

Edexcel IAL Biology A-level

3.9-3.16 - Reproduction and Cell Division

Flashcards

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What is the locus of a gene?



What is the locus of a gene?

The specific location of a gene on a chromosome



What is gene linkage?



What is gene linkage?

The phenomenon seen where genes with similar loci are typically inherited together, since they are unlikely to be separated during meiosis



What are the two types of genetic linkage?



What are the two types of genetic linkage?

Autosomal linkage and sex linkage



What is autosomal linkage?



What is autosomal linkage?

Autosomal linkage is the inheritance of genes with similar loci on non-sex chromosomes together



What is sex linkage?



What is sex linkage?

Sex linkage is the inheritance of nearby genes together on the same sex chromosome. Expression of these genes is sex dependent



What is meiosis?



What is meiosis?

The process involved in the production of gametes which produces **four genetically different haploid** daughter cells

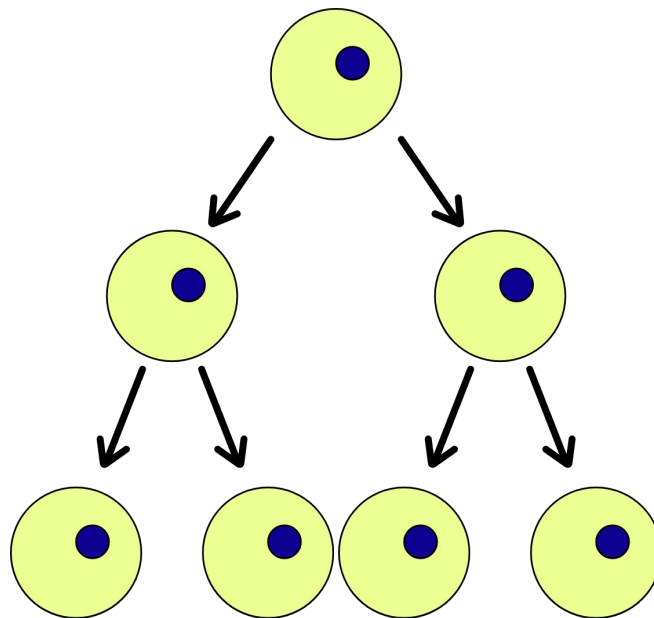


Name the stages in meiosis



Name the stages in meiosis

- Prophase 1
- Metaphase 1
- Anaphase 1
- Telophase 1
- Prophase 2
- Metaphase 2
- Anaphase 2
- Telophase 2



Interphase

After meiosis 1

After meiosis 2



What does the term haploid mean?



What does the term haploid mean?

A cell which only has one set of **unpaired** chromosomes. This term is usually used to describe **germ** cells



What does the term diploid mean?



What does the term diploid mean?

A cell which only has one set of **paired** chromosomes. This term is usually used to describe **somatic** cells

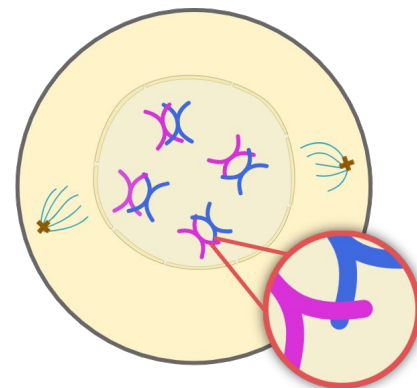


Describe prophase 1



Describe prophase 1

The chromosomes condense, the nuclear envelope breaks down, the centrioles move to the poles of the cell and homologous pairs of chromosomes cross over



Chromosomes cross over and form a bivalent

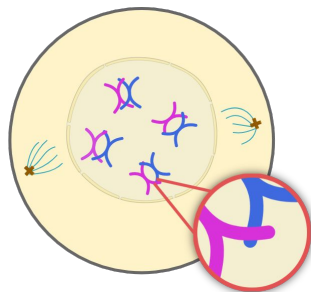


What are chiasmata?



What are chiasmata?

The points where homologous chromosomes cross over in meiosis

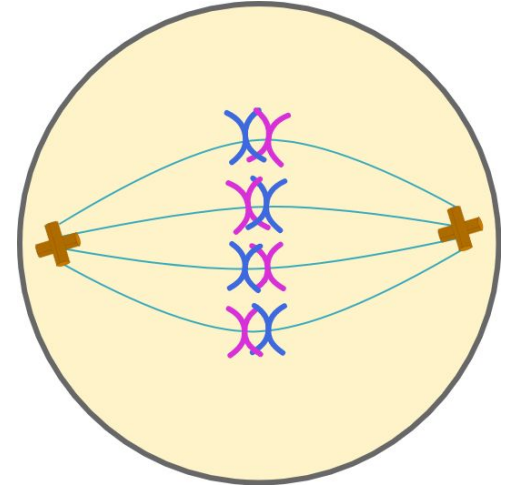


Describe metaphase 1



Describe metaphase 1

The crossed over chromosomes align in the centre of the cell (at the metaphase plate)

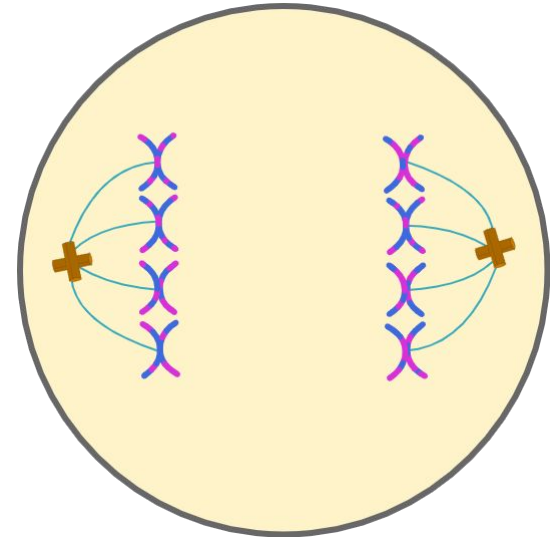


Describe anaphase 1



Describe anaphase 1

The chromosomes are pulled apart by the spindle fibres

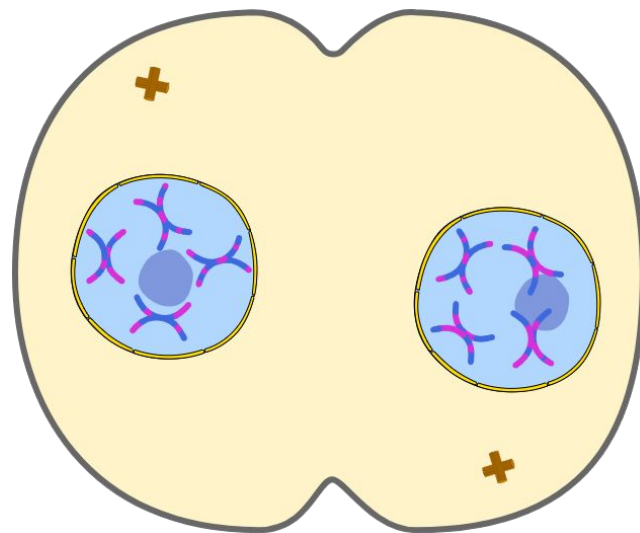


Describe telophase 1



Describe telophase 1

The spindle fibres break down and nuclear envelopes begin to form around the separated sets of chromosomes

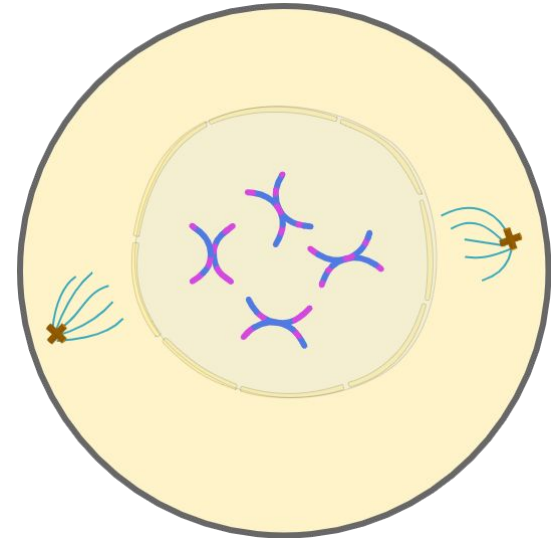


Describe prophase 2



Describe prophase 2

- The nuclear envelope breaks down
- The chromosomes condense
- The centrosomes move to opposite poles of the cell
- Spindle fibres begin to form

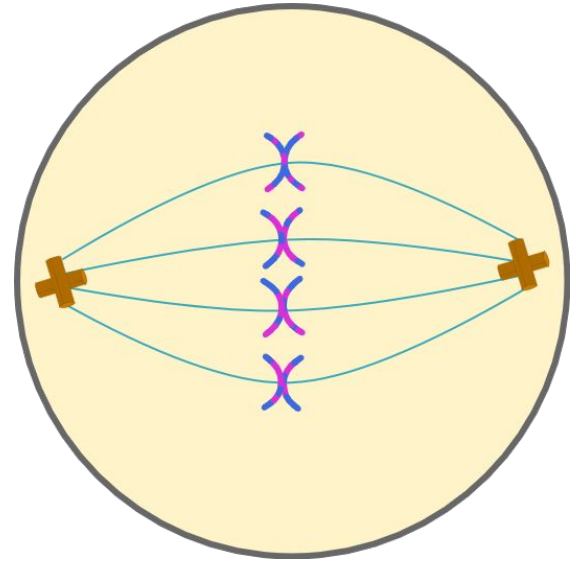


Describe metaphase 2



Describe metaphase 2

The chromosomes align in the centre of the cell on the metaphase plate

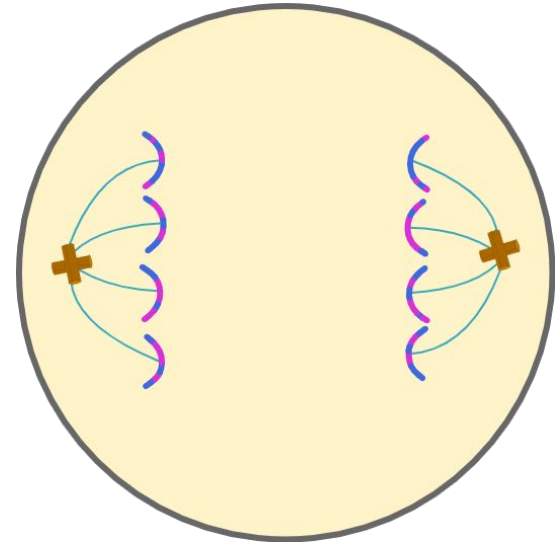


Describe anaphase 2



Describe anaphase 2

The two sister chromatids making up each chromosome are pulled apart by the microtubules

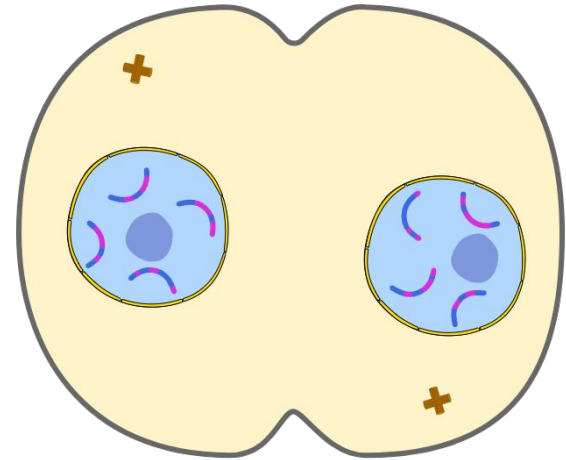


Describe telophase 2



Describe telophase 2

The nuclear envelope begins to reform, the chromosomes decondense and the spindle fibres break down

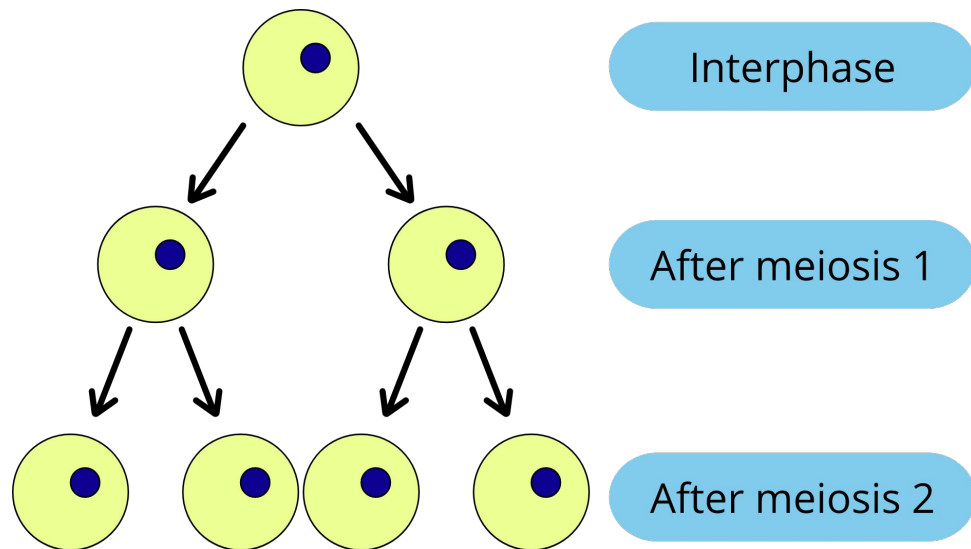


How many daughter cells are formed in meiosis?



How many daughter cells are formed in meiosis?

Meiosis forms four daughter cells.



Which type of cell division produces
diploid cells?



Which type of cell division produces diploid cells?

Mitosis produces diploid cells



Which type of cell division produces haploid cells?



Which type of cell division produces haploid cells?

Meiosis produces diploid cells



Describe 3 points in the process of meiosis where variation is introduced

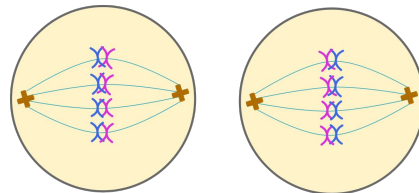


Describe 3 points in the process of meiosis where variation is introduced

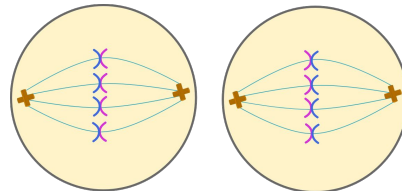
Prophase 1 - Chromosomes can cross over at different points



Metaphase 1 - Chromosomes can line up either way around



Metaphase 2 - Chromosomes can line up either way around

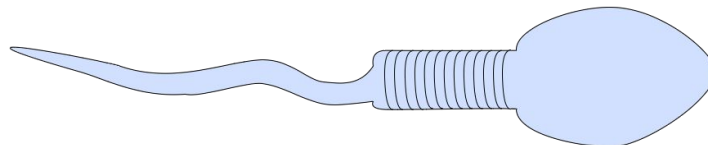
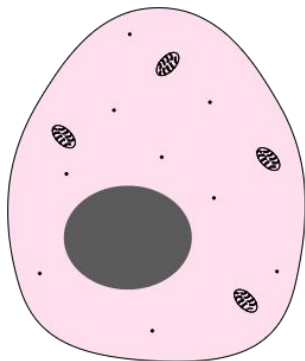


What is the purpose of meiosis?



What is the purpose of meiosis?

Meiosis produces gametes (sex cells)

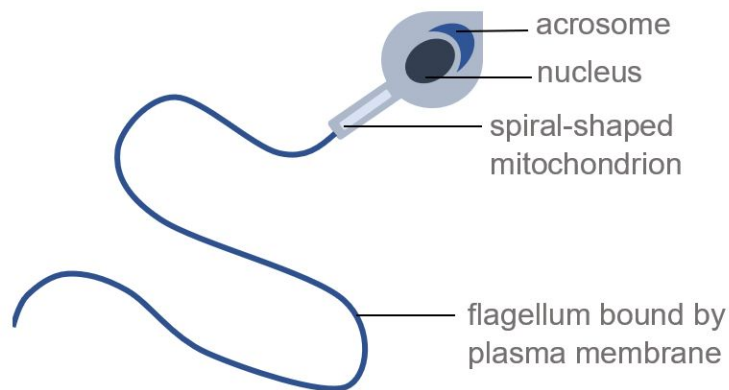


Describe the structure of a mature sperm cell



Describe the structure of a mature sperm cell.

- **Acrosome** contains digestive enzymes which break down the zona pellucida of the egg
- **Flagellum** for propulsion
- Many **mitochondria** for energy



Describe how egg cells are adapted to their function



Describe how egg cells are adapted to their function

- **Haploid nucleus** contains genetic material
- **Mitochondria** in cytoplasm produce energy for the developing embryo
- Cytoplasm contains **nutrients** for the developing embryo
- **Cell membrane hardens** after fertilisation, preventing the entry of other sperm and ensuring the zygote is diploid



Describe how sperm cells are adapted to their function



Describe how sperm cells are adapted to their function

- **Haploid nucleus** contains genetic information
- **Tail** enables movement
- **Mitochondria** provide energy for tail movement
- **Acrosome** contains enzymes that digest the egg cell membrane

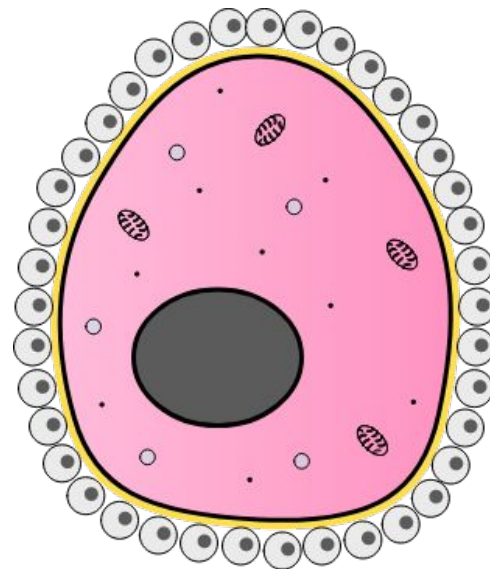


Describe the structure of egg cells

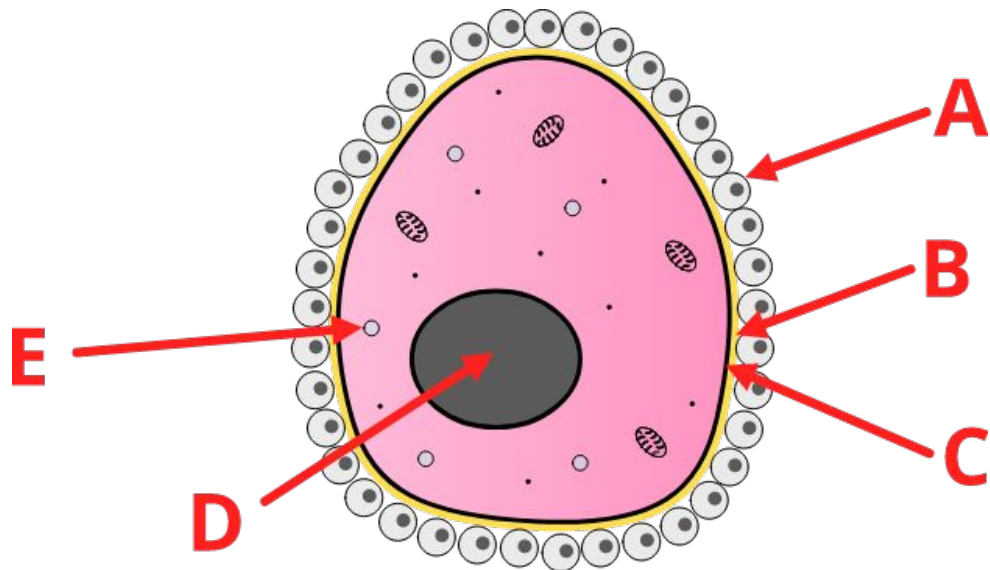


Describe the structure of egg cells

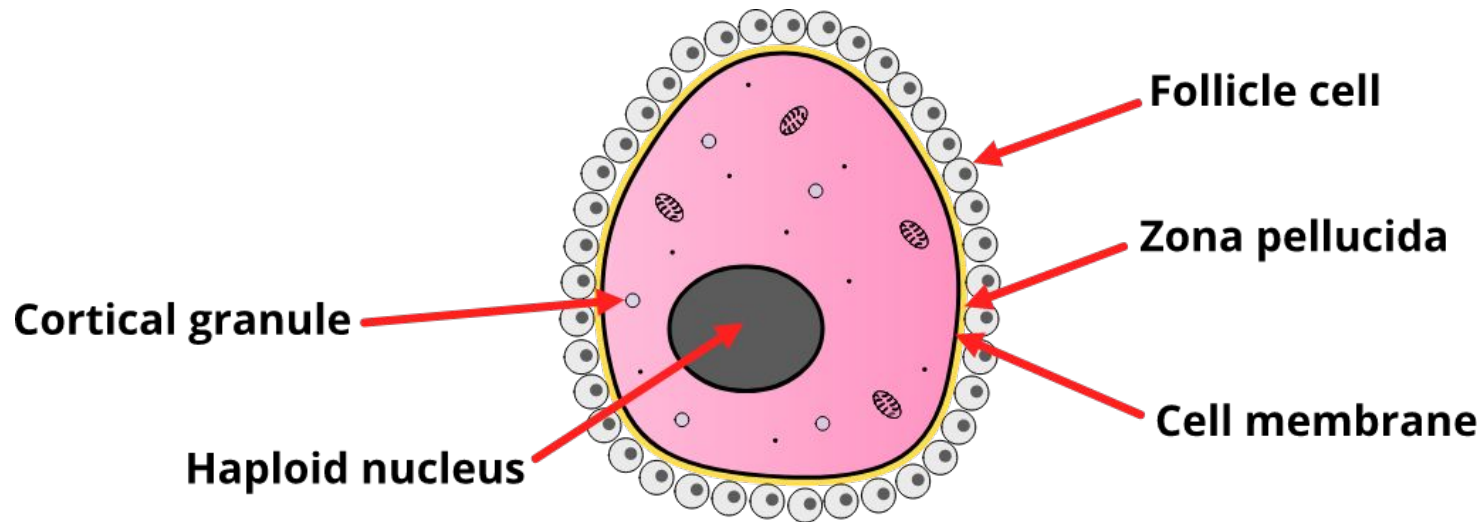
- Egg cells contain a **haploid nucleus**
- The zona pellucida is a layer of glycoproteins (depicted in yellow in the diagram) which surrounds the egg and initiates the **acrosome reaction**
- The cytoplasm contains cortical granules which prevent **polyspermy**
- The follicle cells are involved in hormone production



Label this diagram of an egg cell



Label this diagram of an egg cell



Describe how egg cells are adapted to their function



Describe how egg cells are adapted to their function

- They are very large and contain lots of cytoplasm to support many cell divisions
- They contain many nutrients to support cell division and growth
- The **zona pellucida** ensures fertilisation by only one sperm to prevent polyspermy
- Egg cells have a **haploid** nucleus which creates a **diploid** zygote once it is fertilised by a sperm cell.



What is the acrosome reaction?



What is the acrosome reaction?

As a sperm cell approaches an oocyte, the acrosome membrane fuses with the outer membrane of the sperm cell. This allows the contents of the acrosome to exit the sperm cell. The contents from the acrosome include digestive enzymes which are then able to break down the zona pellucida to allow for fertilisation



What is the cortical reaction?



What is the cortical reaction?

The exocytosis of the contents of cortical vesicles which causes the hardening of the zona pellucida. This prevents multiple fertilisation events (polyspermy)



Define pollination



Define pollination

The deposition of pollen onto a stigma
from an anther



Name the two types of pollination



Name the two types of pollination.

- Cross-pollination
- Self-pollination



What is cross-pollination?



What is cross-pollination?

A type of pollination in which pollen is transferred from an anther of one plant to a stigma of a **different** plant



What is self-pollination?



What is self-pollination?

A type of pollination in which pollen is transferred from an anther of a plant to a stigma of the **same** plant



Where does double fertilisation occur?



Where does double fertilisation occur?

Embryo sac of ovule



How do the male nuclei reach the embryo sac?



How do the male nuclei reach the embryo sac?

- Pollen grain from one plant lands on the stigma of another
- Mitosis of pollen grain to form a **pollen tube nucleus** and **two male gametes**
- Pollen tube grows from the grain down to the ovule via the digestion of the style
- Pollen tube delivers two male gametes



How does the pollen tube enter into the embryo sac?



How does the pollen tube enter into the embryo sac?

Via the micropyle



Define micropyle



Define micropyle.

- Pore in the integument of an ovule through which the pollen tube enters the embryo sac
- Remains as a pore in the testa (seed coat)



What happens during double fertilisation?



What happens during double fertilisation?

In the embryo sac of ovule:

- One sperm cell fertilises an ovum to form a diploid zygote
- One sperm cell fuses with two polar nuclei to form a triploid primary endosperm



What happens to the ovule following double fertilisation?



What happens to the ovule following double fertilisation?

Develops into the seed



How is the diploid embryo formed following double fertilisation?



How is the diploid embryo formed following double fertilisation?

Diploid zygote undergoes mitosis to form diploid embryo



What is mitosis?



What is mitosis?

A type of cell division that produces two genetically identical daughter cells

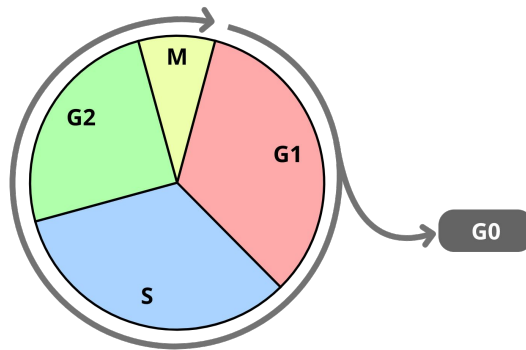


What is the cell cycle?



What is the cell cycle?

The cell cycle is a series of processes that a cell goes through to prepare it for division

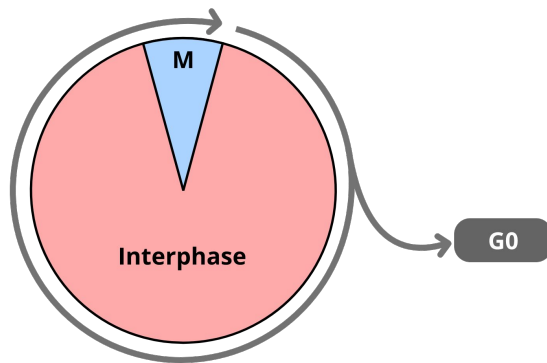


What are the two main sections of the cell cycle?



What are the two main sections of the cell cycle?

Interphase and mitosis



Name the 3 stages of interphase



Name the 3 stages of interphase

Gap 1 (G_1)

Synthesis (S)

Gap 2 (G_2)

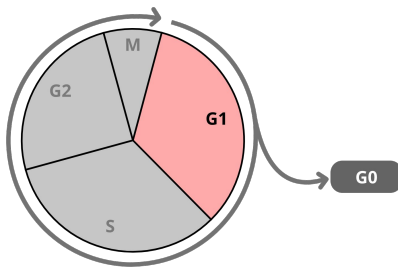


Describe the gap 1 (G_1) phase of interphase



Describe the gap 1 (G_1) phase of interphase

G_1 is the first phase of interphase and it involves the growth of the cell and synthesis of molecules like proteins and RNA. The cell also duplicates its organelles in preparation for mitosis

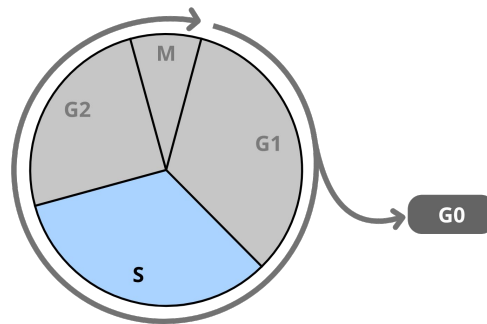


Describe the synthesis (S) phase of interphase



Describe the synthesis (S) phase of interphase

S phase is the second phase of interphase and it is where the DNA in the cell is replicated

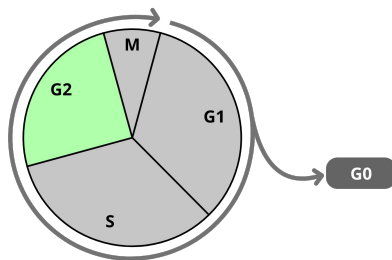


Describe the gap 2 (G_2) phase of interphase



Describe the gap 2 (G_2) phase of interphase

G_2 is the third phase of interphase and is a second growth phase where the cell continues to grow, produces more proteins and organelles and prepares for division



Name the 4 phases of mitosis



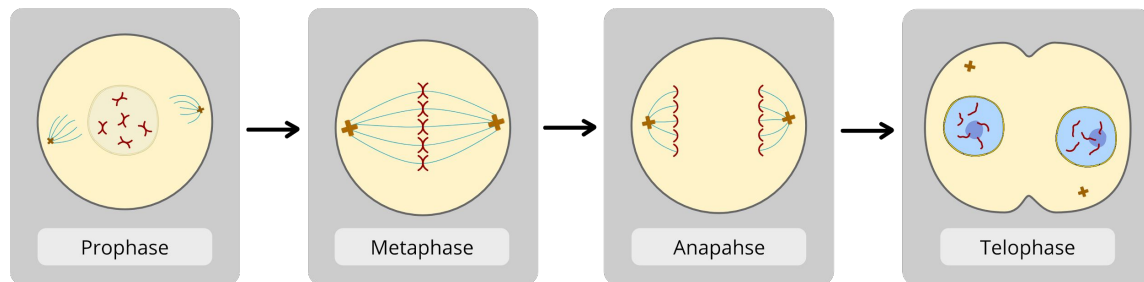
Name the 4 phases of mitosis

Prophase

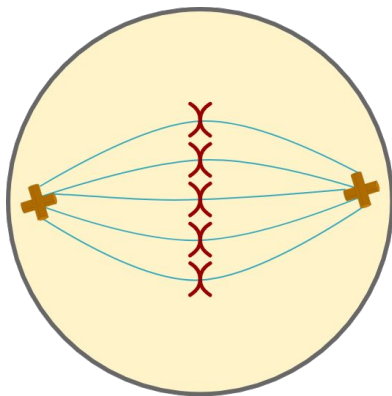
Metaphase

Anaphase

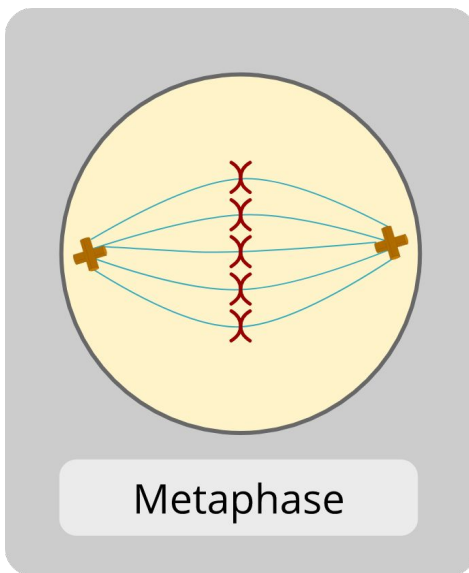
Telophase



Name the phase of mitosis shown in the diagram below



Name the phase of mitosis shown in the diagram below

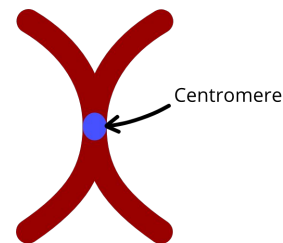
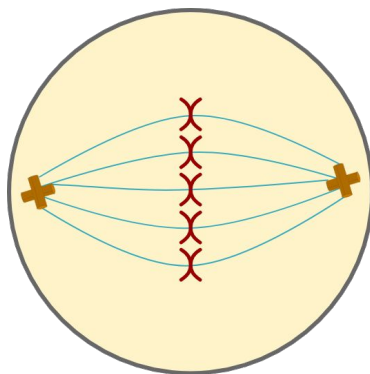


Describe metaphase

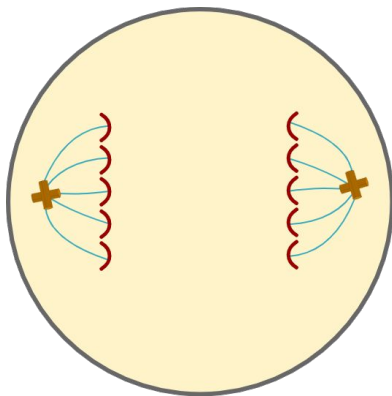


Describe metaphase

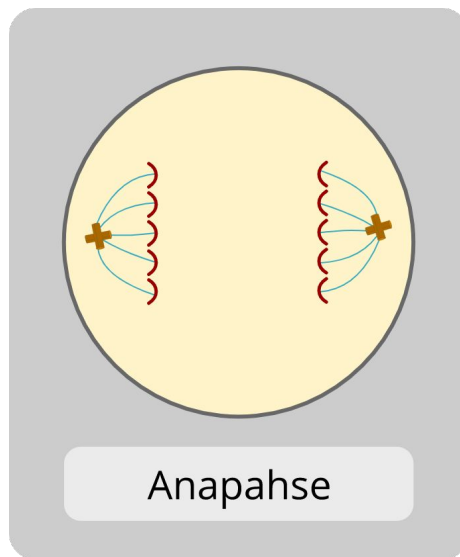
The chromosomes align on the **metaphase plate** at their **centromeres**



Name the phase of mitosis shown in the diagram below



Name the phase of mitosis shown in the diagram below

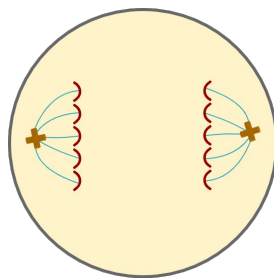


Describe anaphase

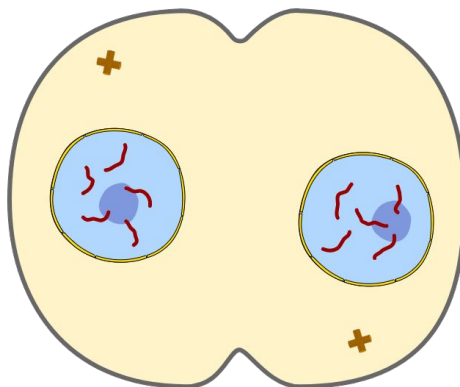


Describe anaphase

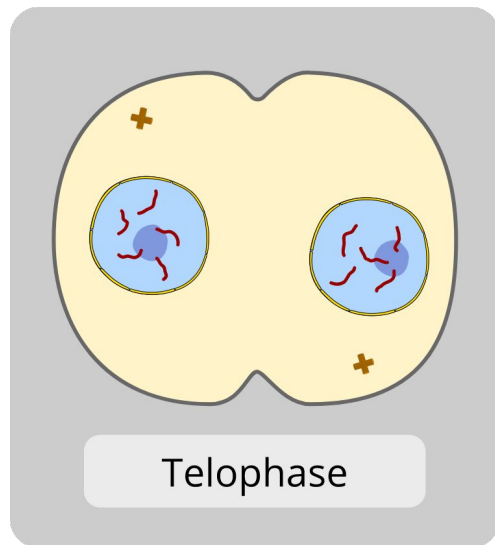
The sister chromatids are pulled to the opposite ends (poles) of the cell by the spindle fibres



Name the phase of mitosis shown in the diagram below



Name the phase of mitosis shown in the diagram below

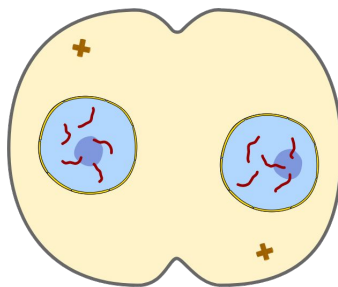


Describe telophase

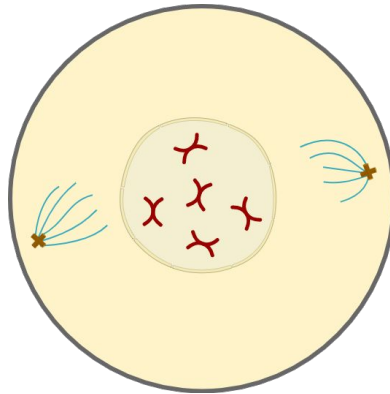


Describe telophase

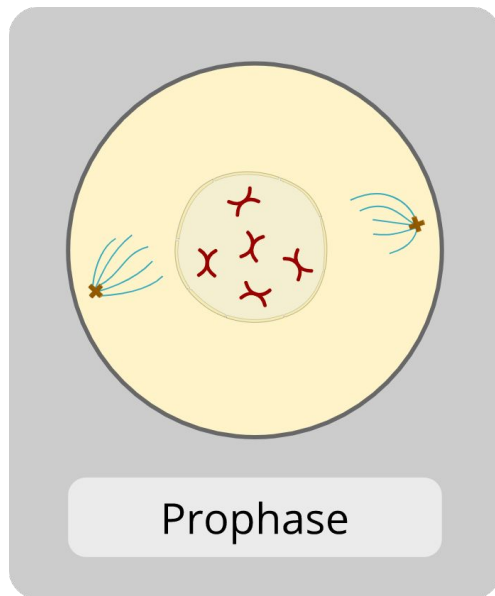
The spindle fibres disassemble, the nucleus and nucleolus begin to reform and the chromosomes begin to decondense



Name the phase of mitosis shown in the diagram below



Name the phase of mitosis shown in the diagram below

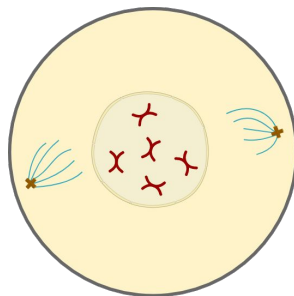


Describe prophase



Describe prophase

The chromosomes in the nucleus condense, the nucleolus disappears and the nuclear membrane begins to break down. Spindle fibres also begin to grow from the centrioles



Give 3 beneficial uses of mitosis



Give 3 beneficial uses of mitosis

- Repair
- Growth
- Asexual reproduction

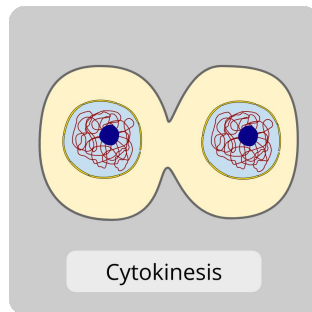


What is cytokinesis?



What is cytokinesis?

The stage at the end of mitosis where the cytoplasm is divided in two

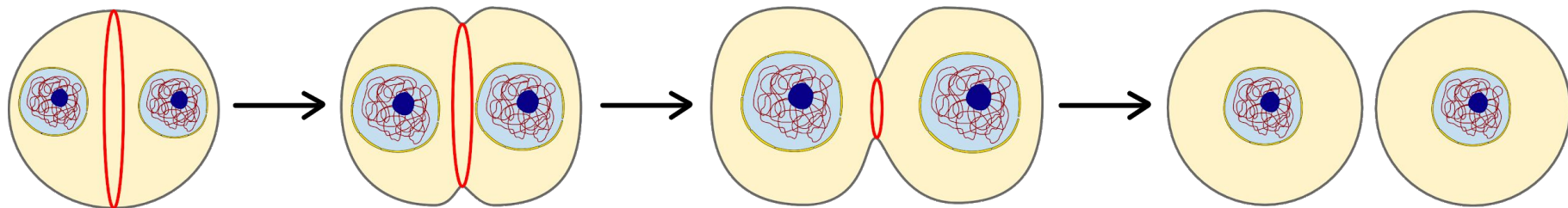


Describe cytokinesis in animal cells



Describe cytokinesis in animal cells

A contractile ring is formed around the centre of the cell which tightens and pinches the cells in the middle. This eventually pinches off to create two new cells

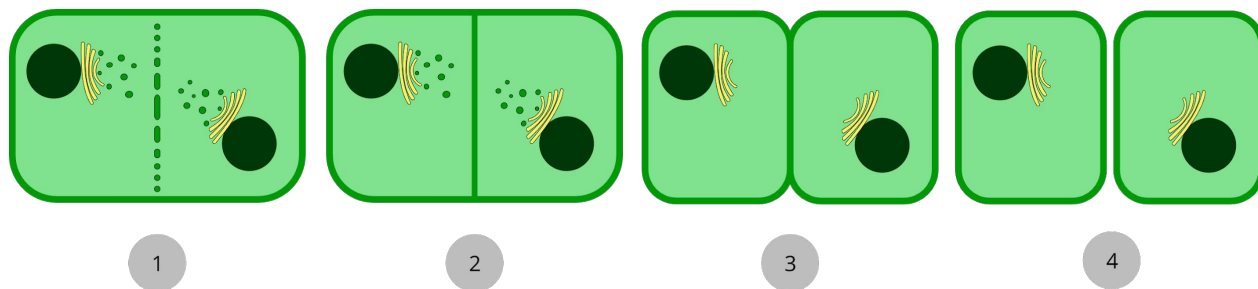


Describe cytokinesis in plant cells



Describe cytokinesis in plant cells

Vesicles are released from the ER and accumulate in the middle. The vesicles fuse together to form an cell plate which is then used to form the new cell walls for each new cell



How are mitotic indices calculated?



How are mitotic indices calculated?

By dividing the number of cells currently undergoing mitosis by the total number of cells

