Edexcel Biology GCSE

Topics 2.1 to 2.9 - Cell division and growth

Flashcards

What is the cell cycle?

What is the cell cycle?

- A series of events that take place in a cell involving cell growth, DNA replication and cell division
- It is described as the lifecycle of a cell

State the three stages of the cell cycle

State the three stages of the cell cycle

Stage 1 - interphase

Stage 2 - mitosis

Stage 3 - cytokinesis

What is interphase?

What is interphase?

The longest stage of the cell cycle that involves cell growth, the synthesis of new organelles and DNA replication

What does DNA replication involve?

What does DNA replication involve?

- Double helix ‘unzips’ exposing two strands
- DNA bases align next to complementary bases on the DNA strands
- Complementary base pairs join
- Two identical DNA molecules formed

What is a chromosome?

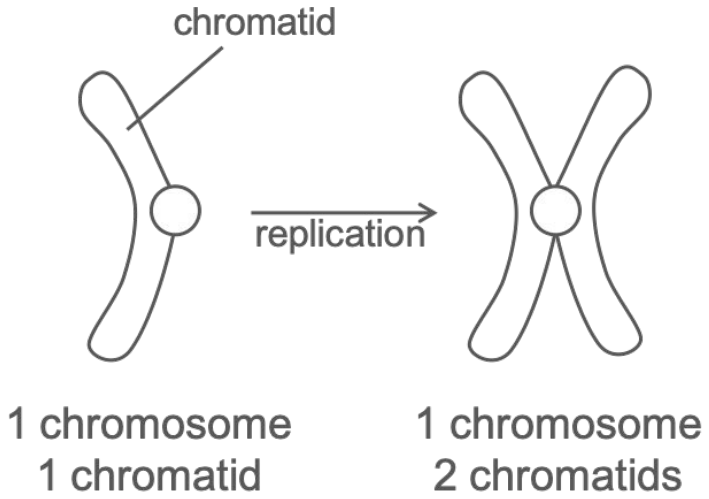
What is a chromosome?

A linear DNA molecule tightly coiled around proteins

What happens to chromosomes during DNA replication?

What happens to chromosomes during DNA replication?

The DNA in the ‘arm’ of each chromosome (chromatid) is replicated.



What is mitosis?

What is mitosis?

A form of cell division that produces two diploid ‘daughter’ cells, both genetically identical to the parent cell.

Why is mitosis important in organisms?

Why is mitosis important in organisms?

- Asexual reproduction
- Growth
- Repair of damaged cells
- Cell replacement

State the four stages of mitosis

State the four stages of mitosis

- **P**rophase
- **M**etaphase
- **A**naphase
- **T**elophase

Outline prophase

Outline prophase

- DNA condenses, chromosomes become visible
- Nuclear membrane disappears

Outline metaphase

Outline metaphase

- Chromosomes line up along the cell equator

Outline anaphase

Outline anaphase

- Spindle fibres attach to each chromosome
- ‘Arms’ of each chromosome pulled to opposite poles
- Chromatids separated

Outline telophase

Outline telophase

- Nucleus of the cell divides
- New membrane forms around each set of chromosomes

What does cytokinesis involve?

What does cytokinesis involve?

- Division of the cell membrane and cytoplasm
- Two genetically identical ‘daughter’ cells produced

A cell divides by mitosis once every 2 minutes. Calculate the number of identical cells present after 10 minutes.

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$10 \div 2 = 5$

5 cell divisions have taken place

$2^5 = 32$ cells

What is cancer?

What is cancer?

- Non-communicable disease
- Uncontrolled cell division (due to damaged DNA) results in the formation of a primary tumour
- Tumour cells break off and spread to other tissues forming secondary tumours

What are percentile charts?

What are percentile charts?

- A chart used to monitor growth
- Measurements (e.g. fetal length or head circumference) can be compared to the expected values at a certain age

What does the 95th percentile mean?

What does the 95th percentile mean?

95% of measurements will be below the value of the 95th percentile

What can doctors determine from percentile charts? (3)

What can doctors determine from percentile charts? (3)

- Slower growth than normal (below the bottom line)
- Faster growth than normal (above the top line)
- Abnormal growth (irregular growth patterns)

Describe growth in animals

Describe growth in animals

- **Cell division** occurs in all body cells. It occurs at a slower rate in adults that in younger animals as growth stops and cell division is only required for replacement and repair.

- Most cells **differentiate** at an early stage and become specialised. Some adult stem cells retain their ability to differentiate.

Describe growth in plants

Describe growth in plants

- **Cell division** can only occur in meristematic tissue. The rate of cell division remains the same throughout a plant's life.
- Meristematic stem cells can **differentiate** into any cell type for as long as the plant lives
- **Cell elongation** occurs in all cells. Cells expand and enlarge enabling growth of the plant.

What are stem cells?

What are stem cells?

Cells that are unspecialised and capable of differentiating into a range of different cell types

What is meant by ‘differentiation’?

What is meant by ‘differentiation’?

- The process by which stem cells become specialised (have a specific function)
- Some genes switch on or off, determining cell type

Why is cell differentiation important?

Why is cell differentiation important?

It enables the formation of specialised tissues with specific functions e.g. muscle tissue.

What are embryonic stem cells?

What are embryonic stem cells?

Stem cells found in very early embryos that are unspecialised and capable of differentiating into any cell type

What is the function of embryonic stem cells?

What is the function of embryonic stem cells?

Enable the growth and development of tissues in human embryos

What are adult stem cells?

What are adult stem cells?

Stem cells that can differentiate into a limited range of cell types e.g. bone marrow stem cells

What is the primary function of adult stem cells?

What is the primary function of adult stem cells?

Replacement of dead cells e.g. replacement of red blood cells which only live for 120 days

Where are stem cells found in plants?

Where are stem cells found in plants?

Meristems

Where is meristem tissue found?

Where is meristem tissue found?

In regions of the plant where cells are continuously dividing e.g. root tips, shoot tips

What are meristematic stem cells?

What are meristematic stem cells?

Stem cells found in meristems that are unspecialised and capable of differentiating into any cell type during the life of a plant

How can stem cells be used in medicine?

How can stem cells be used in medicine?

- Stem cells collected
- Stem cells stimulated to differentiate into specific cell types e.g. heart muscle cells
- Specialised cells transplanted into the patient
- Used to treat damage or disease e.g. heart disease

Where can embryonic stem cells be collected from? (2)

Where can embryonic stem cells be collected from? (2)

- Donor stem cells removed from embryos grown in vitro
- Patient's own stem cells removed from the umbilical blood before birth

What are the benefits of using stem cells in medicine? (4)

What are the benefits of using stem cells in medicine? (4)

- Treat damage or disease e.g. heart disease, type 1 diabetes
- Treat diseases that would otherwise be untreatable
- Used in scientific research
- Growing organs for transplants

What are the risks of stem cell use in medicine? (6)

What are the risks of stem cell use in medicine? (6)

- Transplanted stem cells could cause tumours
- Finding suitable stem cell donors is a difficult task
- Stem cells may be rejected by the body (immunosuppressants taken)
- Potential side effects
- Long term risks of using stem cells unknown
- Stem cells may become contaminated during preparation and when transplanted transmit infections to the patient, making them sicker

What are the ethical issues related to the use of stem cells in medicine? (2)

What are the ethical issues related to the use of stem cells in medicine? (2)

- The embryos that were used to provide stem cells are destroyed which is seen as unethical and a waste of potential human life
- May lead to the reproductive cloning of humans