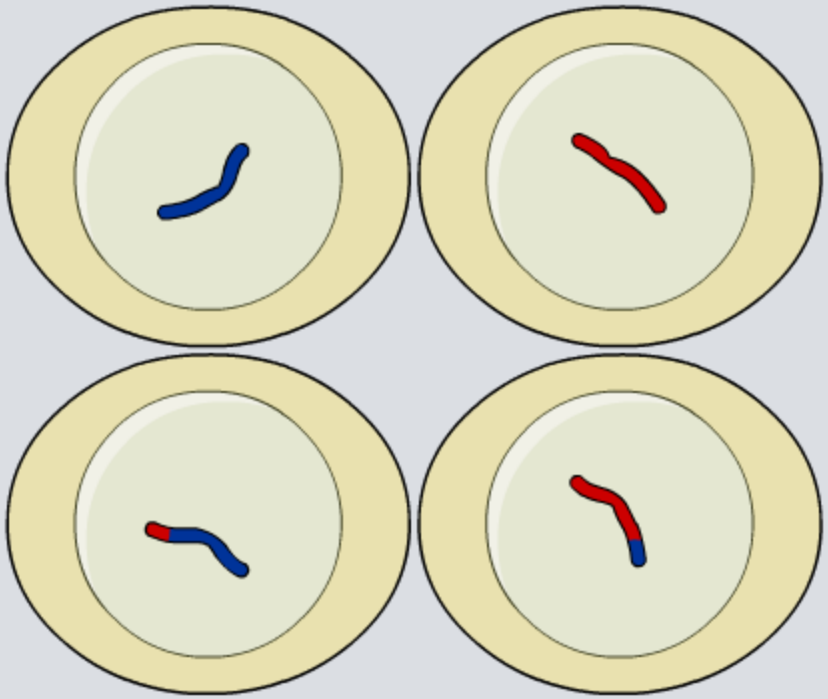
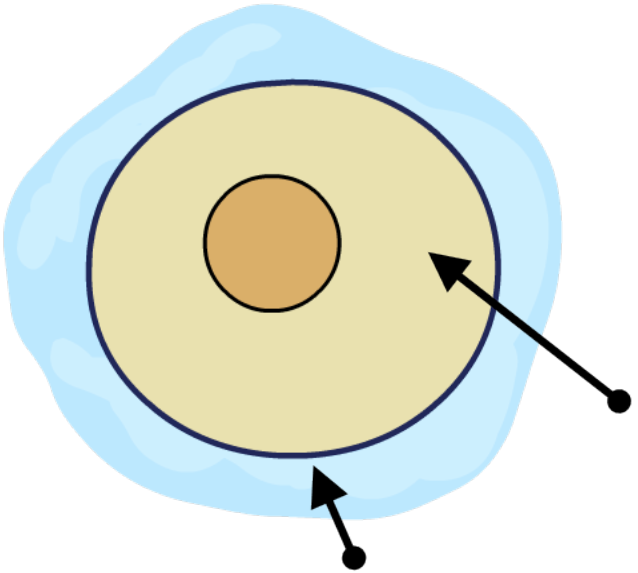
Meiosis



What are sex cells?

Sex cells in animals and plants are called **gametes**. In animals, the gametes are eggs (ova) and sperm.

In mammals, egg cells are produced in the ovaries, and sperm cells are produced in the testes. How are these cells specialized for their roles in reproduction?

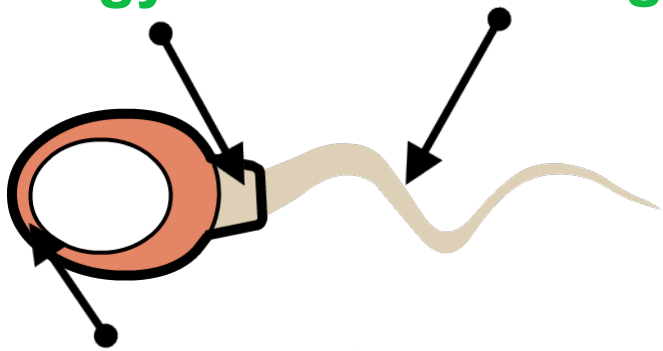


food source in cytoplasm for embryo

protective outer cell layers

lots of mitochondria for providing energy

flexible tail for swimming



enzymes to digest egg cell membrane

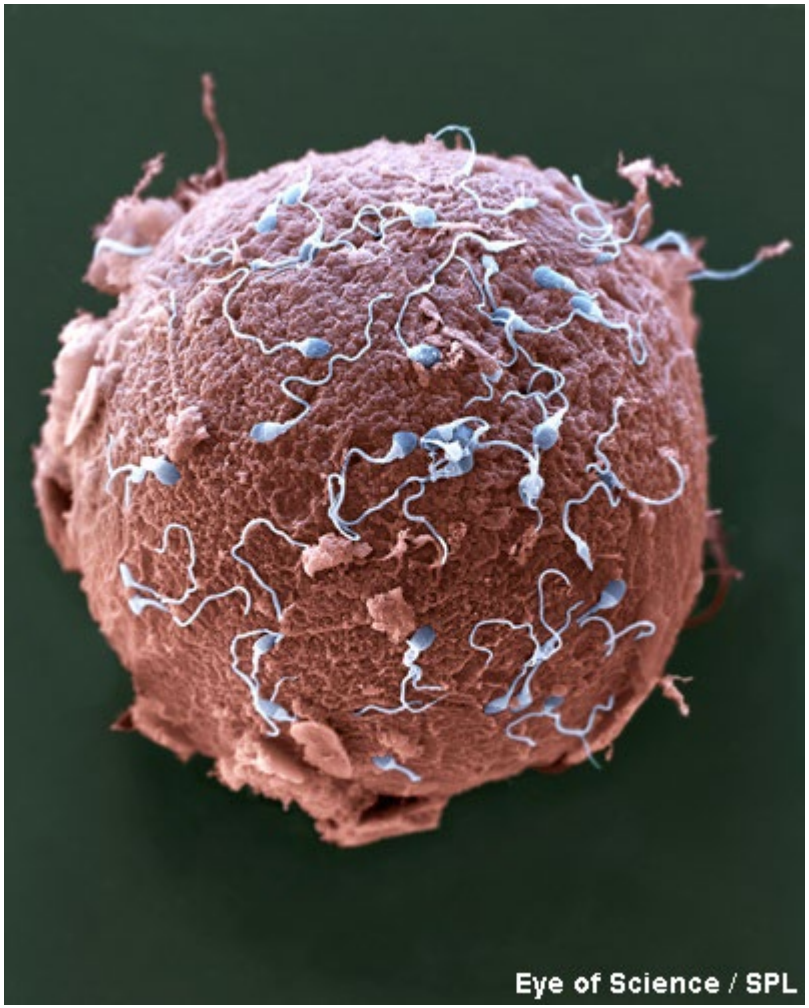
What is fertilization?

Fertilization is the stage of sexual reproduction when gametes fuse. This is the first step in the creation of a new life.

When an egg cell is fertilized, it becomes a **zygote**.

This zygote divides by mitosis many times and becomes an embryo.

The embryo continues to grow and develop into a fetus.



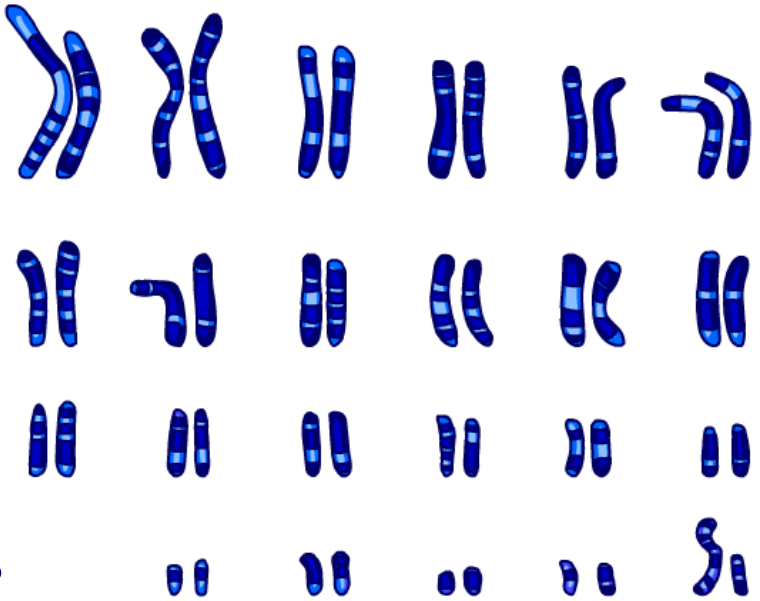
How many chromosomes in gametes?

If gametes had the same number of chromosomes as body cells, what problem would this cause at fertilization?

The embryo would have double the number of chromosomes – 92 instead of 46 in humans.

Why does this not happen?

Only one chromosome from each homologous pair in the parent cell is copied to the gametes during cell division.



This means that human gametes only have **23 chromosomes**.
Gametes are said to be **haploid** cells.

What is meiosis?

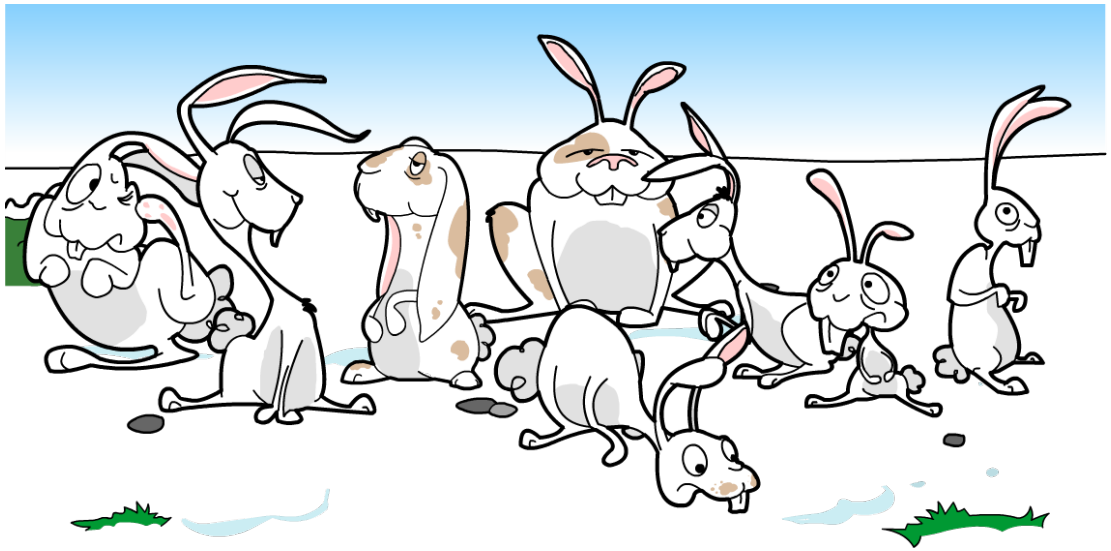
Gametes are produced by a type of cell division called **meiosis**.

The number of chromosomes is halved in meiosis so it is sometimes called **reduction division**.

Unlike mitosis, meiosis produces **four unique** daughter cells.

Why is it important to produce genetically unique gametes?

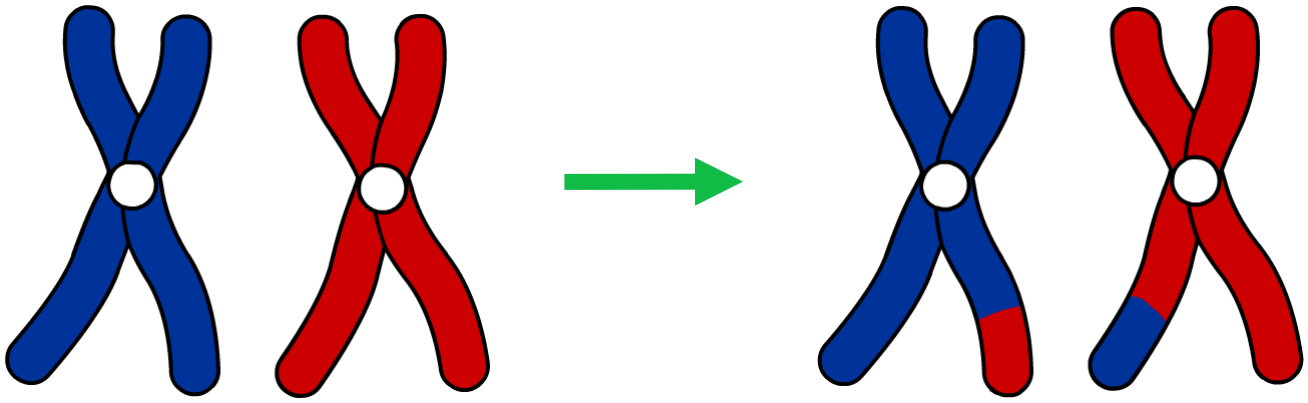
It ensures natural variation within a species.



Increasing genetic variation

Meiosis produces genetically-unique daughter cells, but how does this happen?

In the early stages of meiosis, homologous chromosomes exchange DNA, which creates genetic variation and new combinations of characteristics. This is called **crossing-over**.



homologous pair before crossing-over

homologous pair after crossing-over

What happens during meiosis?

Before meiosis begins, all the chromosomes duplicate to form two chromatids. Cells then undergo two rounds of division.

In the first round of division:

- Homologous pairs of chromosomes align in the middle of the parent cell and are separated.
- The cell divides so each new daughter cell only contains one chromosome from each pair; 23 chromosomes in total.

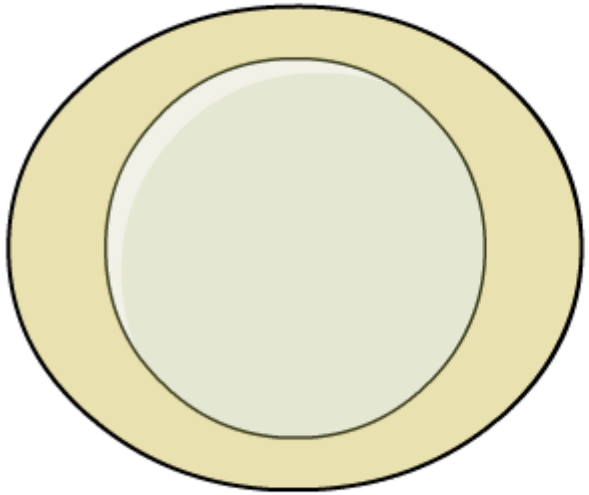
In the second round of division:

- In each cell, the chromosomes align in the center and its chromatids are pulled apart into separate halves of the cell.
- Each cell divides again, so each new cell only contains one chromatid from each chromosome.

What happens during meiosis?

Meiosis is cell division that produces four unique sex cells, or **gametes**.

Click the cell or "**play**" to find out what happens.



The stages of meiosis

What is the order of stages in meiosis?

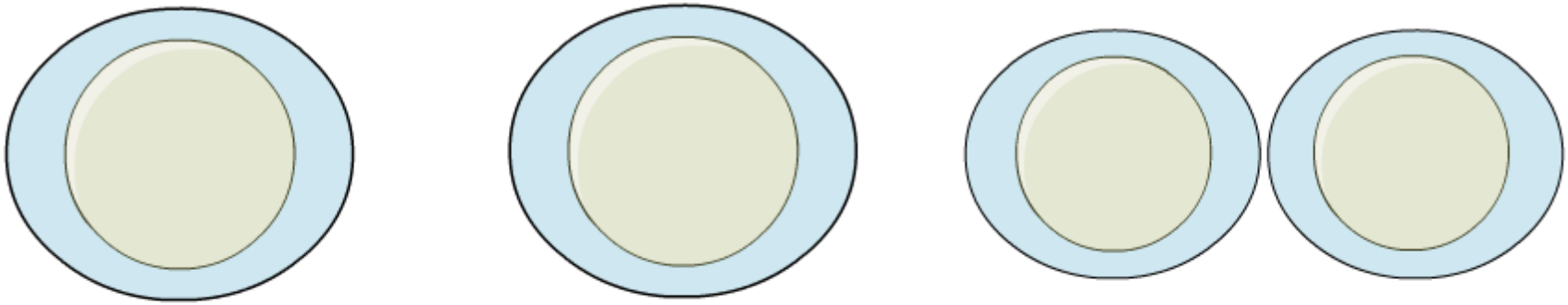
1. chromosomes become shorter and thicker
2. the cell divides into two daughter cells
3. chromosomes align in the center of each cell
4. spindle fibers separate chromosomes into chromatids
5. homologous chromosomes pair up in the center of the cell
6. each cell divides into two daughter cells
7. spindle fibers separate homologous chromosomes

?

C solve

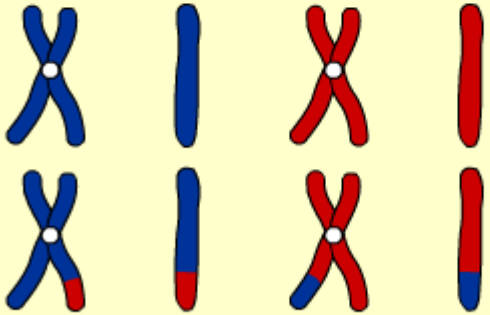
Chromosomes during meiosis

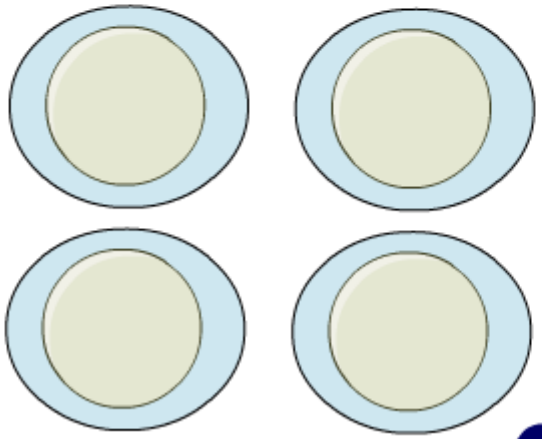
What happens to chromosomes during meiosis?



parent cell → crossing over → 2 daughter cells

chromosome bank





4 daughter cells

?

C solve