Edexcel (B) Biology A-level

2.3 - Eukaryotic cell cycle and division

Flashcards

State what the cell cycle is and outline its stages.

State what the cell cycle is and outline its stages.

Regulated cycle of division with intermediate growth periods.

1. interphase
2. mitosis or meiosis (nuclear division)
3. cytokinesis (cytoplasmic division)

Outline what happens during interphase.

Outline what happens during interphase.

G1: cell synthesises proteins for replication e.g. tubulin for spindle fibres & **cell size doubles.**

S: DNA replicates = chromosomes consist of 2 sister chromatids joined at a centromere.

G2: organelles divide.

What is the purpose of mitosis?

What is the purpose of mitosis?

Produces 2 genetically identical daughter cells

for:

- growth
- cell replacement / tissue repair
- asexual reproduction

Name the stages of mitosis.

Name the stages of mitosis.

1. **P**rophase
2. **M**etaphase
3. **A**naphase
4. **T**elophase

Outline what happens during prophase.

Outline what happens during prophase.

1. **Chromosomes condense**, becoming **visible**. (X-shaped: 2 sister chromatids joined at centromere).
2. **Centrioles** move to opposite poles of cell (animal cells) & **mitotic spindle** fibres form.
3. **Nuclear envelope & nucleolus** break down = chromosomes free in cytoplasm.

Outline what happens during metaphase.

Outline what happens during metaphase.

Sister chromatids line up at **cell equator**, attached to the mitotic spindle by their centromeres.

Outline what happens during anaphase.

Outline what happens during anaphase.

requires energy from ATP hydrolysis

1. Spindle fibres contract = **centromeres divide**.
2. Sister chromatids separate into 2 distinct chromosomes & are pulled to opposite poles of cell. (looks like ‘V’ shapes facing each other).
3. Spindle fibres break down.

Outline what happens during telophase.

Outline what happens during telophase.

1. Chromosomes **decondense**, becoming **invisible** again.
2. New nuclear envelopes form around each set of chromosomes = **2 new nuclei**, each with 1 copy of each chromosome.

What happens during cytokinesis?

What happens during cytokinesis?

1. Cell membrane cleavage furrow forms.
2. Contractile division of cytoplasm.

Explain how to prepare a temporary root tip squash.

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1. Place root in hydrochloric acid to **halt cell division** & hydrolyse middle lamella.
2. **Stain** root tip with a dye that binds to chromosomes.
3. **Macerate** tissue in water using mounted needle.
4. Use mounted needle at 45° to press down **coverslip** & obtain a single layer of cells. Avoid trapping air bubbles.

Explain the procedure for a root tip squash experiment.

Explain the procedure for a root tip squash experiment.

1. Prepare a temporary mount of root tissue.
2. Focus an optical microscope on the slide. Count total number of cells in the field of view and number of cells in a stage of mitosis.
3. Calculate **mitotic index** (proportion of cells undergoing mitosis).

Name 2 dyes that bind to chromosomes.

Name 2 dyes that bind to chromosomes.

toluidine blue (blue)

acetic orcein (purple-red)

Why is only the root tip used when calculating a mitotic index?

Why is only the root tip used when calculating a mitotic index?

Meristematic cells at root tip are actively undergoing mitosis.

Cells further from root tip are elongating rather than dividing.

What is meiosis?

What is meiosis?

A form of cell division that produces four genetically different haploid cells (cells with half the number of chromosomes found in the parent cell) known as gametes.

What happens during meiosis I?

What happens during meiosis I ?

1. Homologous chromosomes pair to form bivalents.
2. Crossing over (exchange of sections of genetic material) occurs at chiasmata.
3. Cell divides into two. Homologous chromosomes separate randomly. Each cell contains either maternal or paternal copy.

What happens during meiosis II?

What happens during meiosis Ⅱ?

1. Independent segregation of sister chromatids.
2. Each cell divides again, producing 4 haploid cells.

Draw diagrams to show cells after each stage of meiosis.

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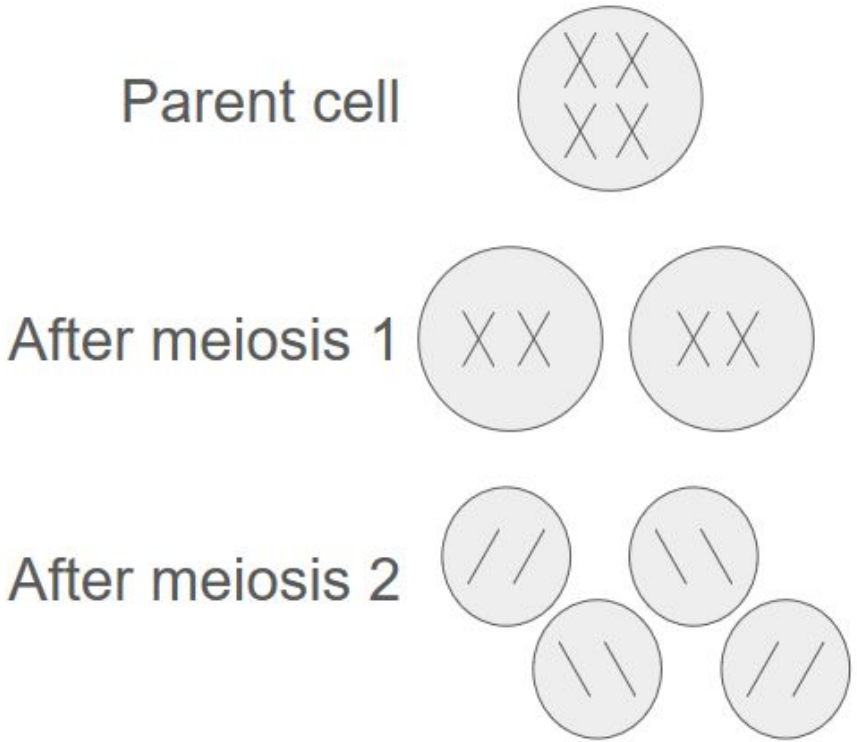

How does meiosis produce genetic variation?

How does meiosis produce genetic variation?

- Crossing over during meiosis Ⅰ.
- Independent assortment (random segregation) of homologous chromosomes & sister chromatids.

Result in new combinations of alleles.

What is a chromosome mutation?

What is a chromosome mutation?

Involves section of a chromosome rather than 1 base.

Types include: deletion, inversion, duplication, translocation.

What is a translocation mutation?

What is a translocation mutation?

A base sequence from one chromosome fuses with a non-homologous chromosome.

What is a non-disjunction mutation?

What is a non-disjunction mutation?

Chromosomes fail to separate correctly in meiosis.

Gametes have at least one more (polysomy) or one less (monosomy) chromosomes than normal.

Give examples of conditions caused by non-disjunction.

Give examples of conditions caused by non-disjunction.

trisomy-21 = Down's syndrome.

X-monosomy of sex chromosomes = Turner's syndrome.