divide by mitosis. Stem cells occur where there is a requirement for growth, tissue repair and cell replacement (Topic 5.3).

**SUMMARY TEST 5.2**

The stage when a cell is not dividing is called **(1)**. The first stage of mitosis is called **(2)**. During this stage in animal cells, each pair of cylindrical structures, called **(3)** move to the opposite **(4)** of the cell. Thin structures, called microtubules develop and form the spindle fibres that span the cell and together form the **(5)**. Towards the end of this stage, the **(6)** disassembles and the **(7)** disappears. During the second stage, called **(8)**, the chromosomes arrange themselves at the **(9)**. By the third stage, called **(10)**, the **(11)** of each chromosome divides into two and the microtubules attached to each pull the individual **(12)** to opposite ends of the cell. In the final stage, known as **(13)**, the nuclear envelope and nucleolus reform and chromosomes become longer and thinner to form chromatin.

**REMEMBER**

The replication of DNA takes place during interphase before the nucleus and cell divide.

*The Practical skills section on the accompanying CD covers temporary root tip squash preparations and discusses how to make high-powered drawings of cells in stages of mitosis.*

**EXTENSION**

In animal cells, the pair of centrioles are replicated before the start of mitosis. The centrosome is the area containing the centrioles and associated proteins. During prophase, the centrosome divides so that each centriole pair moves to the opposite poles of the cell and the spindle apparatus forms. Animal cells that have the centrioles removed can still form a spindle, but not always with successful results. Plant cells do not have centrioles but do have microtubule organising centres (MTOCs) that perform the same role as the centrosome containing the centrioles in animal cells.

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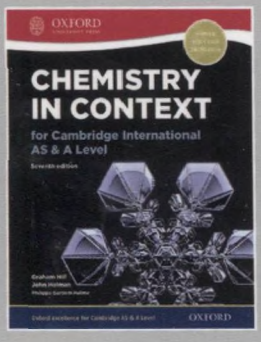


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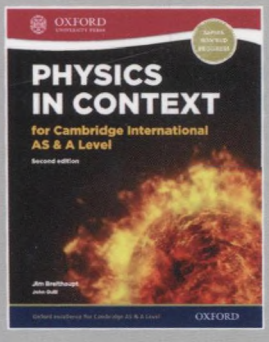


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## Chapter 17 Biotechnology



## Chapter 18 Selection and evolution



## Chapter 19 Gene technology



A section on practical skills can be found on the accompanying website. The relevant sections in the book are highlighted using conical flask icons.

Website icons indicate additional assessment material on the accompanying website.

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