

Review

- What would the complementary strand of DNA be for the following sequence?

ATT GCA CCG

CELL DIVISION

Cell division and multiplication

- As we already mentioned, the genetic information contained in the nucleus is **hereditary**
- Meaning it is passed on **from cell to cell;**
from parent to child
- This happens during **cellular reproduction**

Cell division and multiplication

- Why would cells need to reproduce?
 - To increase the number of cell (in other words, to grow)
 - To repair damaged tissues
 - To produce gametes (sex cells)

Cellular Reproduction

- To reproduce a whole individual, humans require sexual reproduction
- And this requires the product of sex cells (gametes) through meiosis

Cellular Reproduction

- But we do sometimes need to reproduce individual cells for growth or repair through asexual reproduction
- And this is done through mitosis

Mitosis vs Meiosis

- There are 2 types of cellular reproduction:
- **Mitosis:** when a cell divides to produce 2 identical daughter cells
 - Used for growth and repair in somatic cells

Mitosis vs Meiosis

- There are 2 types of cellular reproduction:
 - **Meiosis:** when a cell divides to produce **4** reproductive cells that are each different from the original cell. These daughter cells only contain half the genetic material of the parent cell
 - Used to create gametes (sex cells)

Meiosis



Mitosis



Mitosis

- Ensures **growth** (an increase in the number of cells that make up an organism).
- When our bodies grow so does the **number of cells**, so we have more cells when we are adults than when we were babies



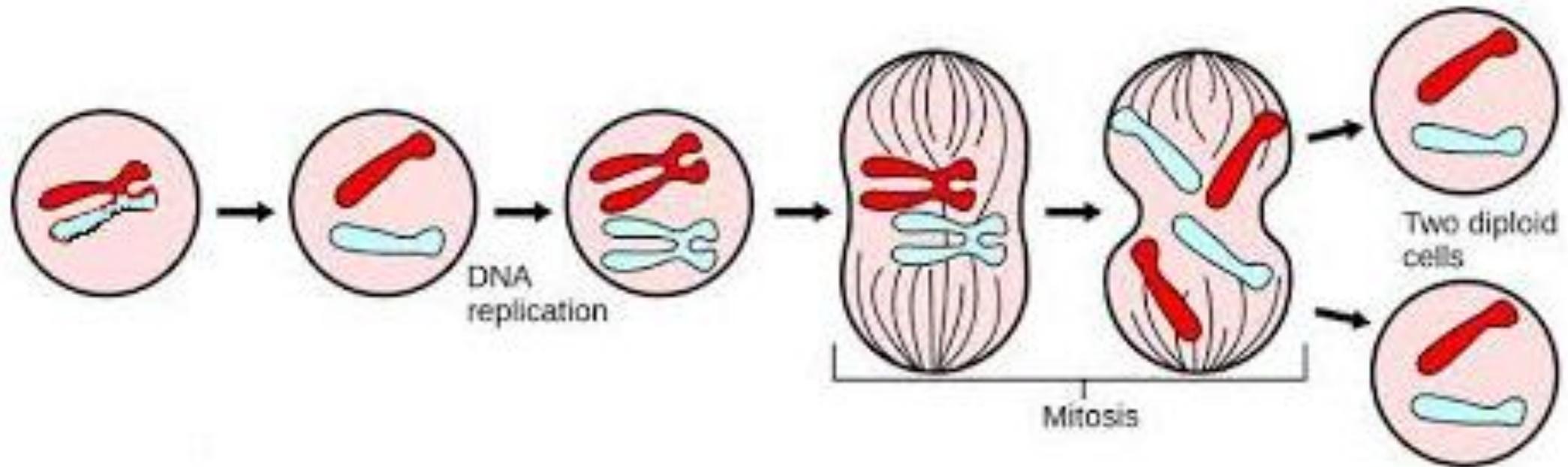
Mitosis

- **Mitotic activity**: number of mitoses carried out by cells (more intense during childhood and adolescence than any other stage of life)
- **How often the cells undergo mitosis**

Mitosis

- Ensures **repair of damaged tissues** (ex. injuries, cuts, fractures, etc) or tissues that have become **worn out**
- Certain cells wear down more easily than others and need replacing more often
 - E.g. skin cells are replaced every 2 weeks and white blood cells every 120 days)

Mitosis



Steps of Mitosis

1. DNA unravels

2. DNA duplicates

3. DNA condenses into chromosomes

4. Chromosome pairs split

- Half go to one end, the other half to the other

5. New nuclear membrane forms around the two new cells

Go from 1 diploid cell to 2 diploid cells

Diploid vs Haploid

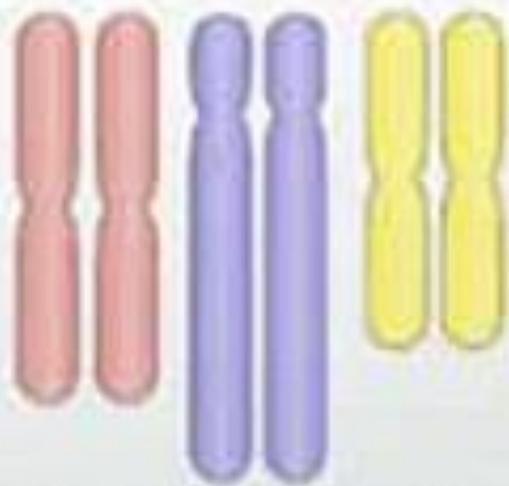
- **Diploid:**

- A cell that contains **2 complete sets of chromosomes** (one from each parent) → **2n**

- **Haploid:**

- A cell that **only contains 1 complete set of chromosomes** (half of what is needed to make a full individual) → **n**

Diploid (2n)



**two sets of
chromosomes**

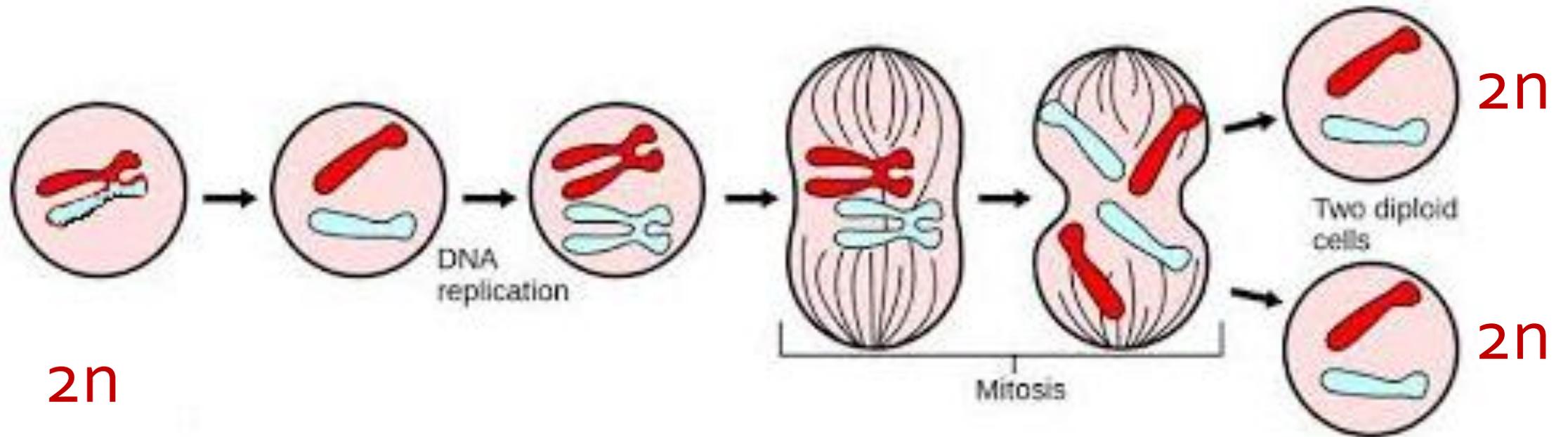
Haploid (n)



**one set of
chromosomes**

 STEM CELLS
THAILAND

Mitosis



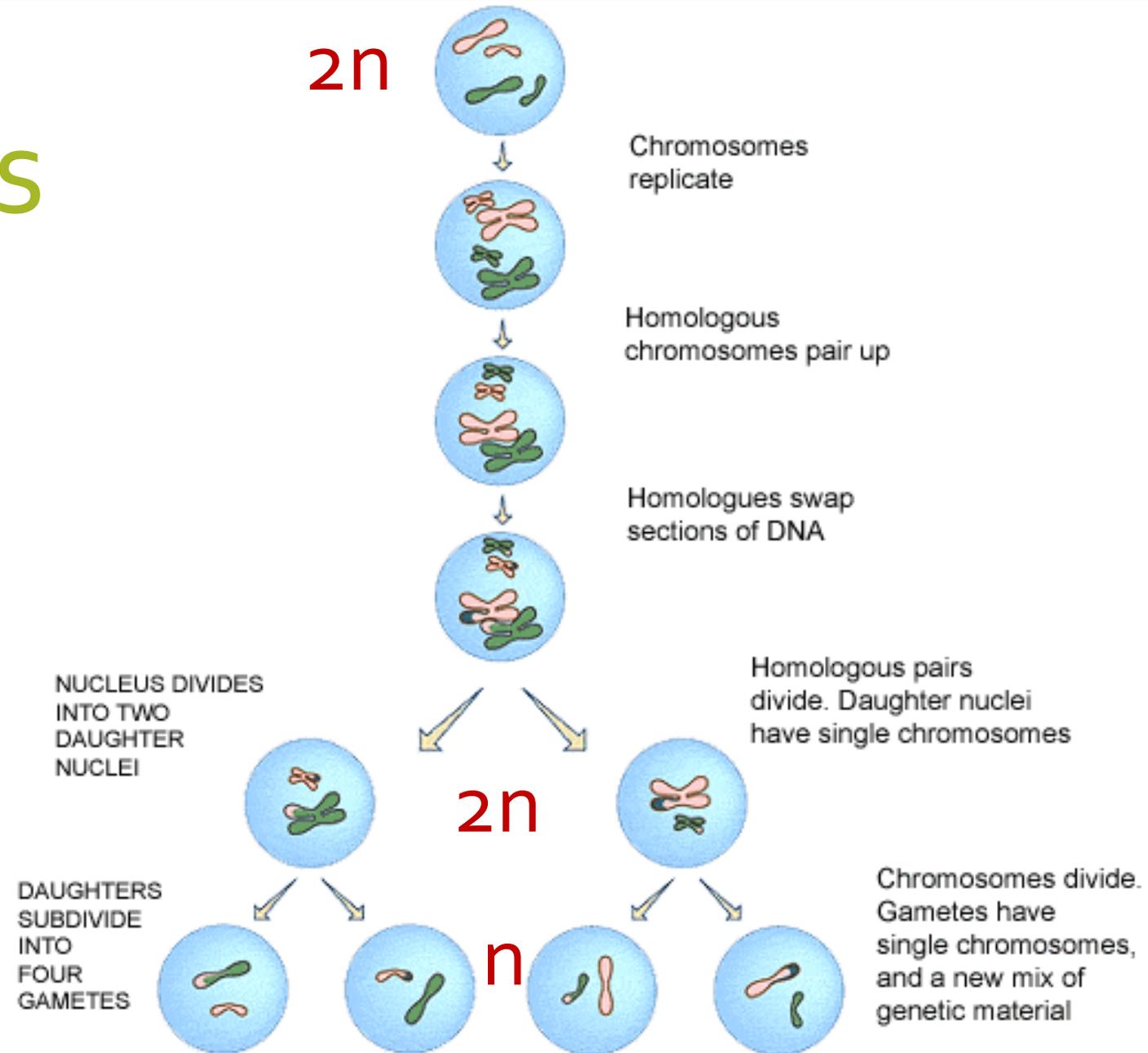
Meiosis

- **Meiosis** is a form of cell division that produces **4 reproductive cells** that are **different from the original cell** because they each contain **half the DNA**
- The result is 4 daughter cells, each contain **23 chromosomes** and all different genetic material.

Meiosis

- Each daughter cell ends up with **half the genetic info**. These are called **haploid (n) cells**.
- This is used to create sex cells
 - Sex Cells: **sperm and ova** (eggs), are also called **gametes**

Meiosis



Meiosis

- In order to produce cells that contain only half the DNA, there are **TWO divisions** that take place.
- The **first** one is **similar to mitosis** (where DNA doubles itself first)
- The **second** division happens right after the first division, **but without duplicating the DNA**

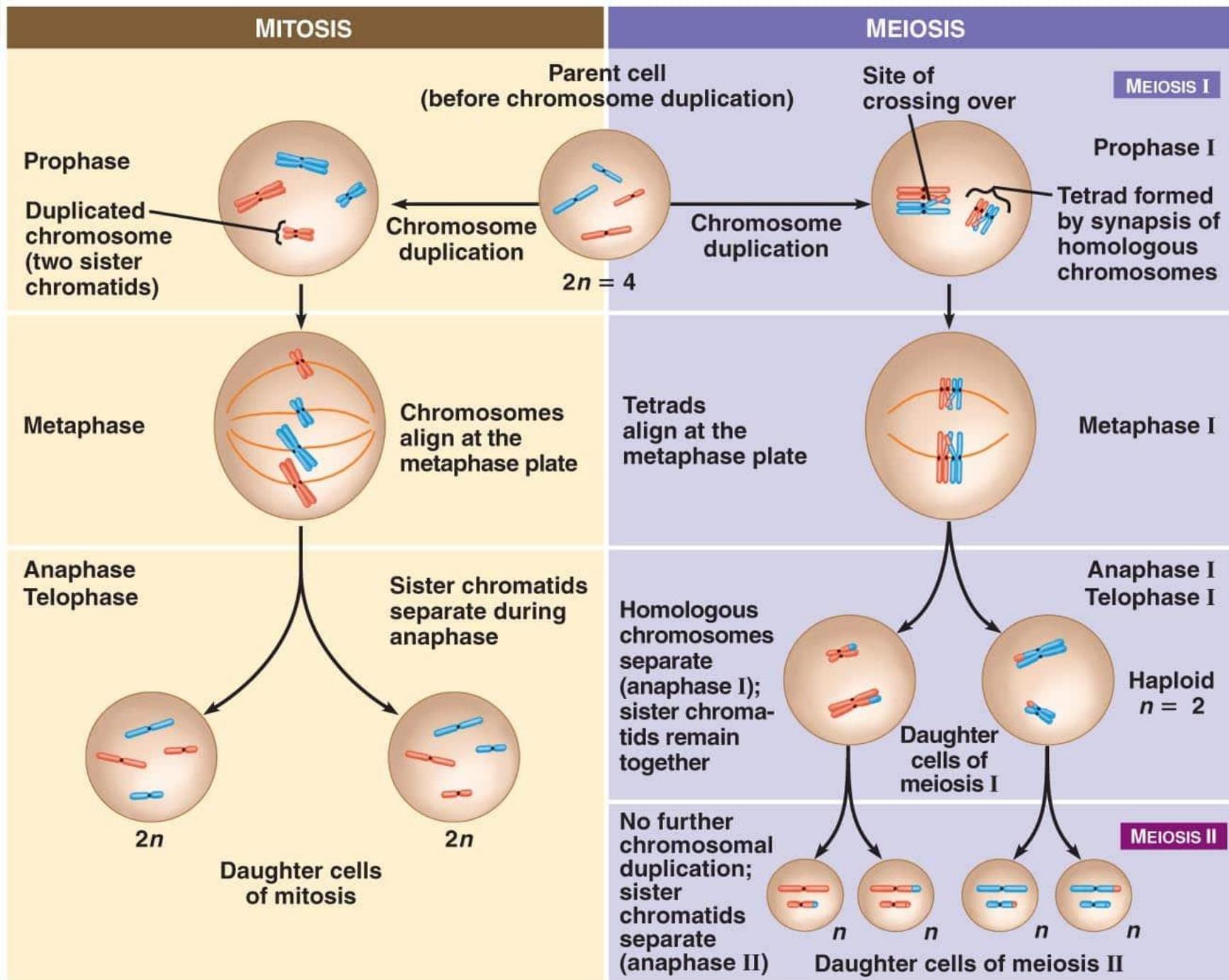
Steps of Meiosis

1. DNA unravels
2. DNA duplicates
3. DNA condenses into chromosomes
4. Homologous chromosomes pair up and swap sections of DNA
5. Cell splits into two diploid cells with homologous pairs
6. Each of these cells then splits again
7. Nuclear membrane forms

Go from 1 diploid cell to

4 haploid cells

These are the gametes (sperm or ova)



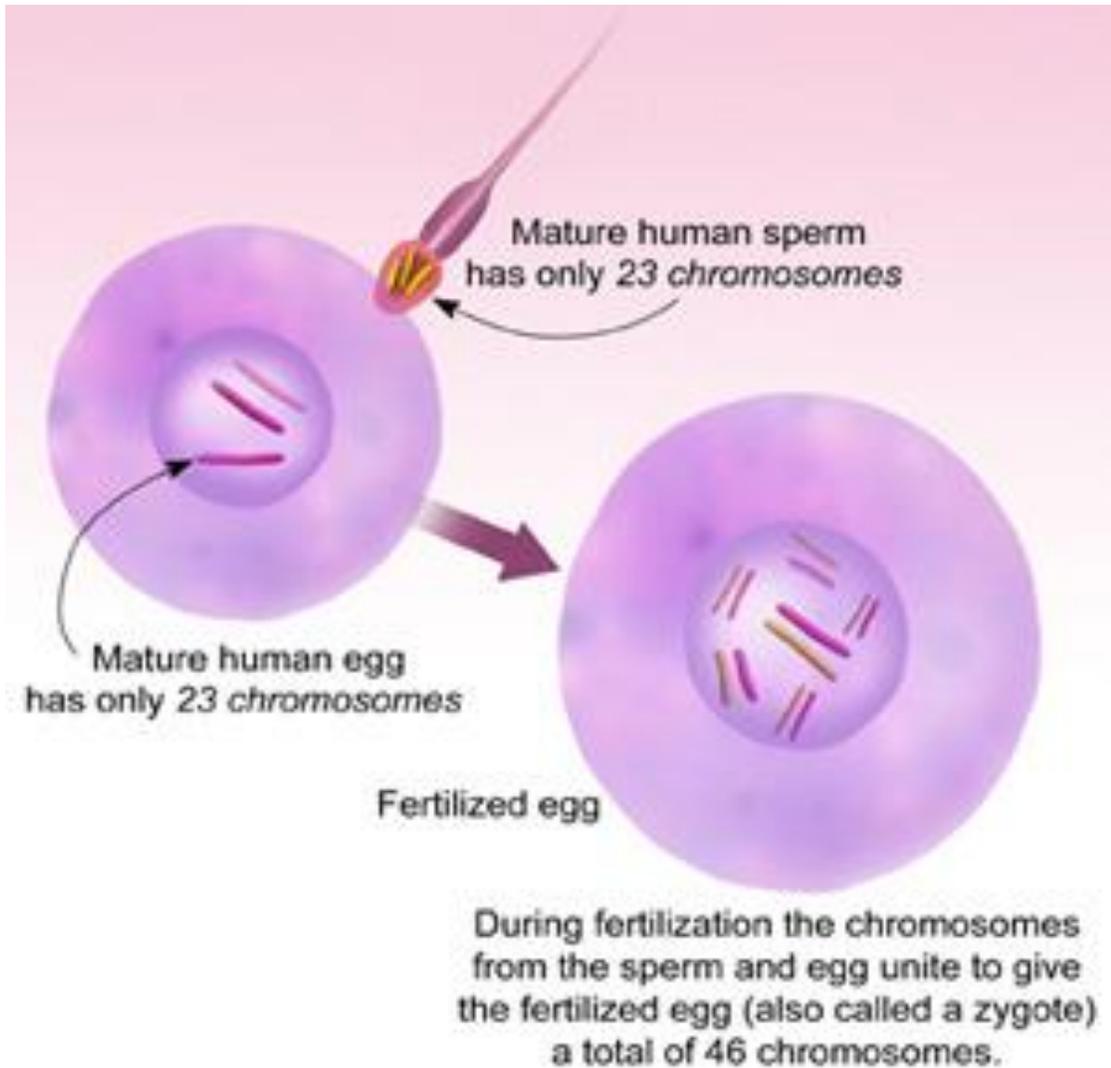
Why is it important that sex cells
only have $\frac{1}{2}$ the number of
chromosomes?

Meiosis and Fertilization

- Meiosis prevents DNA from doubling with every generation.
- During fertilization millions of spermatozoa (n) encounter the ovum (n).

Meiosis and Fertilization

- Only **one sperm** will be able to penetrate **the ovum** and combine the male genetic info (n) with that of the female (n) to produce a **zygote (2n)**.
- From there, **mitosis** results in the development of an **embryo** (the first steps to a baby)



From there, the zygote will undergo many repetitions of mitosis in order to grow!