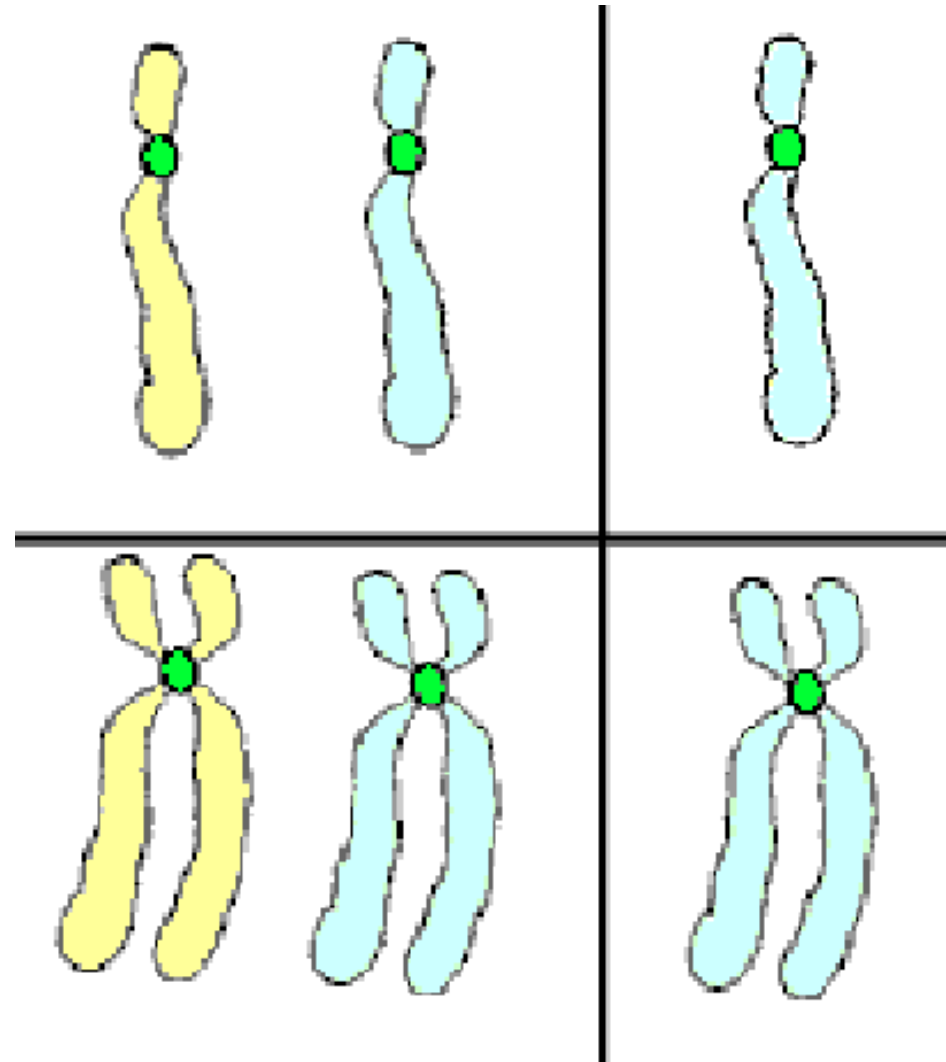




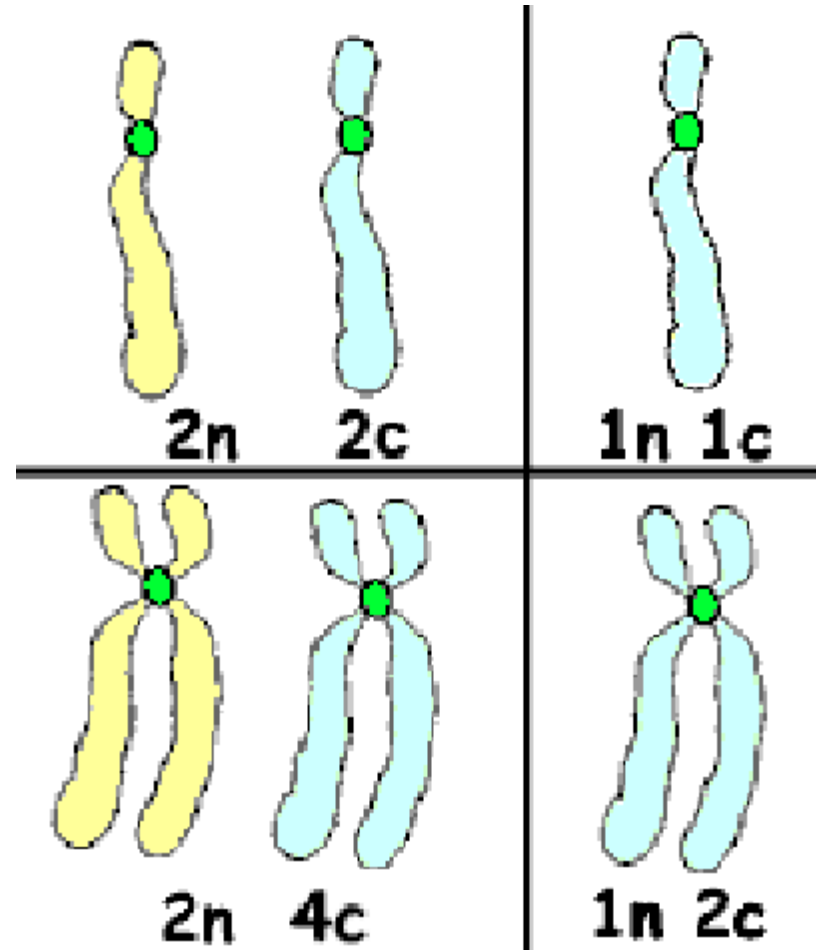
CHAPTER 3.3

Meiosis

REVISION: CHROMOSOMES VS CHROMATIDS



REVISION CHROMOSOMES VS CHROMATIDS



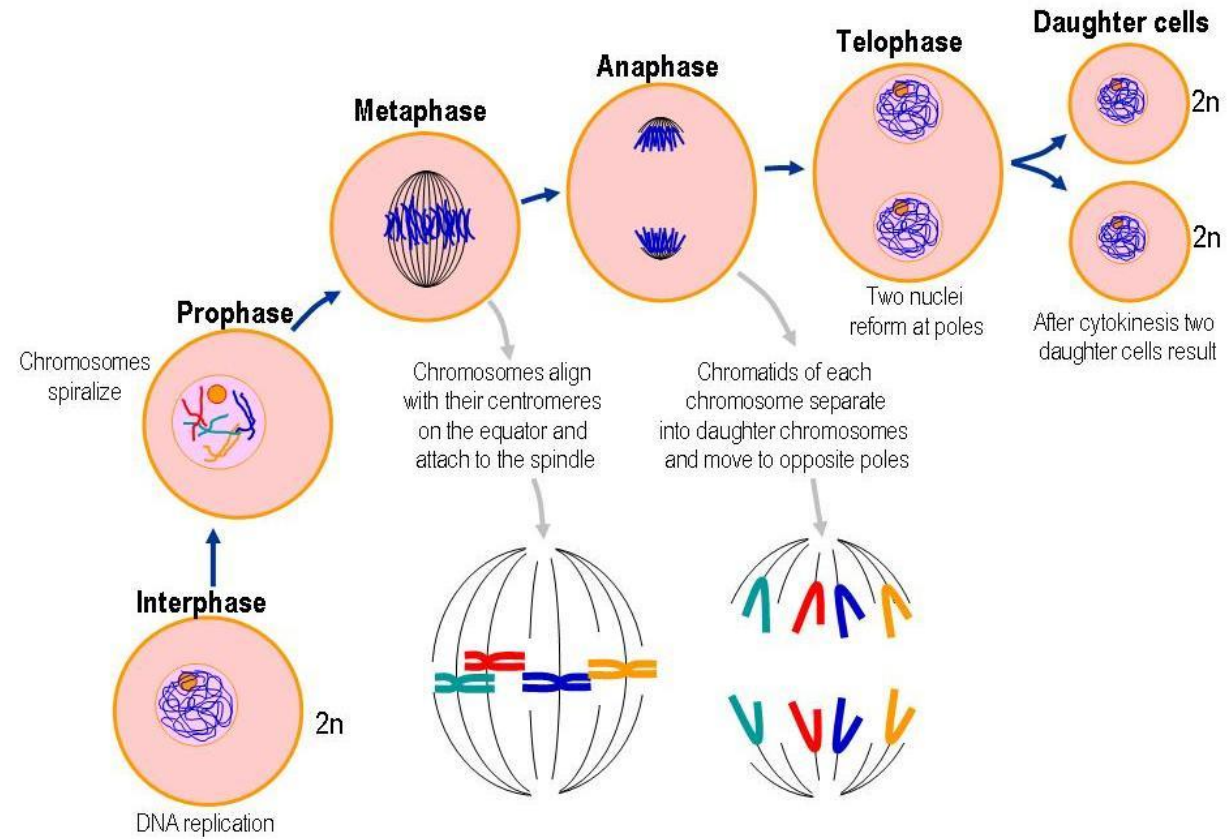


REVISION MITOSIS

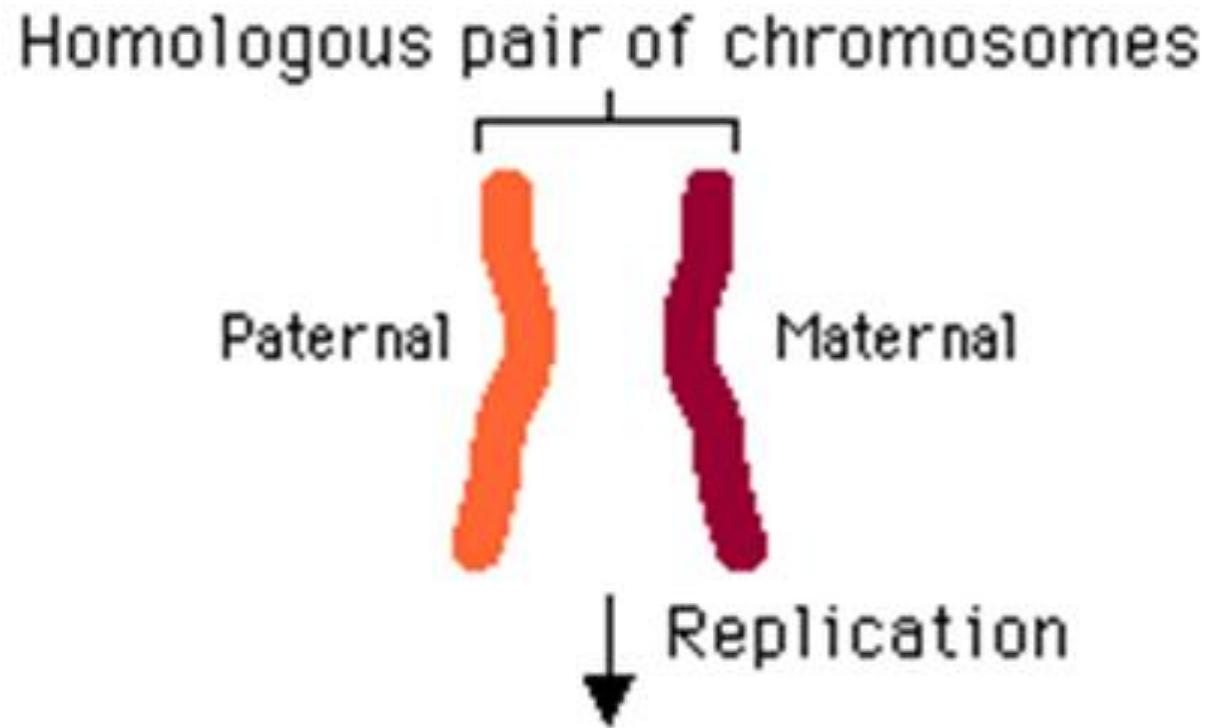
DNA – Replication

Mitosis – 4 stages + processes

MITOSIS



REPLICATION DURING MEIOSIS



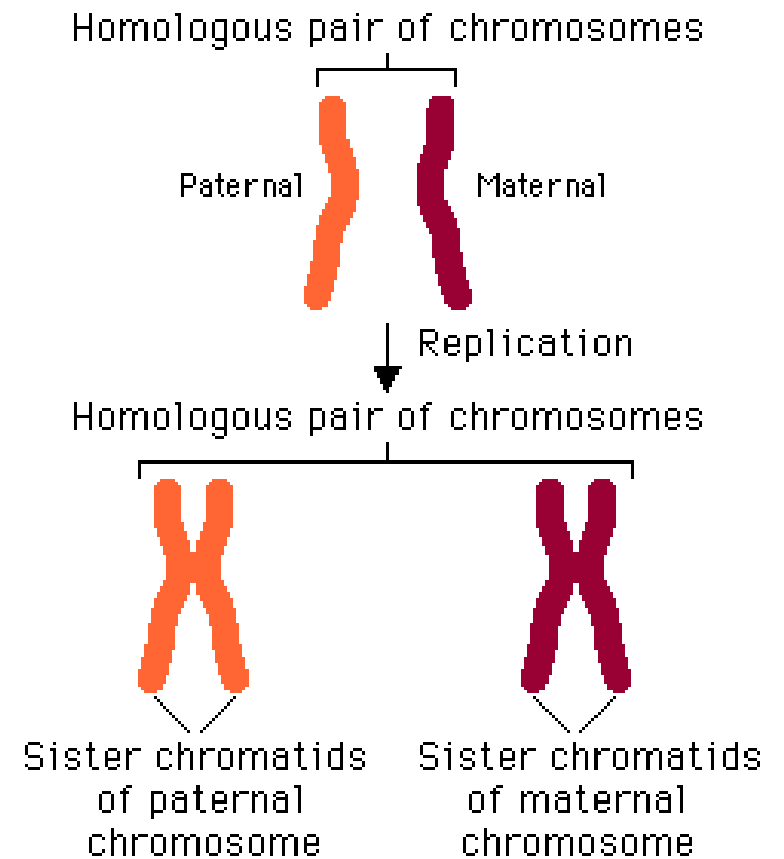
REPLICATION DURING MEIOSIS

During **S-phase** (before meiosis) → **DNA-replication**

Chromosomes are replicated and copies attached to each other at **centromere**.

Attached chromosome + copy = **sister chromatids**.

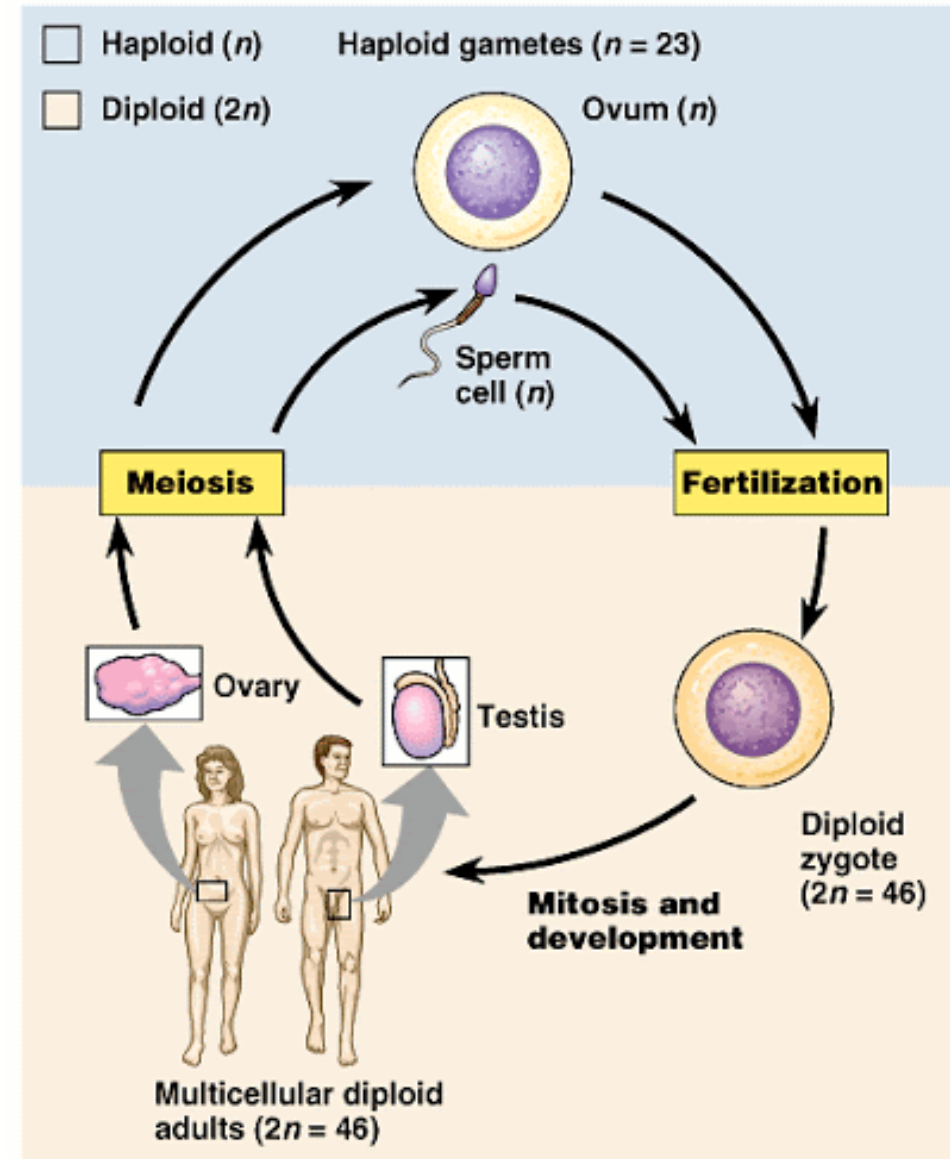
After S-phase → growth and preparation for meiosis



SEXUAL LIFE CYCLE

Diploid vs haploid

Maintain static chromosome number → sex cells half the chromosome number

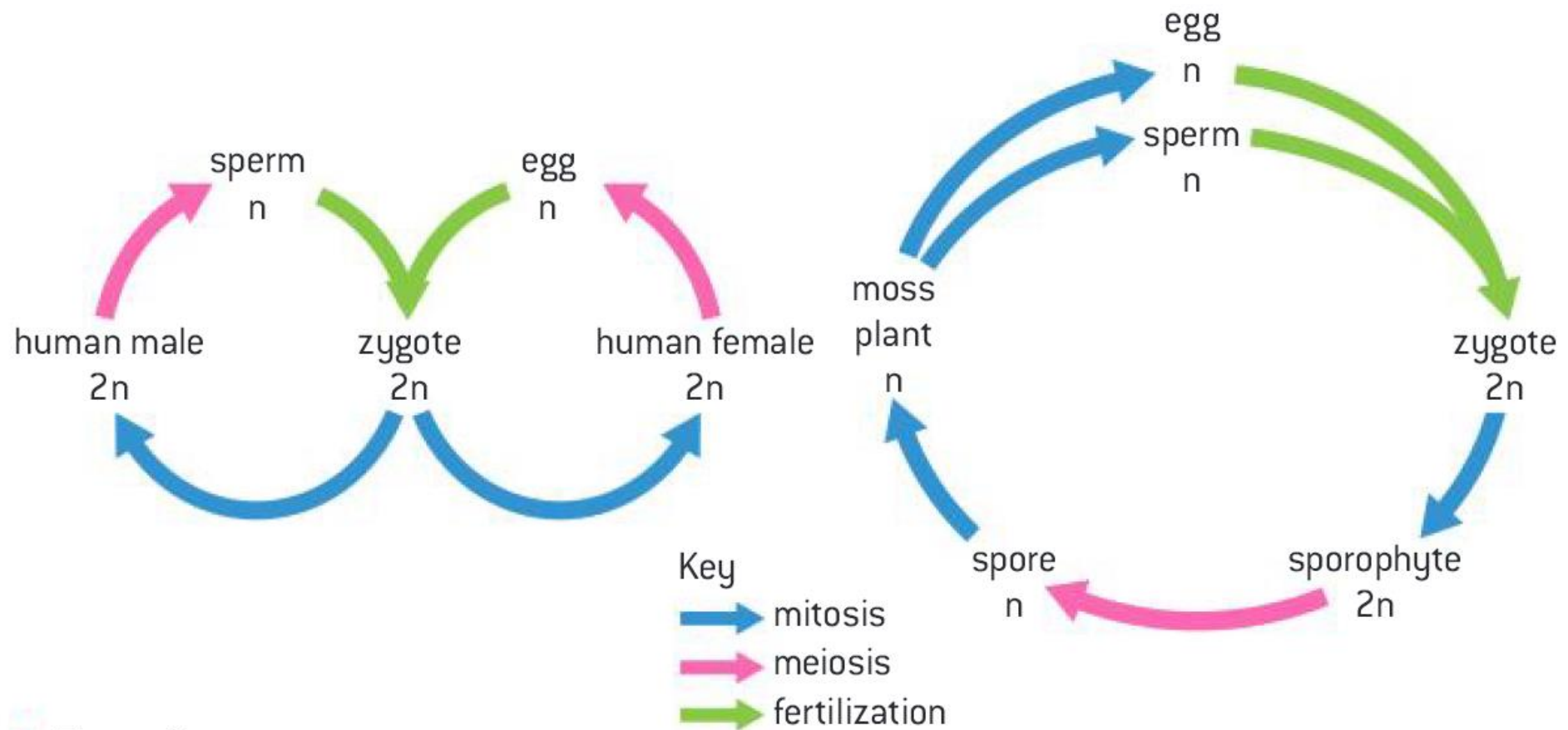




LIFE CYCLES

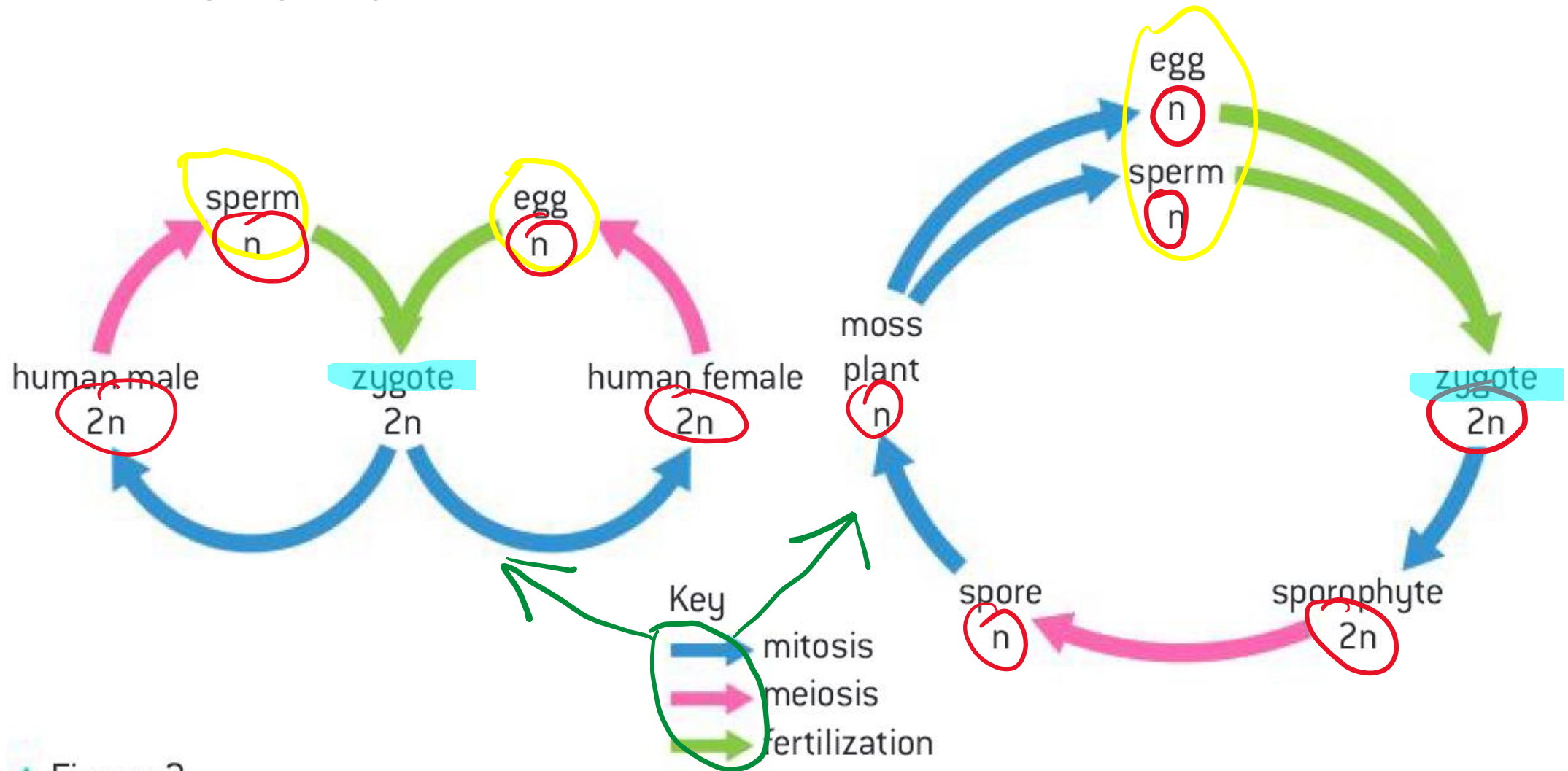
IB-companion page 161

LIFE CYCLES



▲ Figure 3

LIFE CYCLES



▲ Figure 3

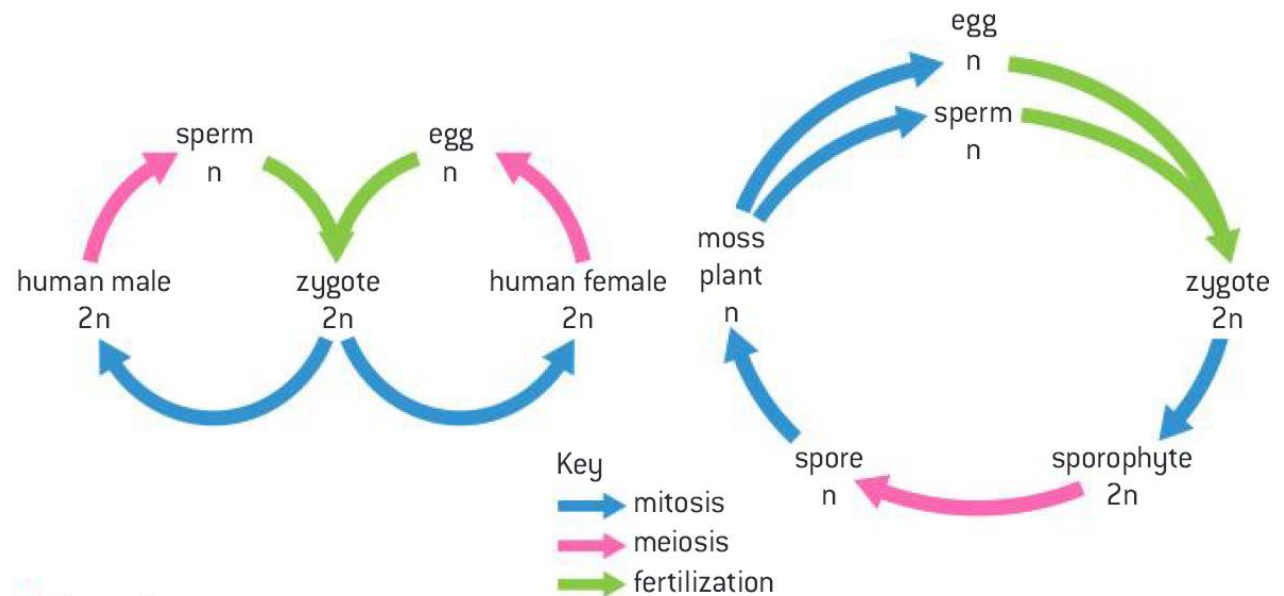
LIFE CYCLES

Zygote → male & female

Zygote → sporophyte and gametophyte

Meiosis → eggs + sperms

Mitosis → eggs + sperms

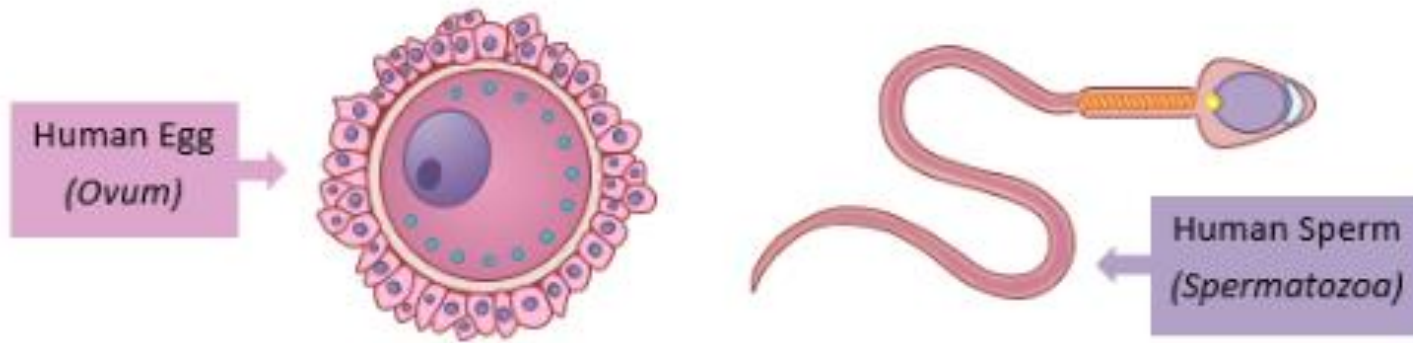


▲ Figure 3

GAMETES

Gametes = haploid sex cells

Created via **meiosis** and differentiated via **gametogenesis**



Human Egg
(Ovum)

Human Sperm
(Spermatozoa)

MEIOSIS

Two divisions:

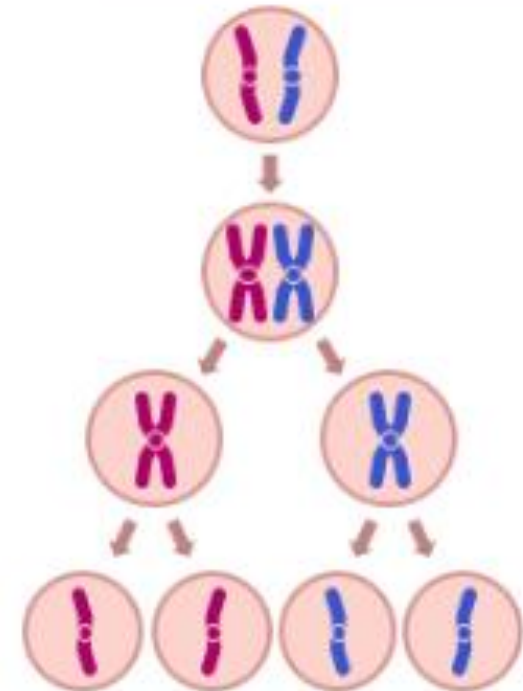
First division separates *homologous chromosomes*

- It is a reduction division (diploid → haploid)

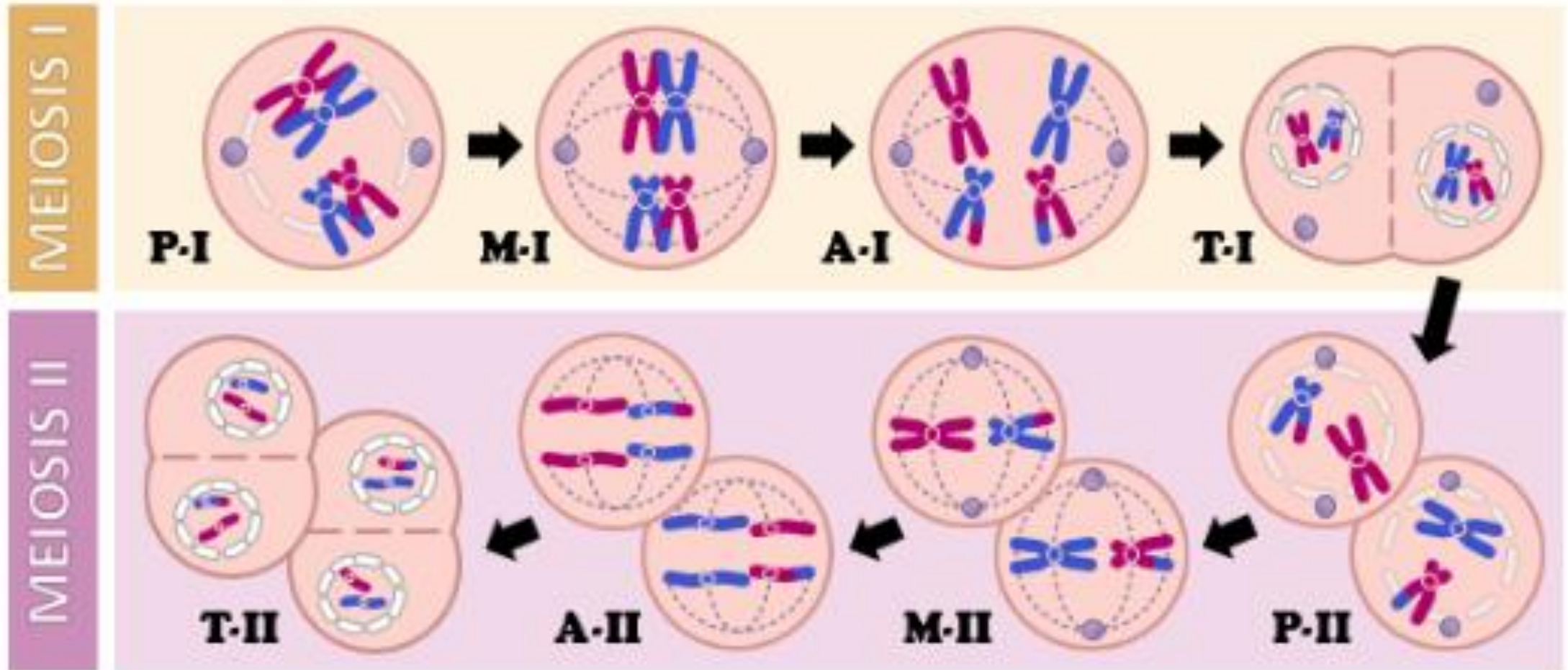
Second division separates the *sister chromatids*

- It is a mitotic division of a haploid cell.

End result = 4 genetically distinct haploid cells



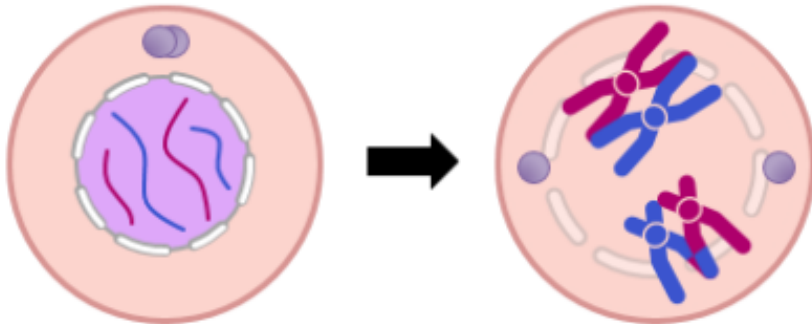
STAGES OF MEIOSIS



STAGES OF MEIOSIS: FIRST DIVISION

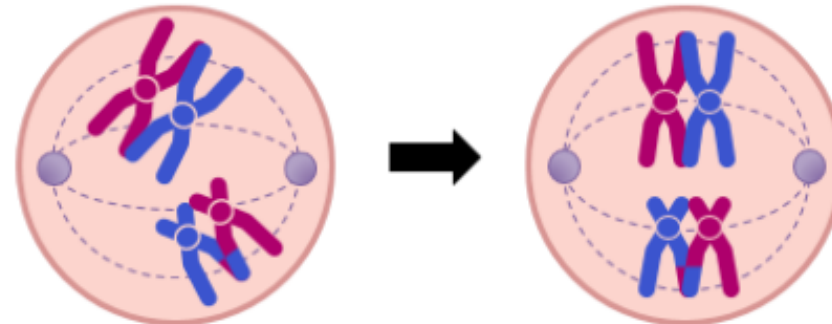
Prophase I

- Homologous pairs form bivalents (crossing over occurs at chiasma)
- Chromosomes condense
- Nuclear membrane breaks down



Metaphase I

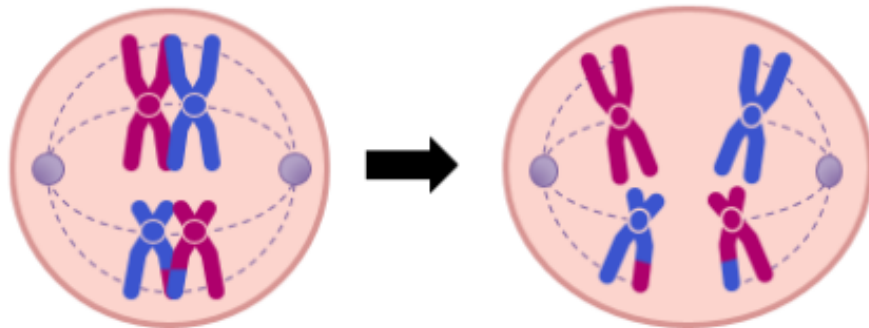
- Microtubule spindle fibers connect from centrosomes to centromeres
- Spindle fibers contract, causing the bivalents to align at the centre



STAGES OF MEIOSIS: FIRST DIVISION

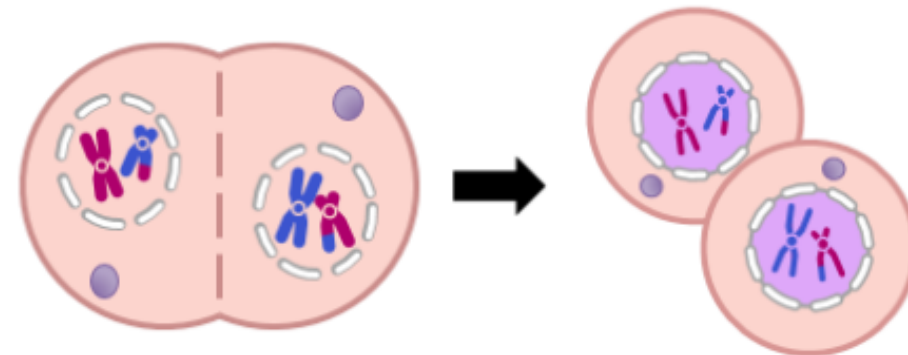
Anaphase I

- Spindle fiber contraction cause the bivalents to separate
- Homologous chromosomes move to opposite poles of cell



Telophase I

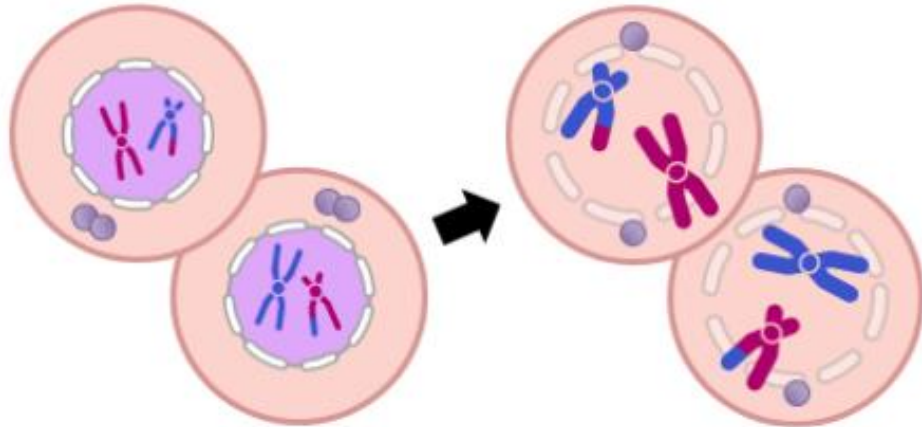
- The chromosomes de-condense
- Nuclear membranes *may* reform
- Cytokinesis occurs concurrently
- Daughter cells are haploid



STAGES OF MEIOSIS: SECOND DIVISION

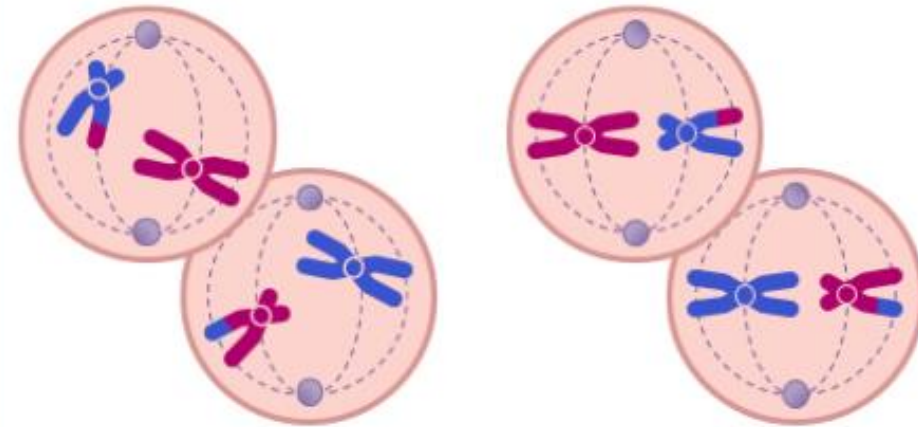
Prophase II

- Chromosomes re-condense
- Nuclear membrane breaks down
- Centrosomes move to poles



Metaphase II

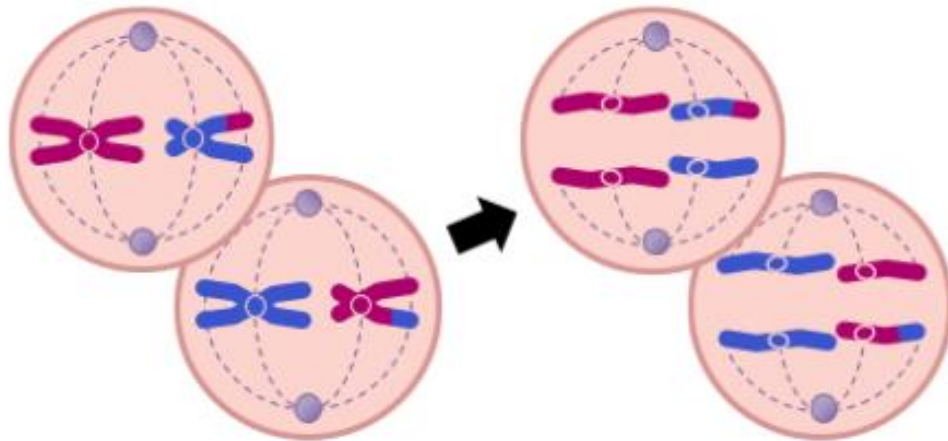
- Microtubule spindle fibers connect to centromeres and contract
- Chromosomes align at the centre



STAGES OF MEIOSIS: SECOND DIVISION

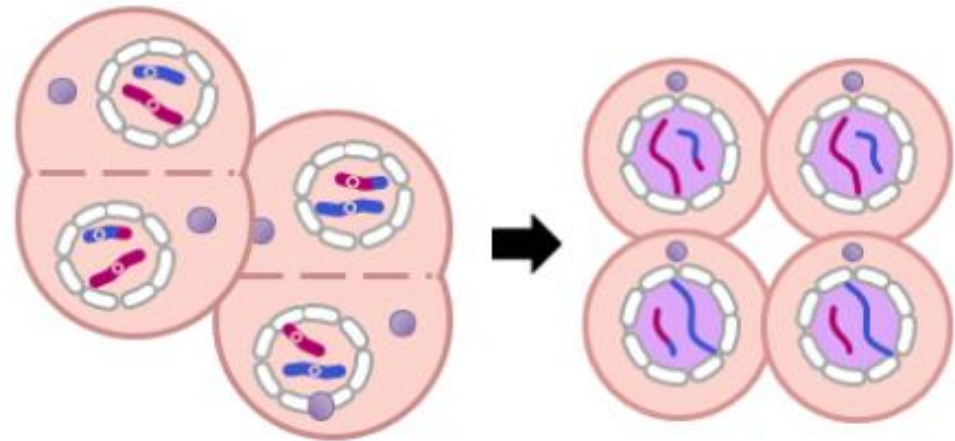
Anaphase II

- Spindle fiber contraction cause the sister chromatids to separate and move to opposite poles of cell

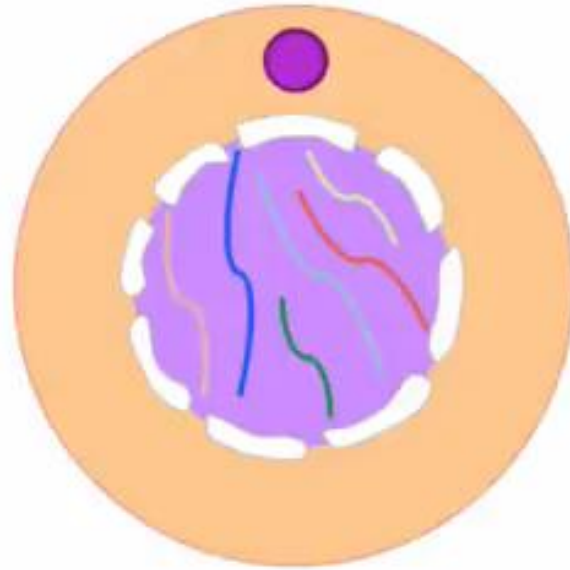


Telophase II

- The chromosomes de-condense
- Nuclear membranes reform
- Cytokinesis occurs concurrently



STAGES OF MEIOSIS



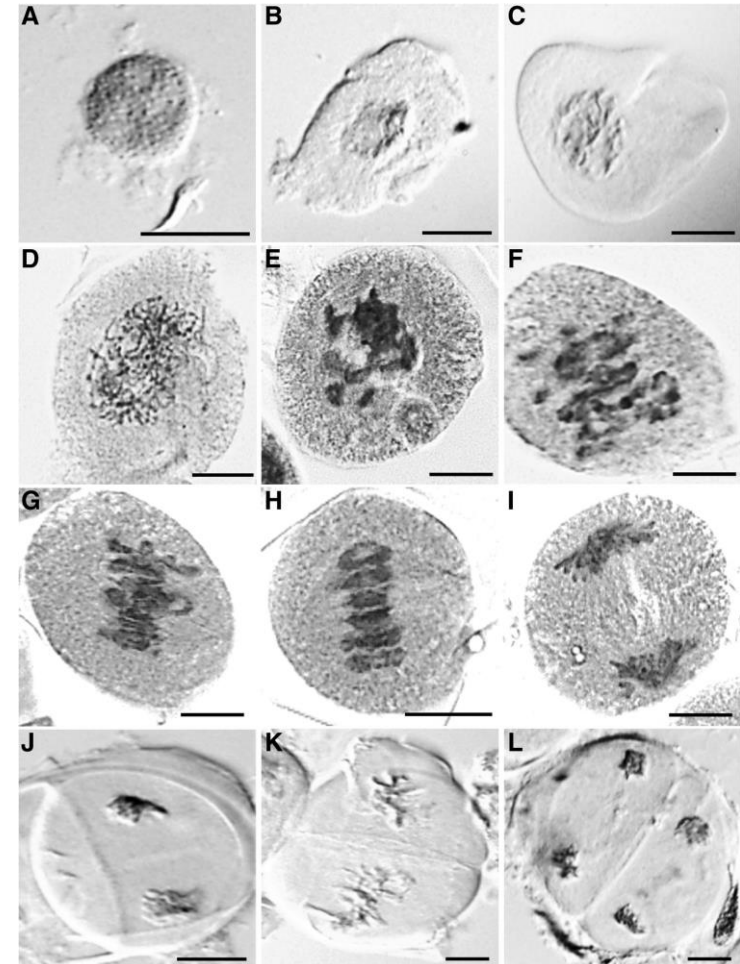
SUMMARY: MEIOTIC DIVISION

Meiotic division:

- In sex cells (gametes)
- Two divisions
- Produces 4 daughter cells
- Daughter cells are genetically distinct

Definition:

Meiosis is the division of a diploid cell to produce 4 genetically distinct haploid cells.



MEIOSIS VERSUS MITOSIS

	Meiosis	Mitosis
D ivisions	Two	One
I nheritance	Alleles segregated	No segregation
S ynapsis	Yes	No
C rossing Over	Yes	No
O utcomes	Four cells	Two cells
P loidy	Diploid → Diploid	Diploid → Haploid
U se	Make sex cells	Make body cells
G enetics	Identical cells	Genetic variation



Hint: Disco Pug

PURPOSE OF MEIOSIS

Primary purpose: make haploid cells for sexual reproduction

- Cells are genetically distinct → promotes variation in offspring

There are three mechanisms → genetic variation

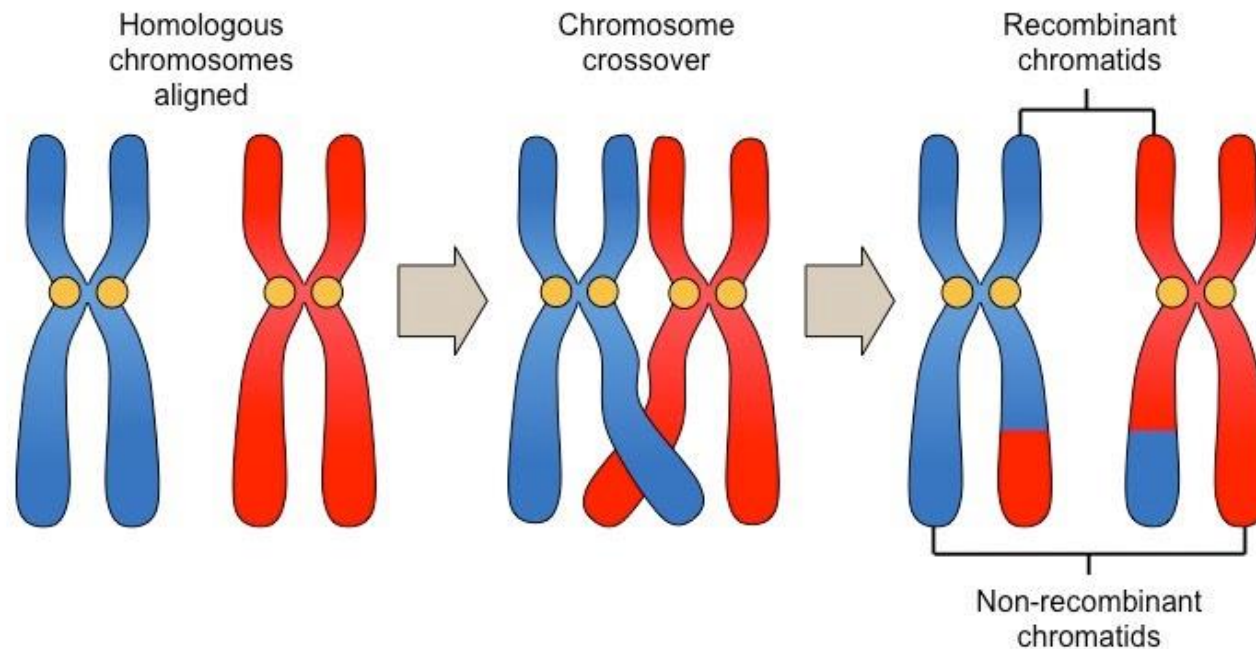
- Crossing over between non-sister chromatids (*prophase I*)
- Random assortment of homologous chromosomes (*metaphase I*)
- Fusion of gametes from different parents

Genetic variation improves survival prospects of a species (biodiversity)

SOURCES OF VARIATION: CROSSING OVER

Homologous chromosomes connect via chiasmata to form bivalents

Genetic exchange at chiasmata results in recombinant chromosomes



Marvel: "Infinity War is the most ambitious crossover event in history."

Mr. Prantner:

