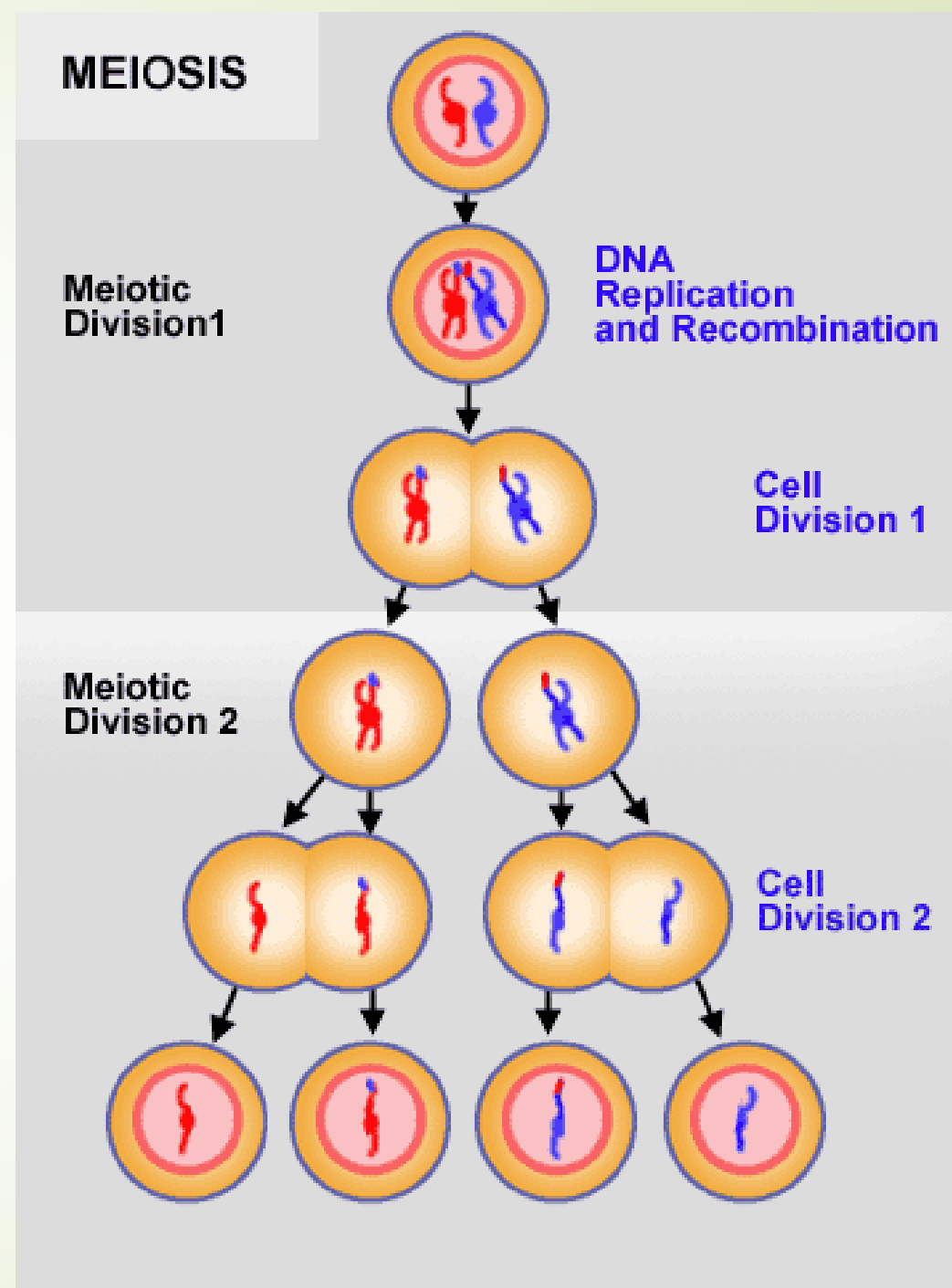


Meiosis

Types of Cells

Phases of Meiosis



**Mitosis is how
your Toes
got made**

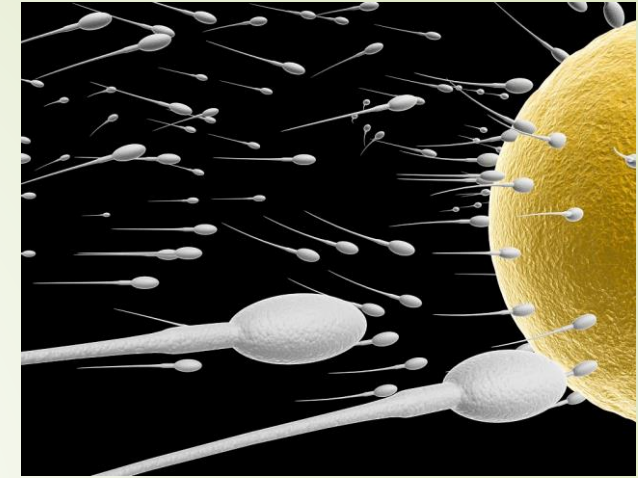


**Meiosis is how
your folks
made You**



I. Introduction

- ▶ A. An organism must inherit a single copy of every gene from both "parent"
 - ▶ 1. (Humans – 23 from mother and 23 from father, total of 23 pairs or 46 chromosomes)
- ▶ B. When an organism produces its own gametes (sex cells) the two sets of genes must be separated from each other so that each gamete contains one set of genes, or $\frac{1}{2}$ the DNA
- ▶ C. Human gametes are sperm and egg produced in the gonads (testes and ovaries)



II. Chromosome Numbers

➤ A. Somatic Cells (body cells)

➤ 1. Contain two sets of chromosomes (one set from mom, one set from dad) are called homologous chromosomes.

➤ 2. Diploid Cells

➤ a.) contain **both sets** of homologous chromosomes ("2 sets of each gene").

➤ 3. The number of chromosomes is represented by **2N**.

➤ Ex: Humans $2N = 2(23) = 46$ chromosomes

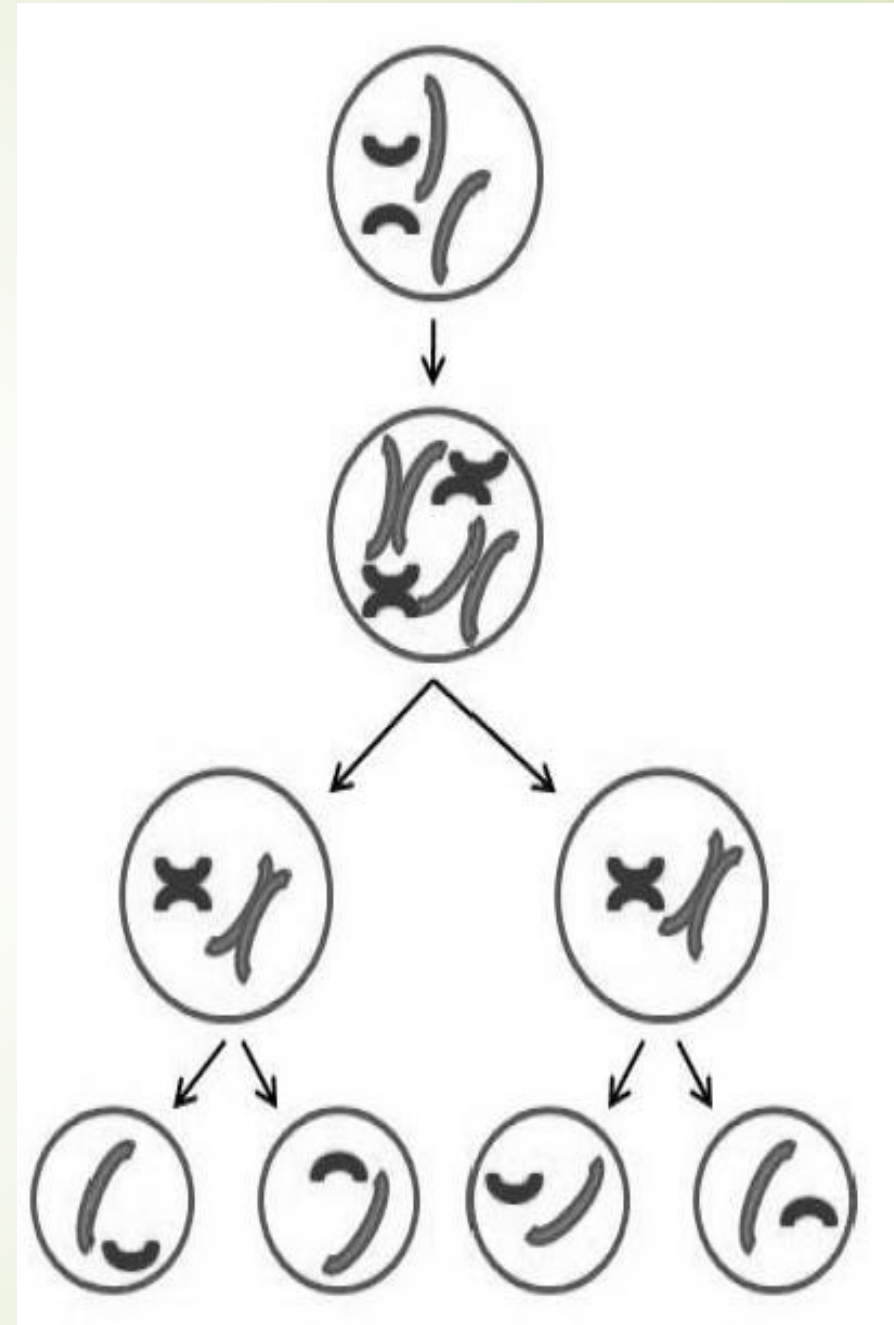
➤ B. Gametes (sex cells)

➤ 1. Contain a single set of chromosomes and are called haploid ("one set").

➤ 2. The number of chromosomes is represented by N. Humans $N=23$.

III. Meiosis

- ▶ A. Haploid cells are produced from diploid cells through the process of Meiosis.
- ▶ B. Meiosis Definition
 - ▶ 1. A process of reduction division in which the number of chromosomes per cell is cut in half through the separation of homologous chromosomes to form 4 genetically **DIFFERENT** haploid cells.



C. Phases of Meiosis 1

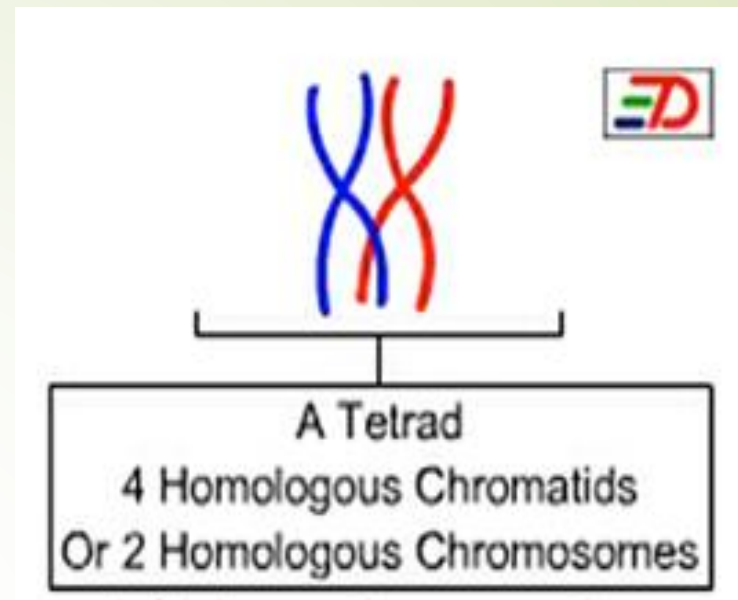
1. Meiosis I

A. Chromosomes are replicated **BEFORE** meiosis 1 starts

B. Each replicated chromosome lines up in the center of the cell and pairs with its corresponding homologous chromosome.

***One replicated chromosome, (2 chromatids) from mom and one replicated chromosome (2 chromatids) from dad.

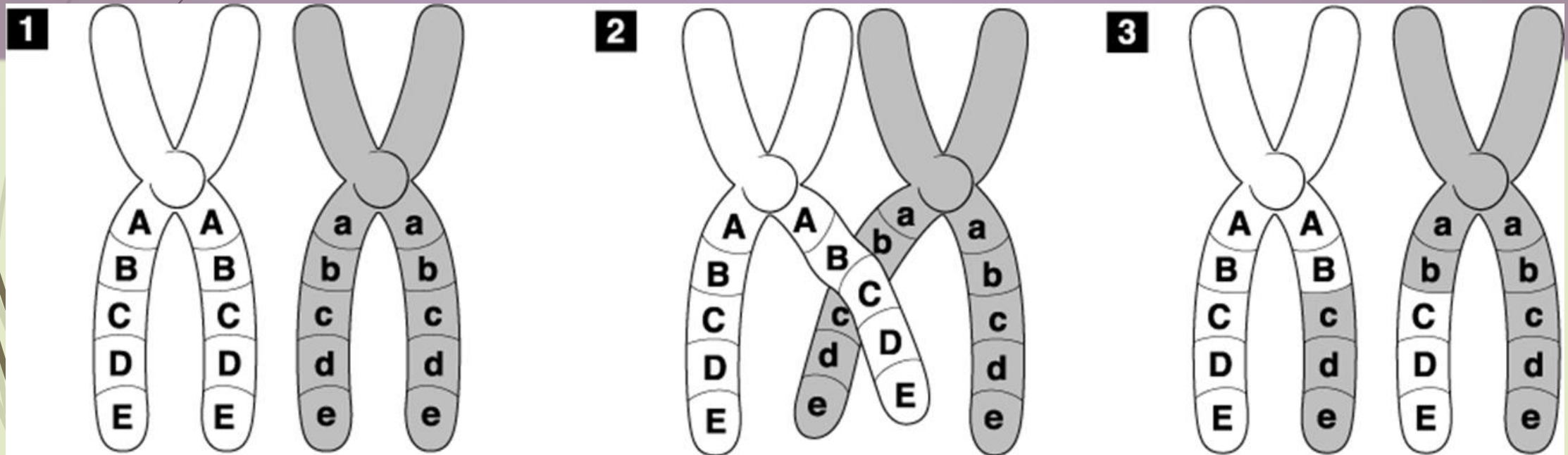
The **four chromatids** form a **tetrad**.



C.) Crossing-over in Prophase I (of Meiosis I)

- As homologous chromosomes pair up and form tetrads, portions of the chromatids are exchanged.
- Results in new genetic combinations. (Do you look exactly like your brother or sister?)

D.) Homologous chromosomes separate, resulting in two new cells with different genetic combinations in each cell



2. Meiosis II

- A. NO CHROMOSOME REPLICATION THIS TIME.
- B. Chromosomes line up in the center of the cell
- C. Paired chromatids separate.
- D. Resulting 4 daughter cells now contain the haploid # (N), half the original chromosome number

MEIOSIS

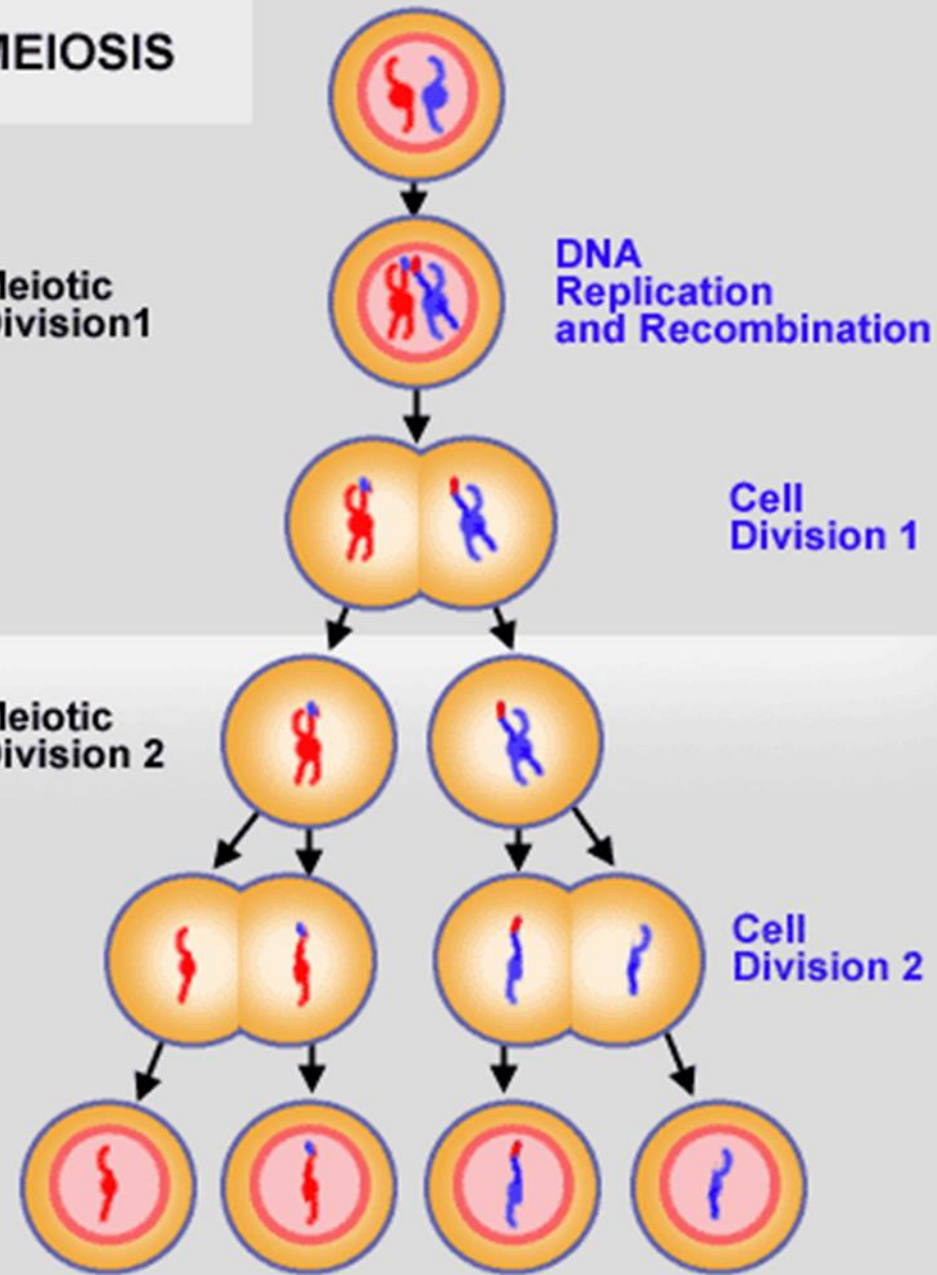
Meiotic Division 1

DNA Replication and Recombination

Cell Division 1

Meiotic Division 2

Cell Division 2



MEIOSIS II: Separates sister chromatids

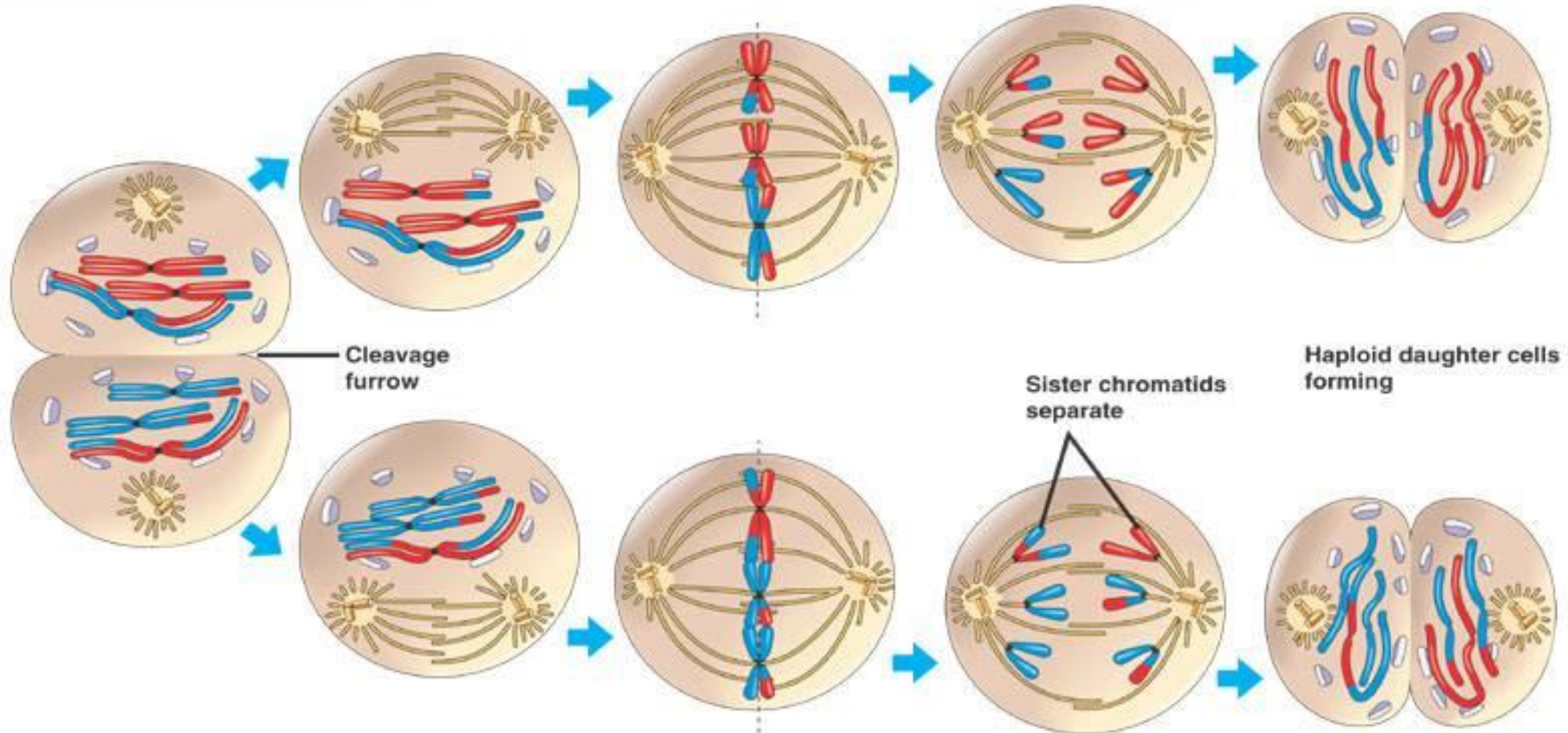
TELOPHASE I AND
CYTOKINESIS

PROPHASE II

METAPHASE II

ANAPHASE II

TELOPHASE II AND
CYTOKINESIS



Cleavage
furrow

Sister chromatids
separate

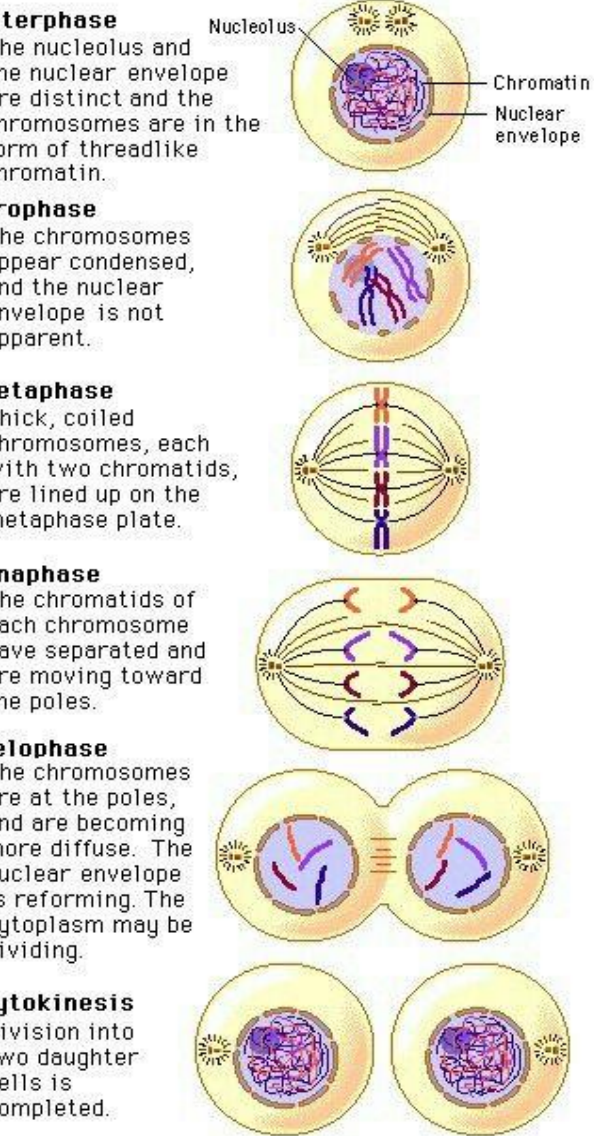
Haploid daughter cells
forming

Two haploid cells
form; chromosomes
are still double

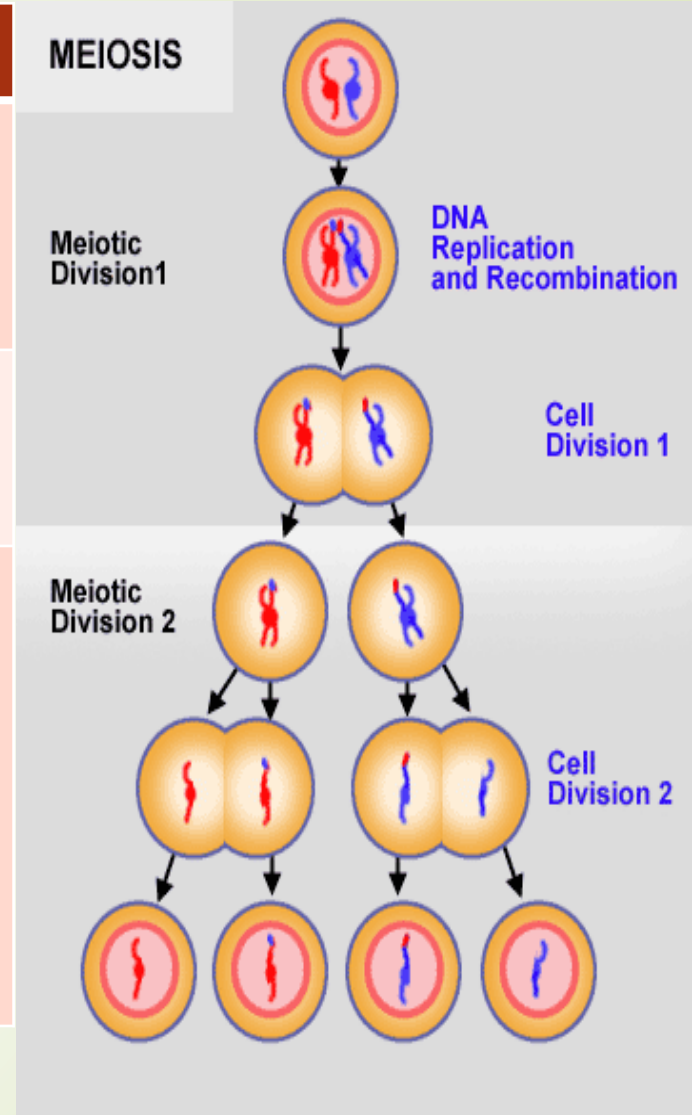
During another round of cell division, the sister chromatids finally separate;
four haploid daughter cells result, containing single chromosomes

IV. Comparing Mitosis and Meiosis

Video



Mitosis	Meiosis
Results in two genetically identical cells	Results in four genetically different cells
1 diploid cell → 2 diploid cells	1 diploid cell → 4 haploid cells
Asexual reproduction for growth or replacement of cells (produce somatic cells)	Sexual reproduction (produce gametes)





And that is how meiosis works