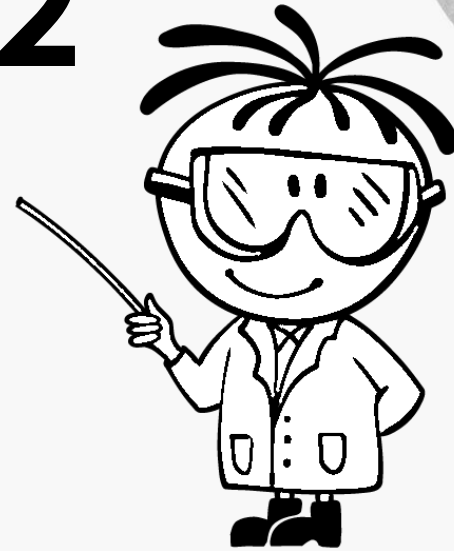


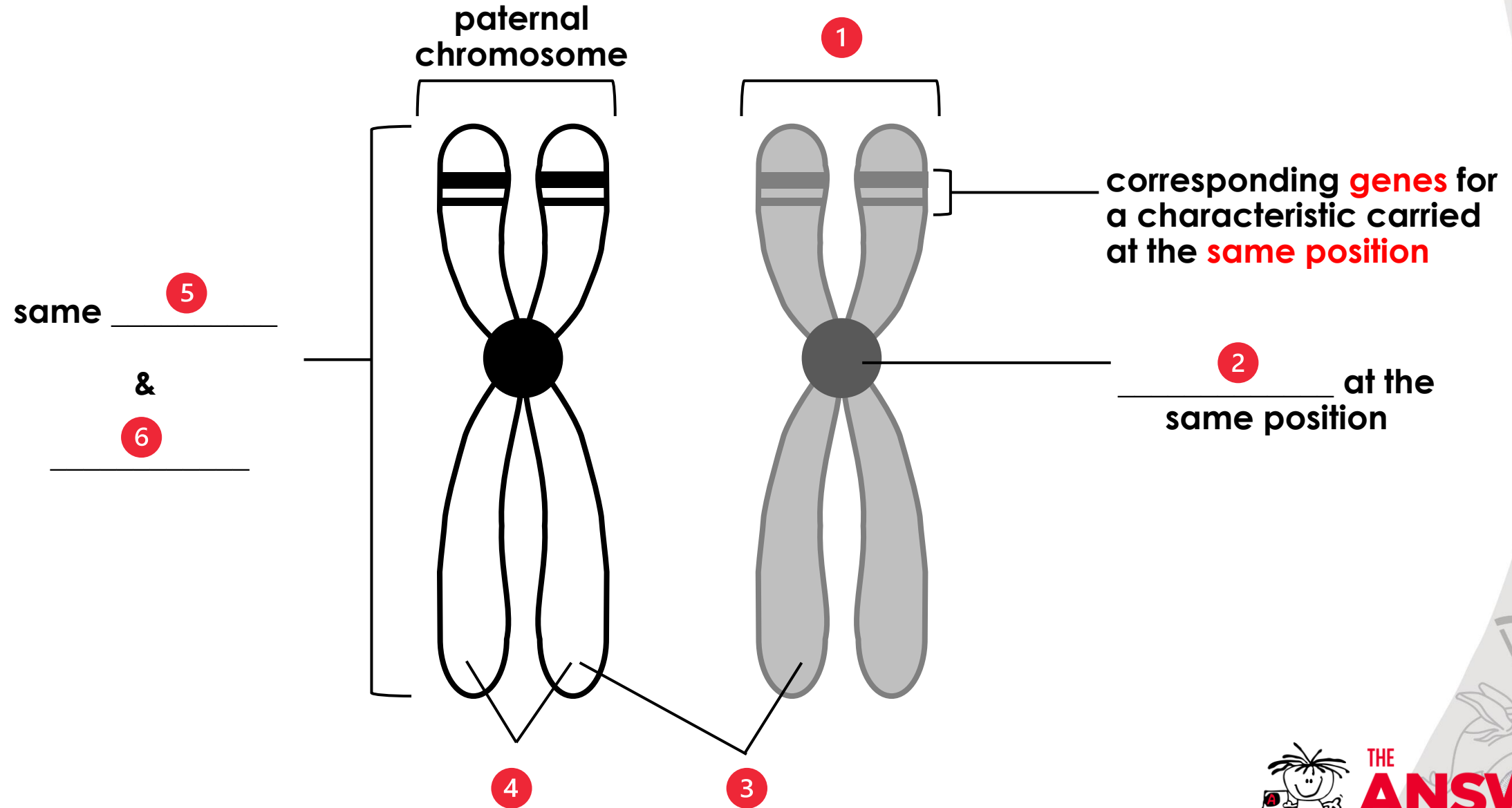
GRADE 12 MEIOSIS

REVISION

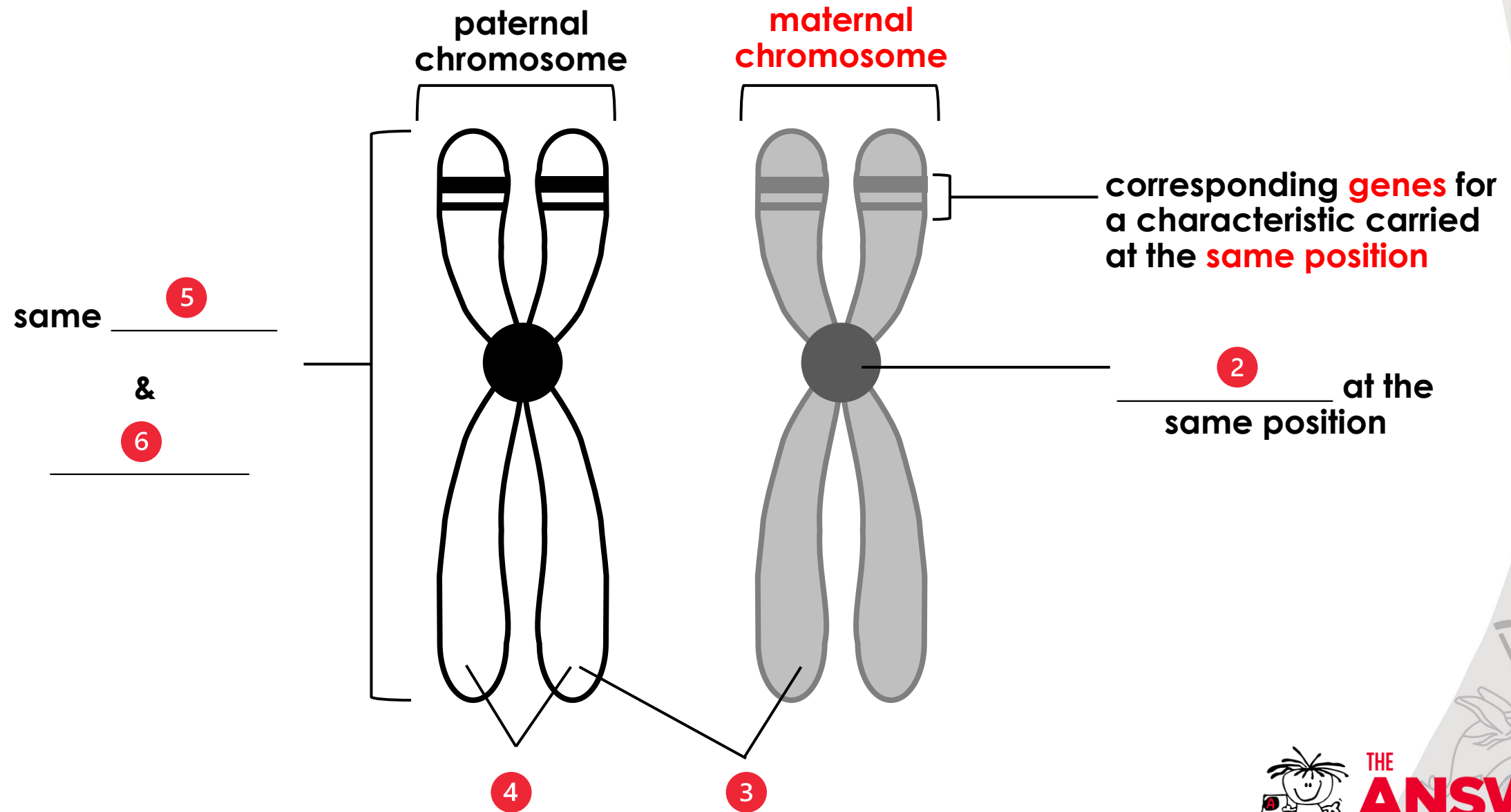


CHROMOSOMES

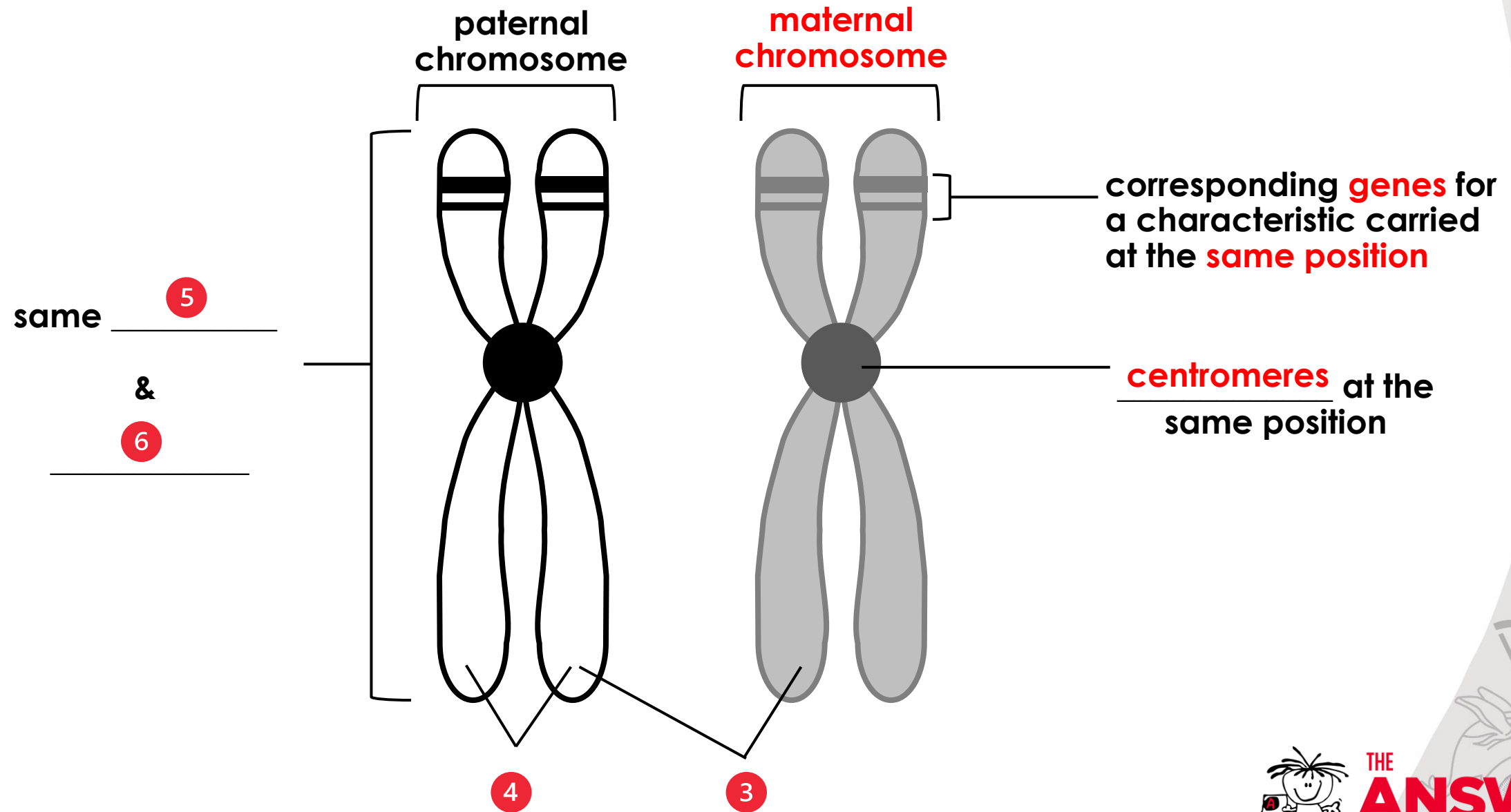
Provide labels for the homologous chromosomes.



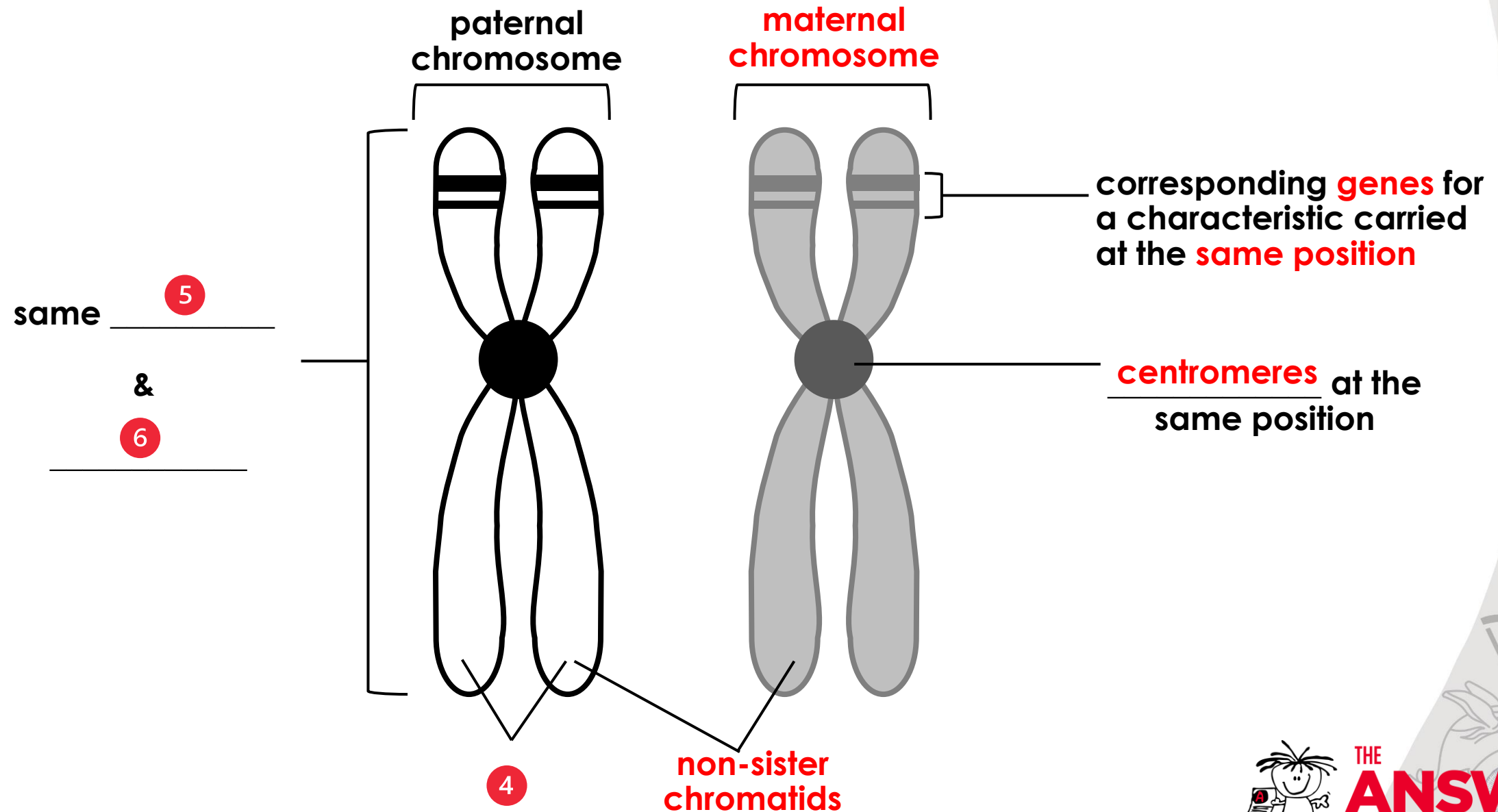
Provide labels for the homologous chromosomes.



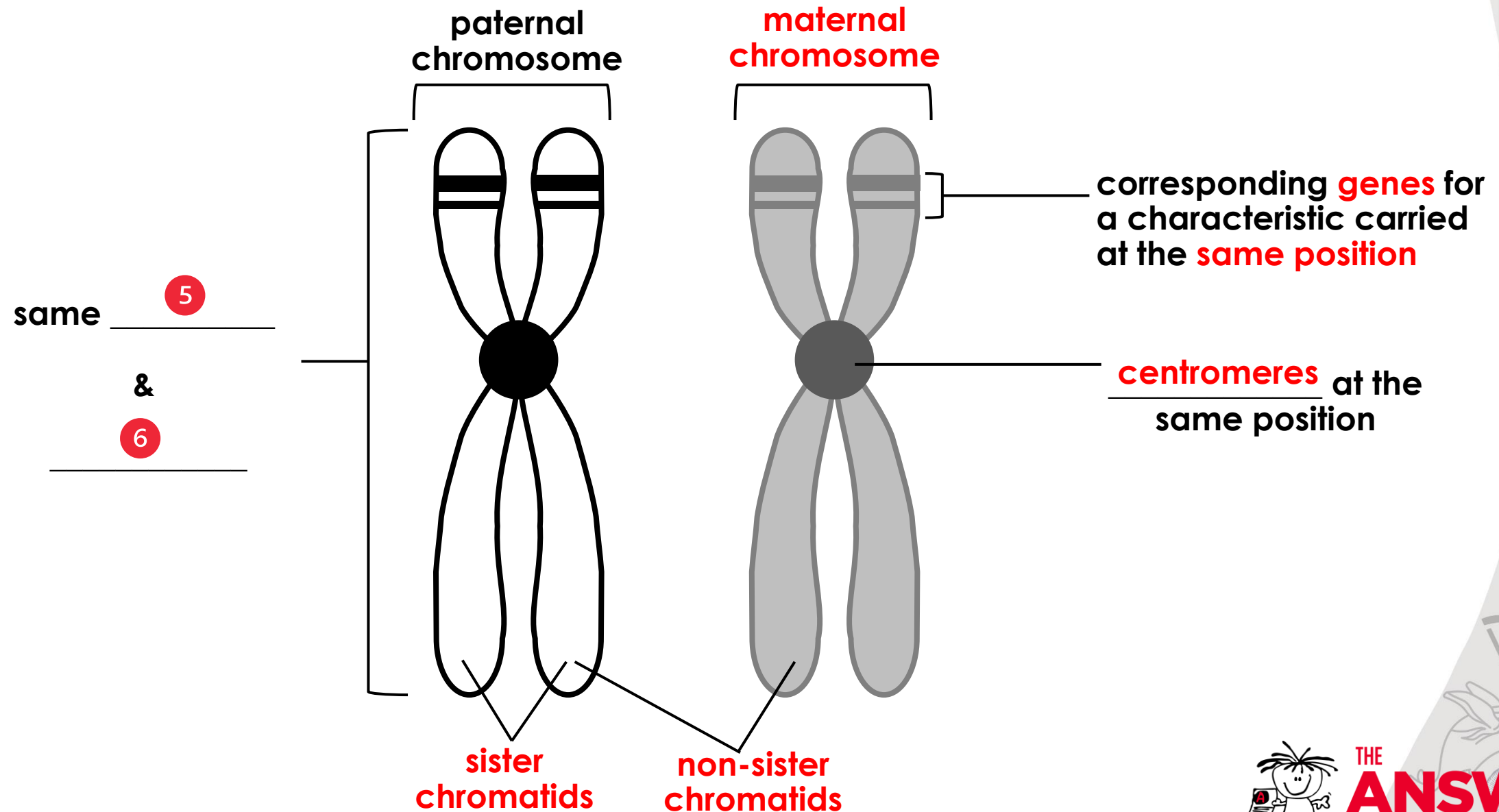
Provide labels for the homologous chromosomes.



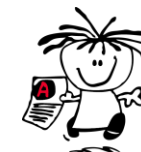
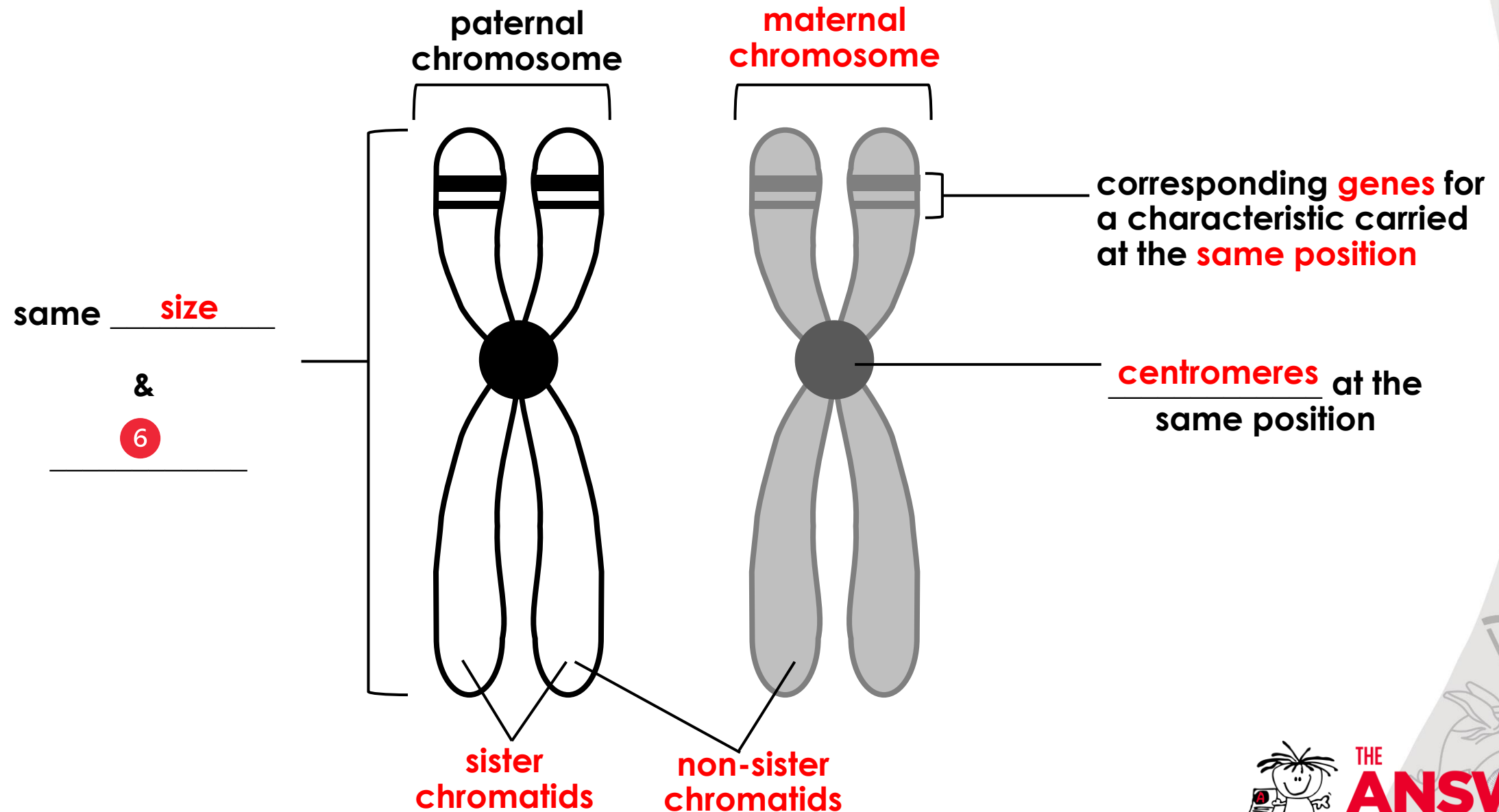
Provide labels for the homologous chromosomes.



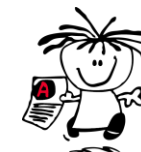
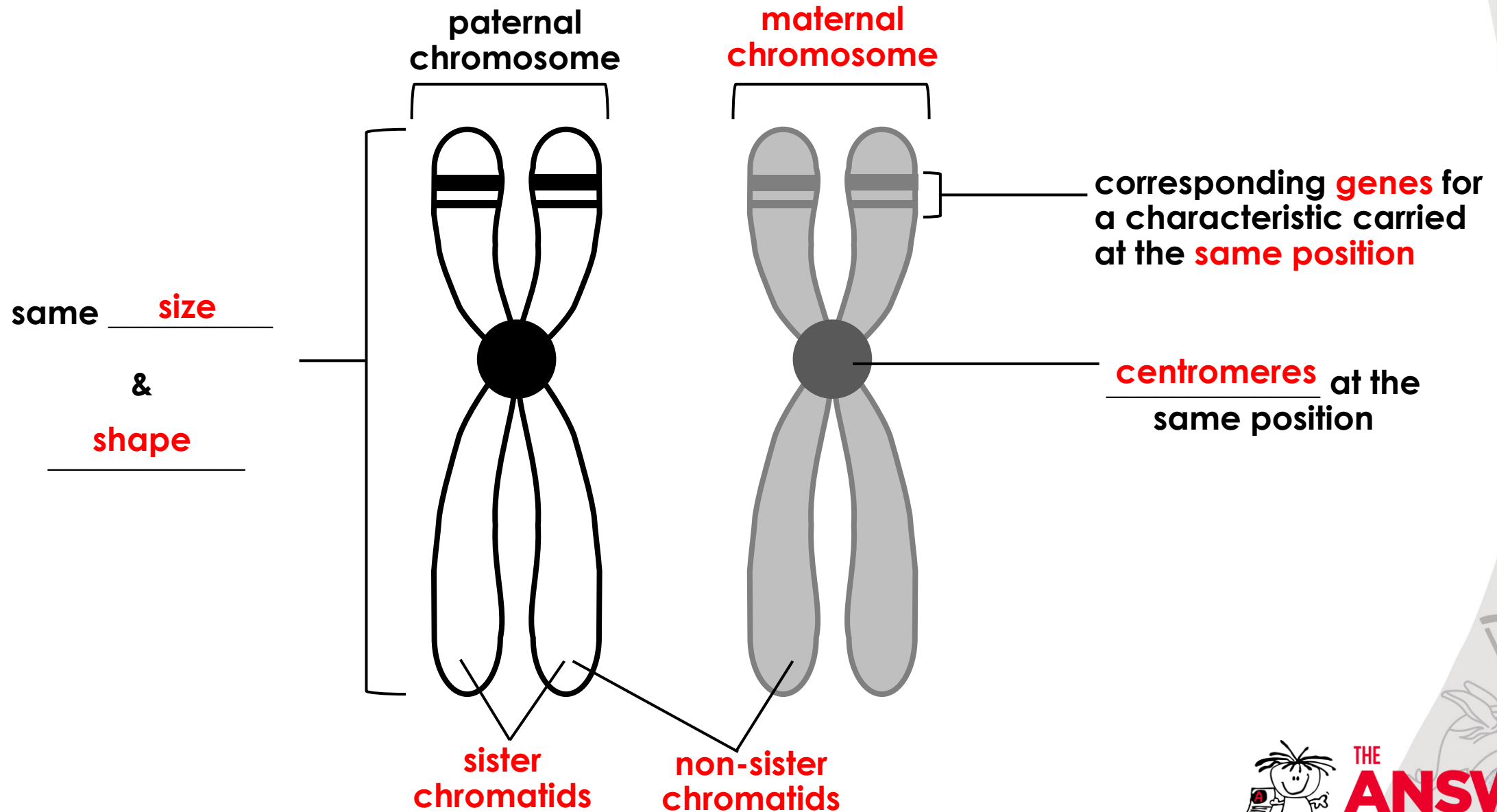
Provide labels for the homologous chromosomes.



Provide labels for the homologous chromosomes.

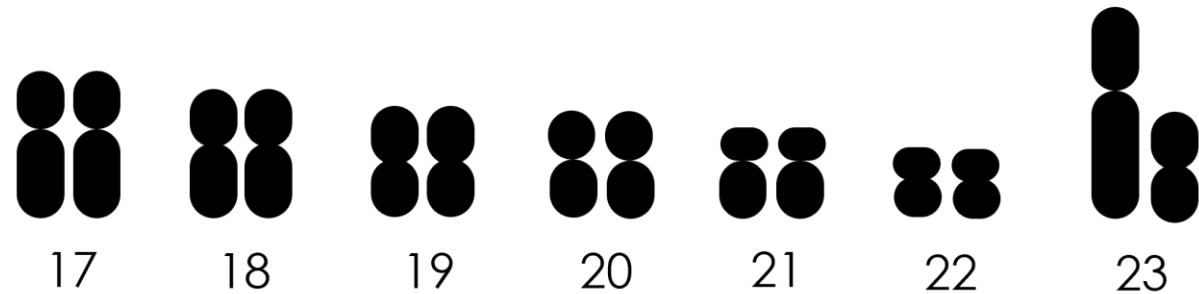
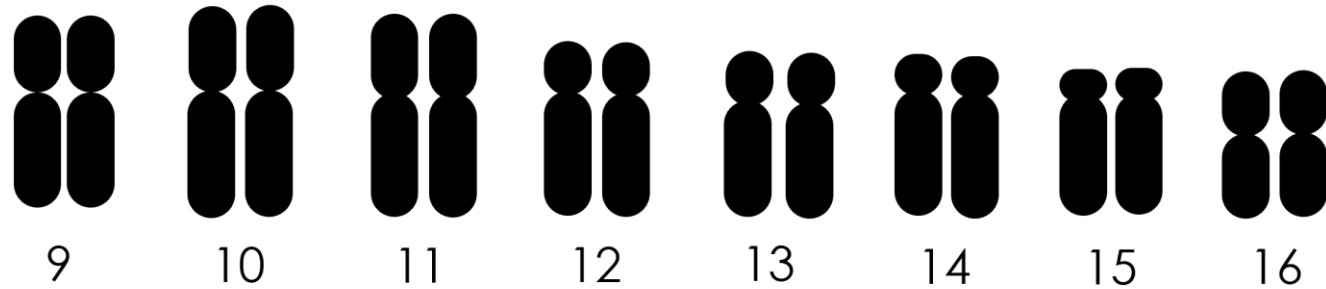
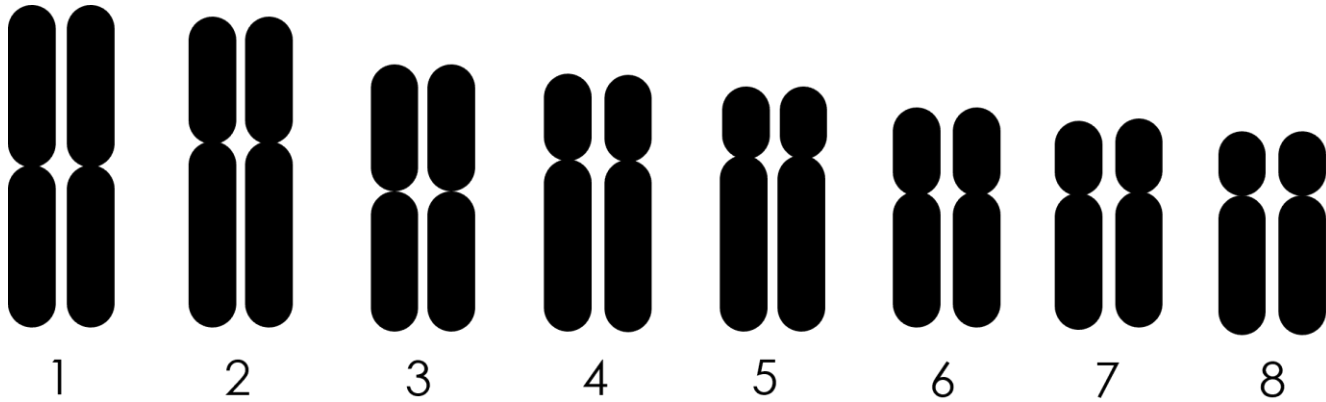


Provide labels to the homologous chromosomes.



KARYOTYPES

1



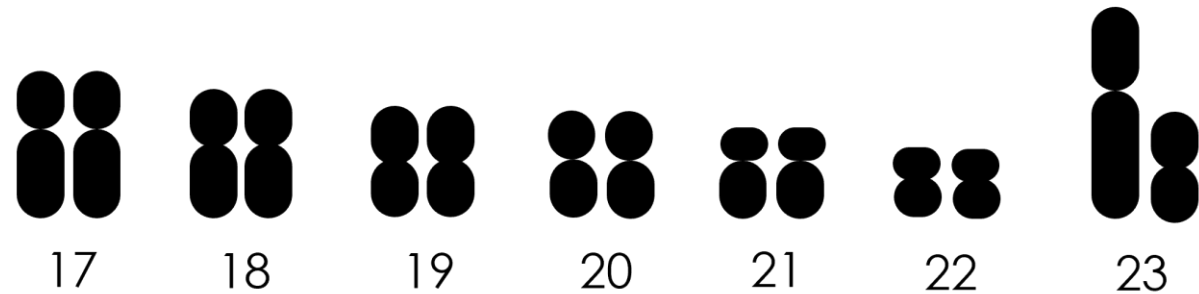
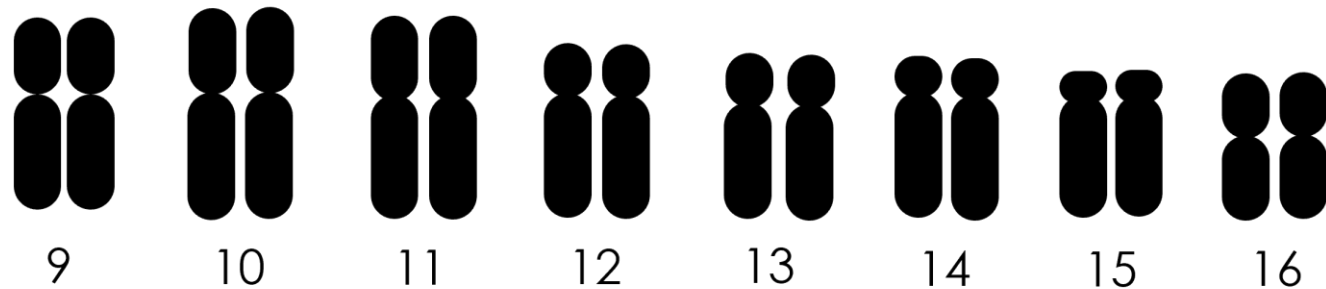
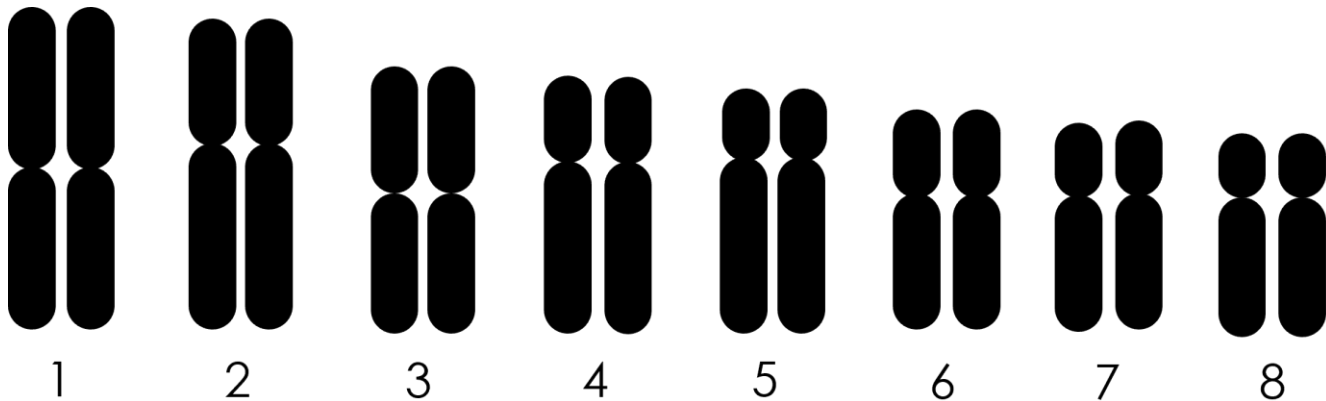
During what phase of cell division is a karyotype taken?

Are replicated or unreplicated chromosomes shown in this karyotype?

Give a NAME for chromosome pairs 1 to 22.

Give a NAME for chromosome pair 23.

1



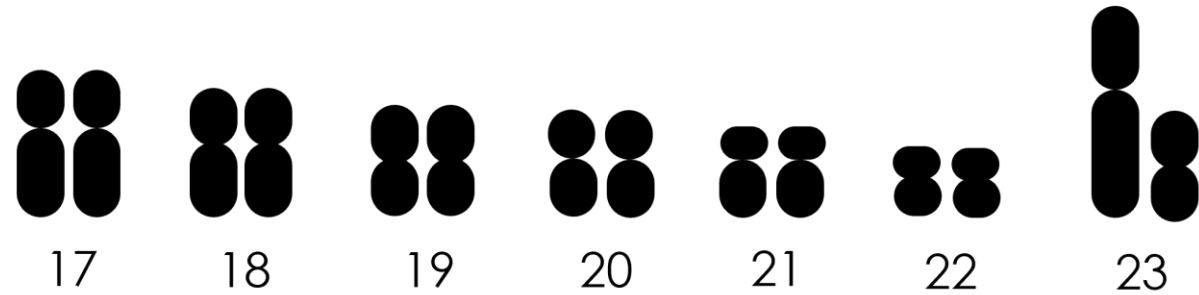
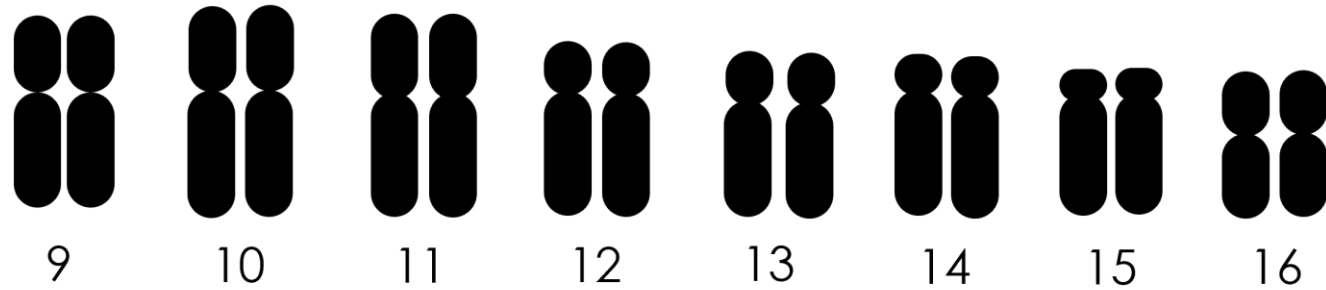
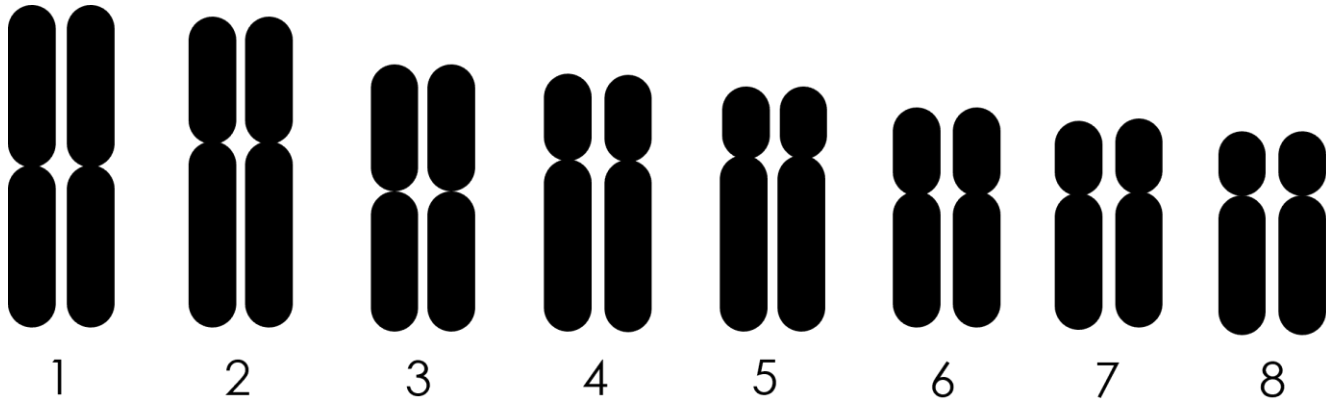
Metaphase

**Are replicated or
unreplicated
chromosomes shown
in this karyotype?**

**Give a NAME for
chromosome pairs
1 to 22.**

**Give a NAME for
chromosome pair 23.**

1



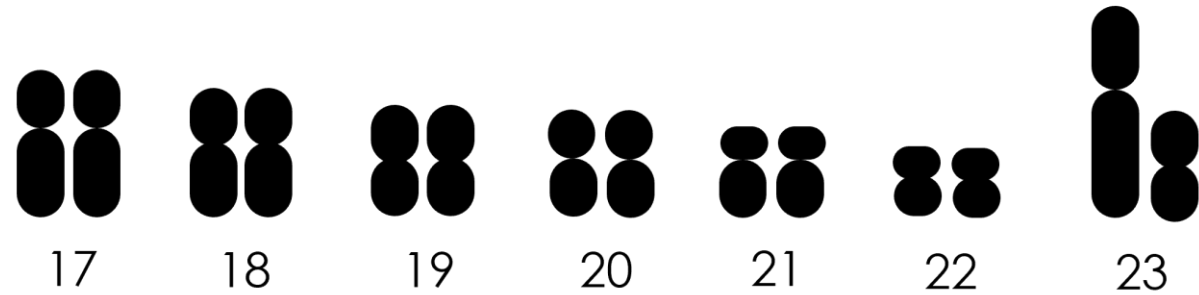
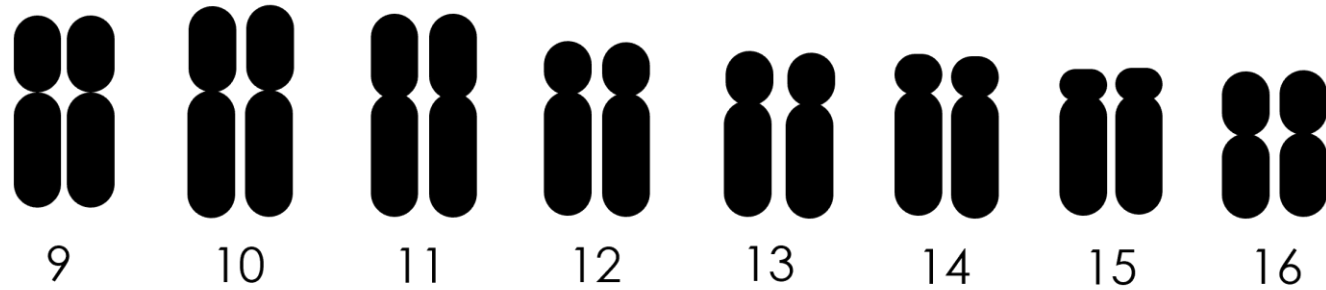
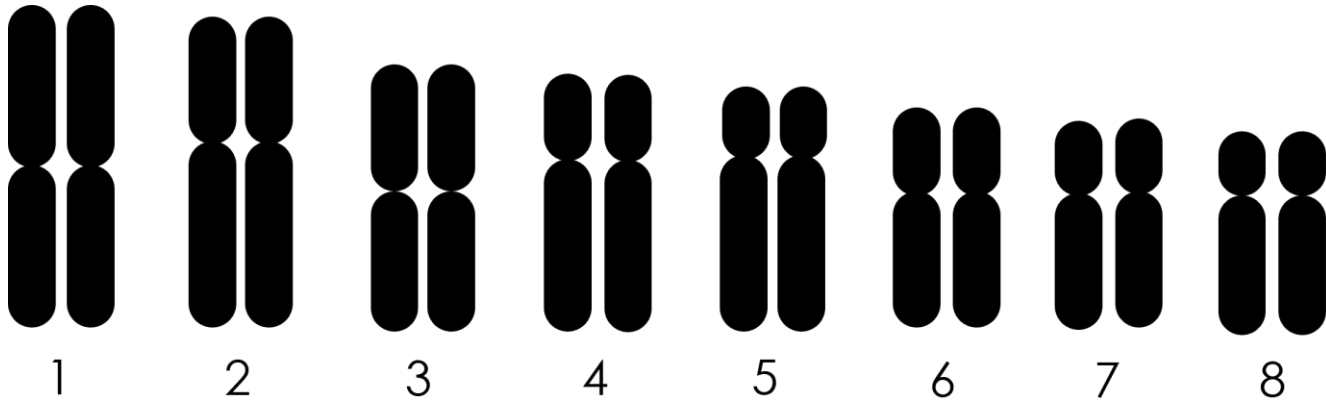
Metaphase

**unreplicated
chromosomes**

**Give a NAME for
chromosome pairs
1 to 22.**

**Give a NAME for
chromosome pair 23.**

1



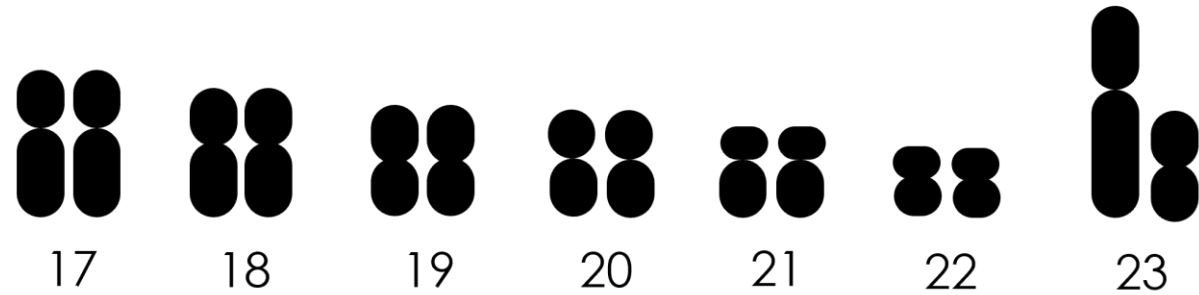
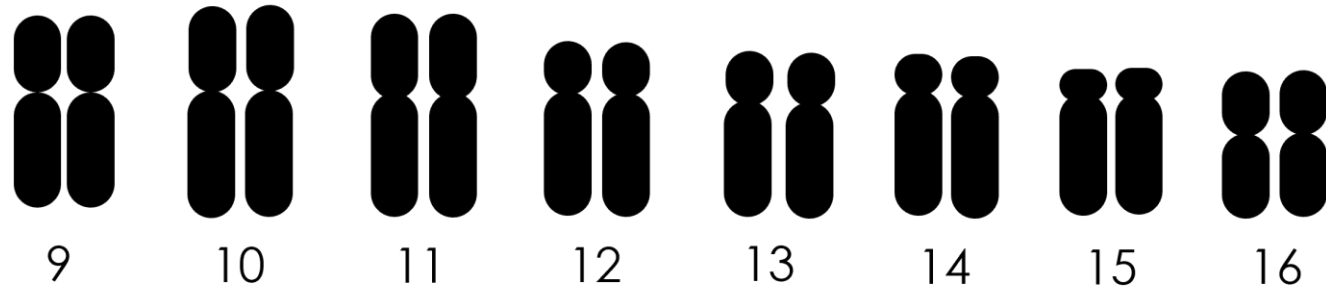
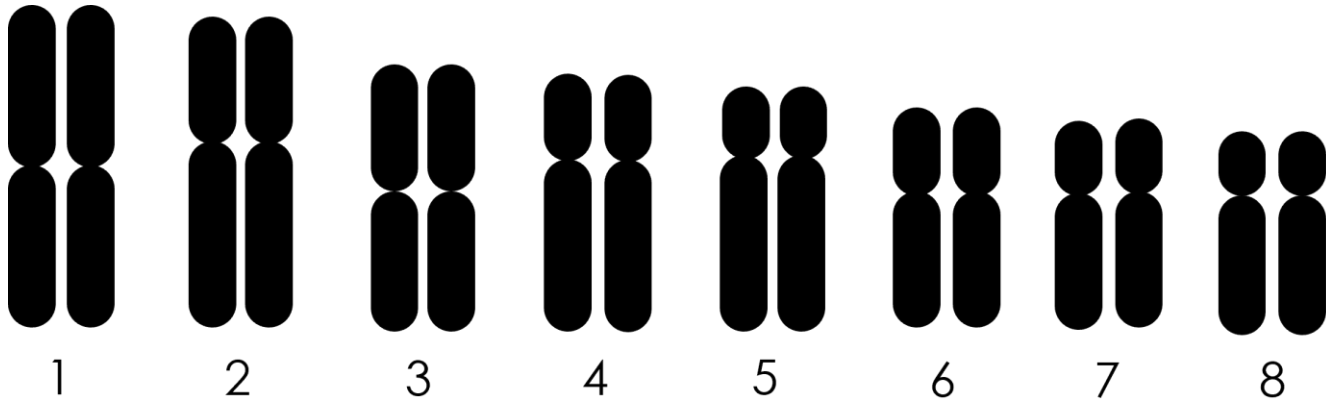
Metaphase

**unreplicated
chromosomes**

autosomes

**Give a NAME for
chromosome pair 23.**

1



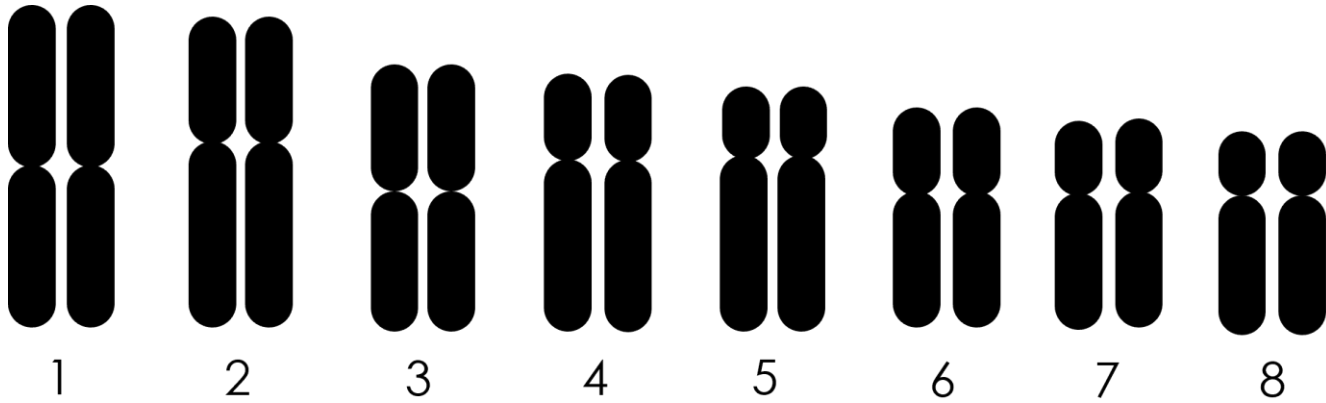
Metaphase

**unreplicated
chromosomes**

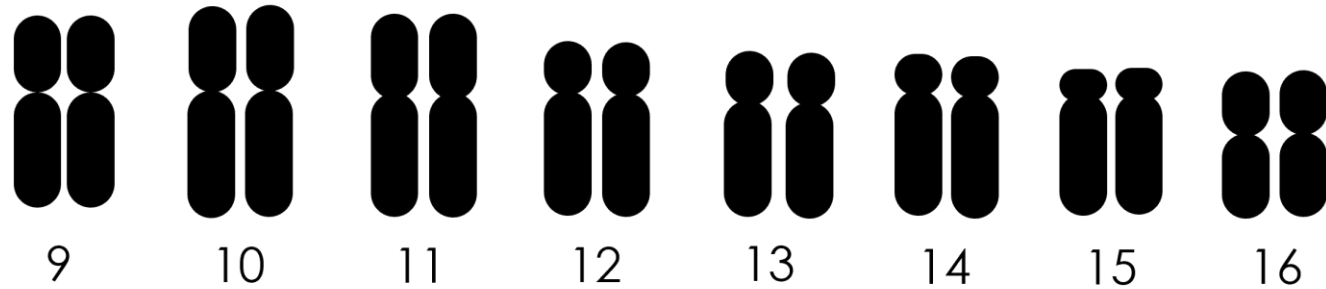
autosomes

gonosomes

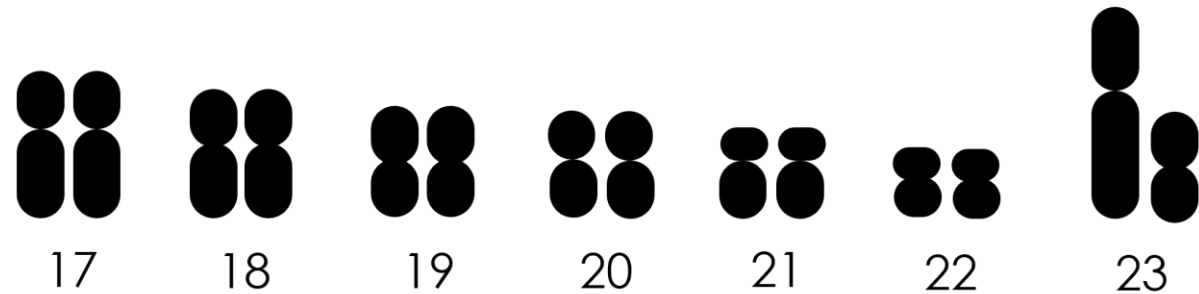
1



Give the NUMBER(S) of the chromosome(s) that are homologous.

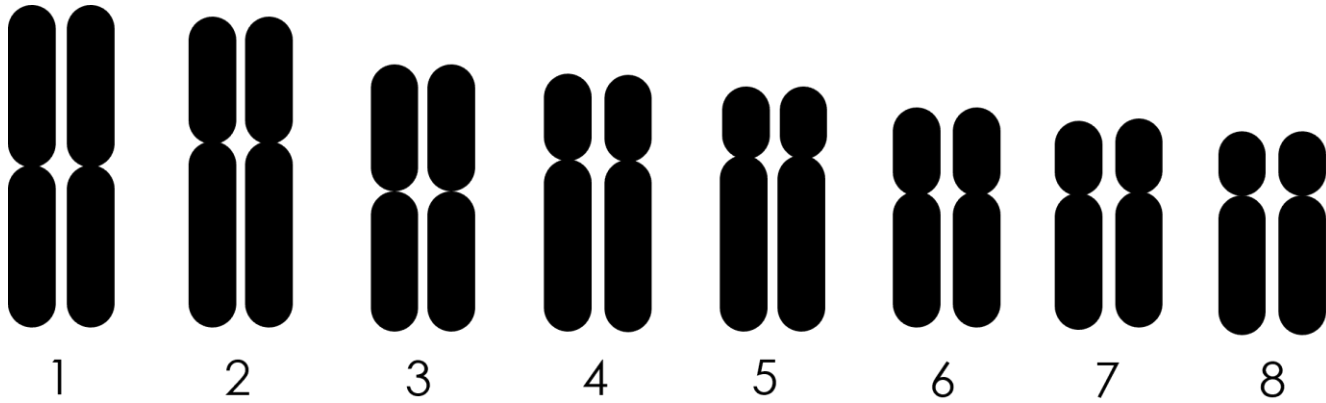


Give the NUMBER(S) of the chromosome(s) that are non-homologous.

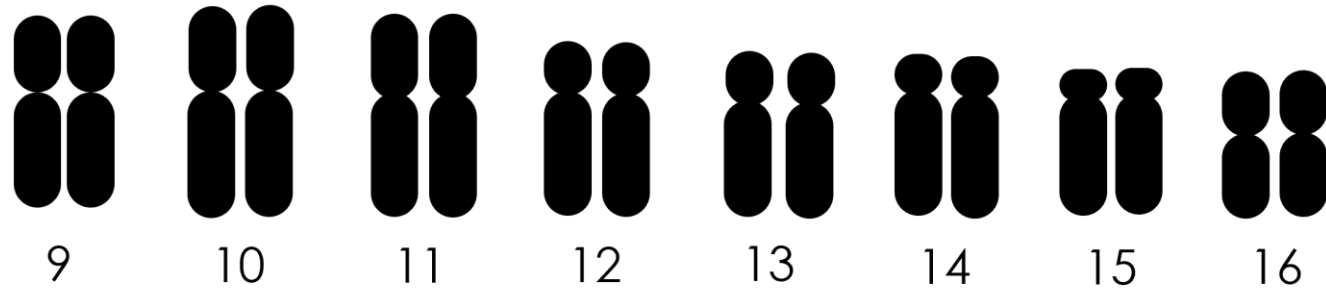


Is this a male or female karyotype?

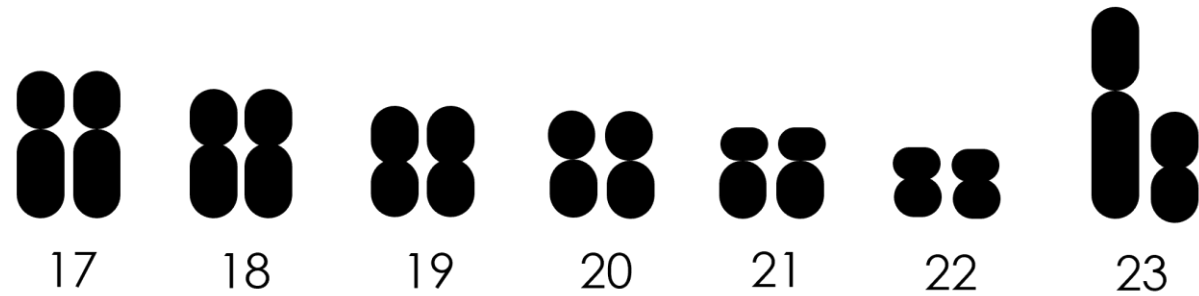
1



1 - 22

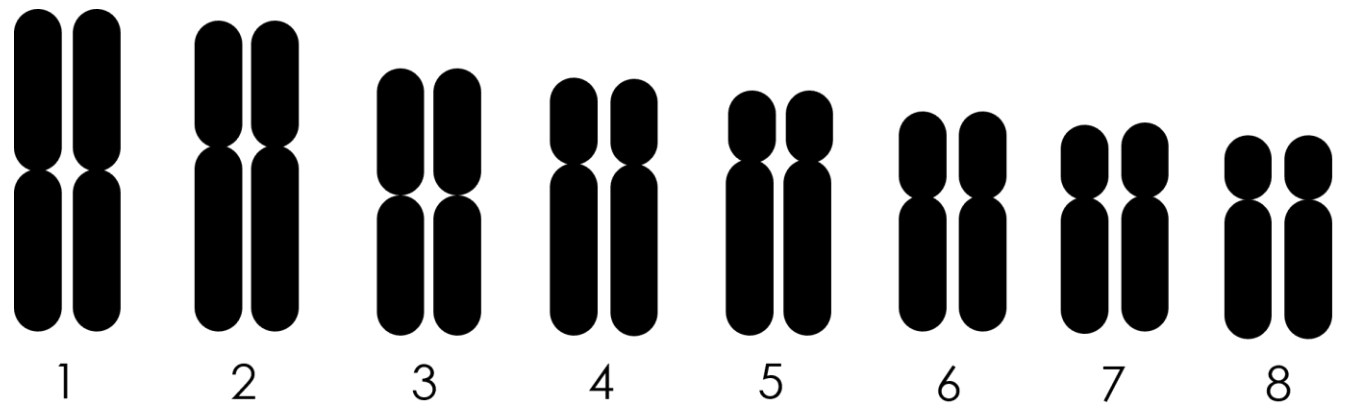


Give the NUMBER(S) of the chromosome(s) that are non-homologous.

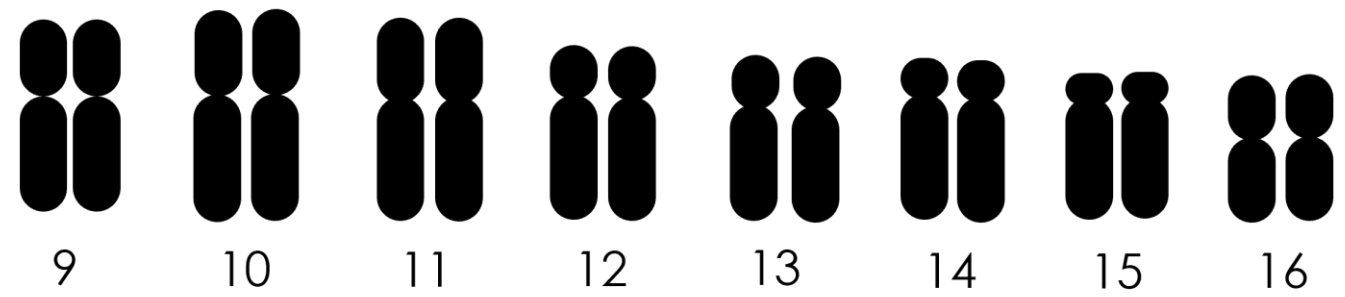


Is this a male or female karyotype?

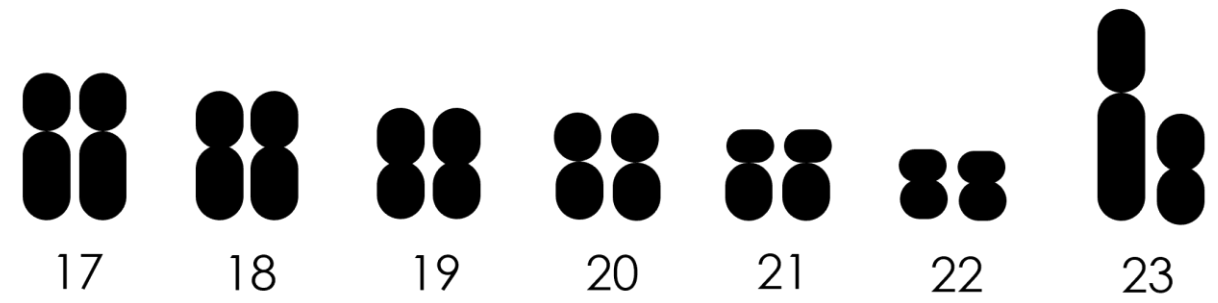
1



1 - 22

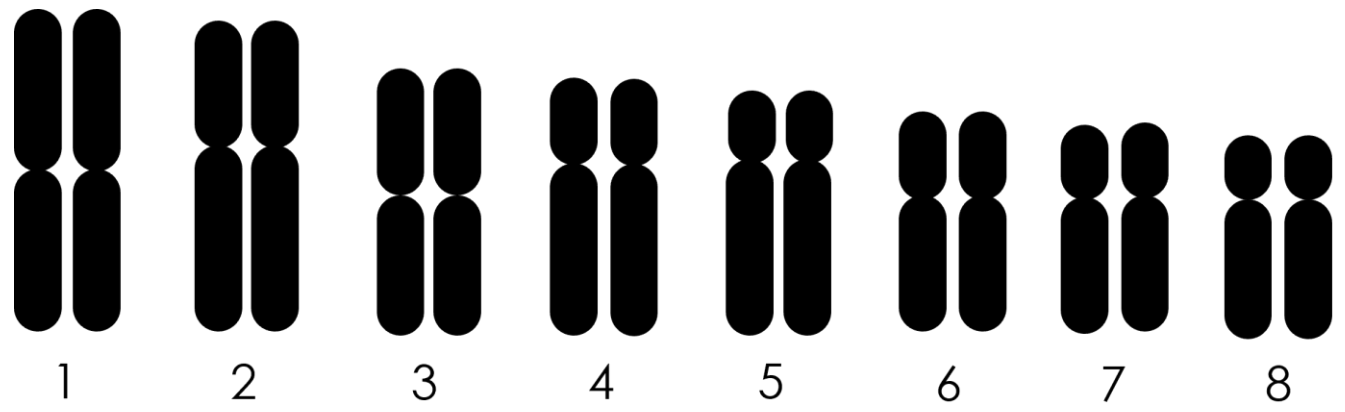


23

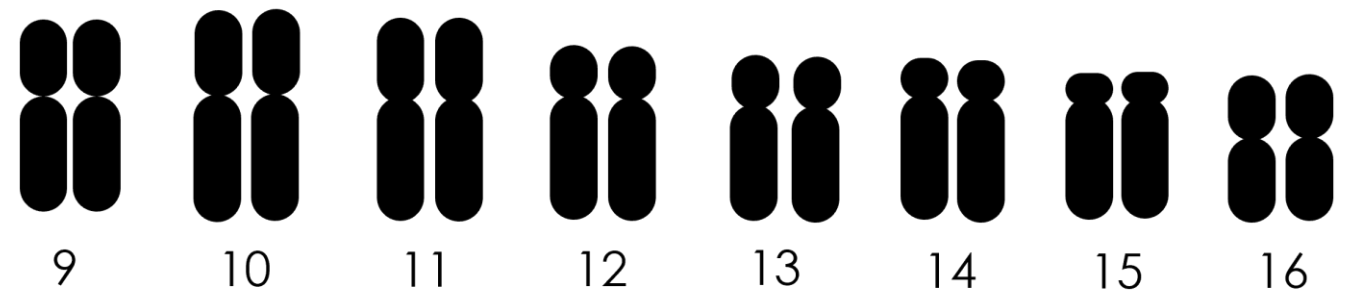


Is this a male or female karyotype?

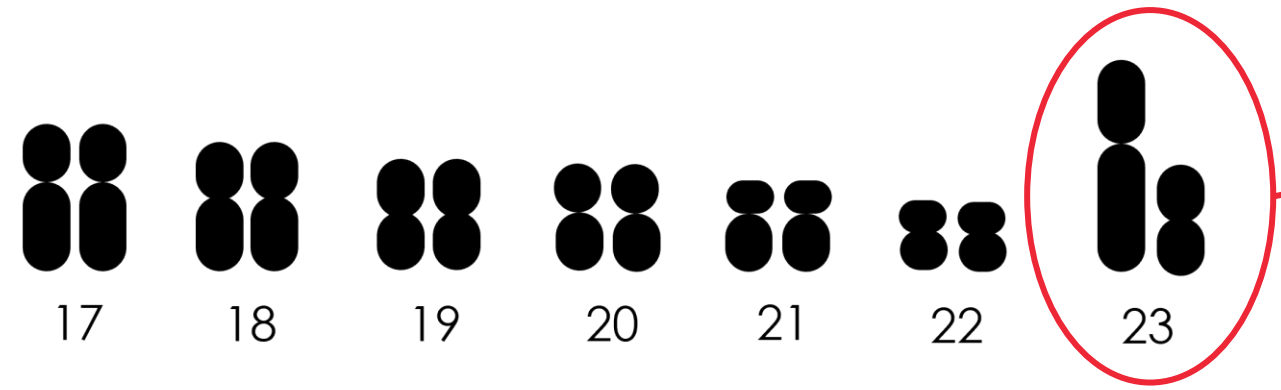
1



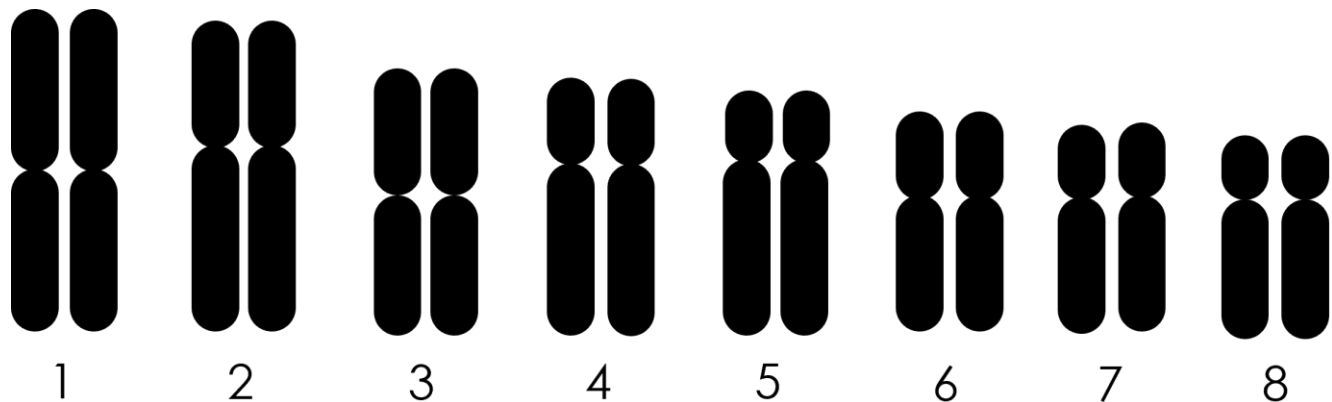
1 - 22



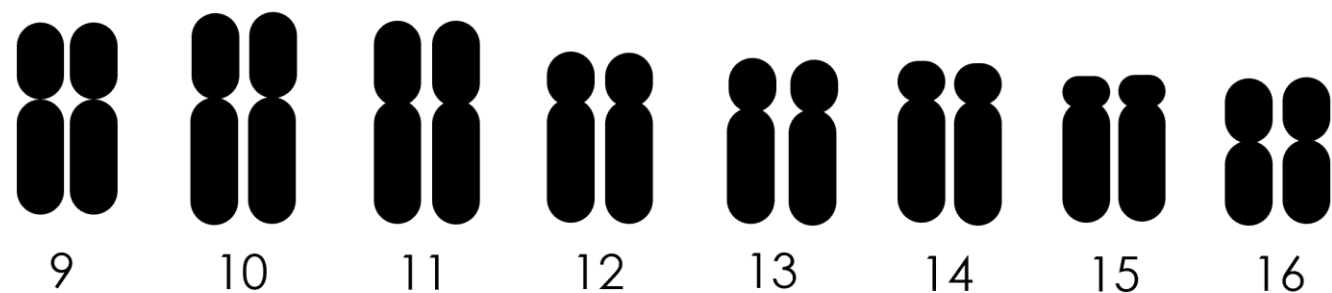
23



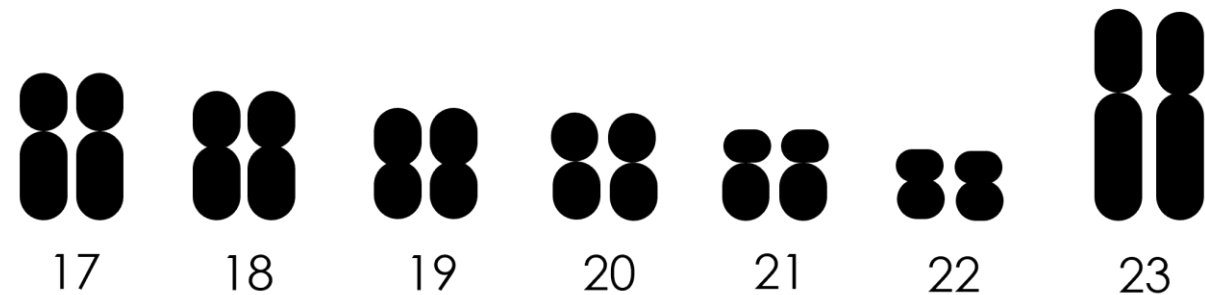
male



Give the NUMBER(S) of the chromosome(s) that are homologous.

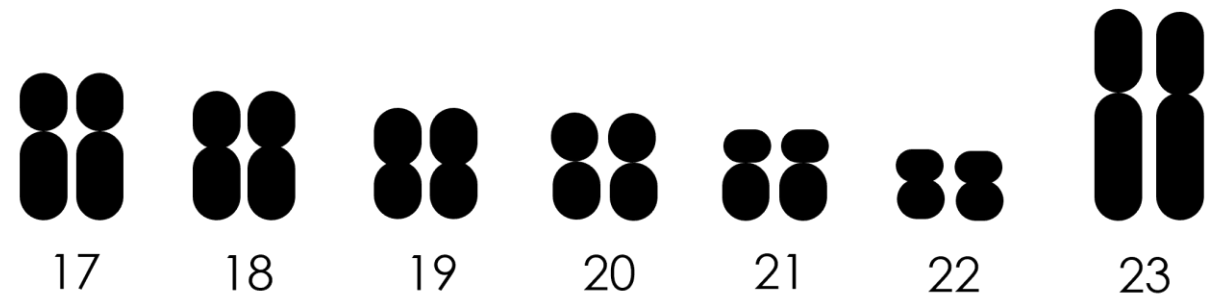
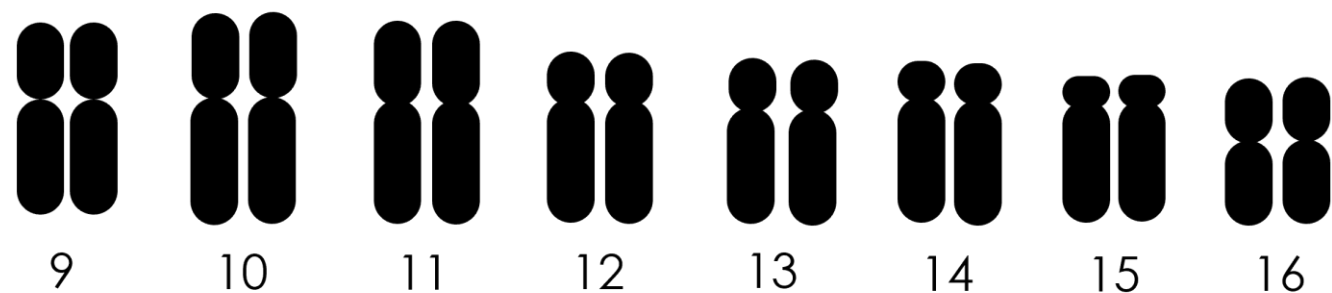
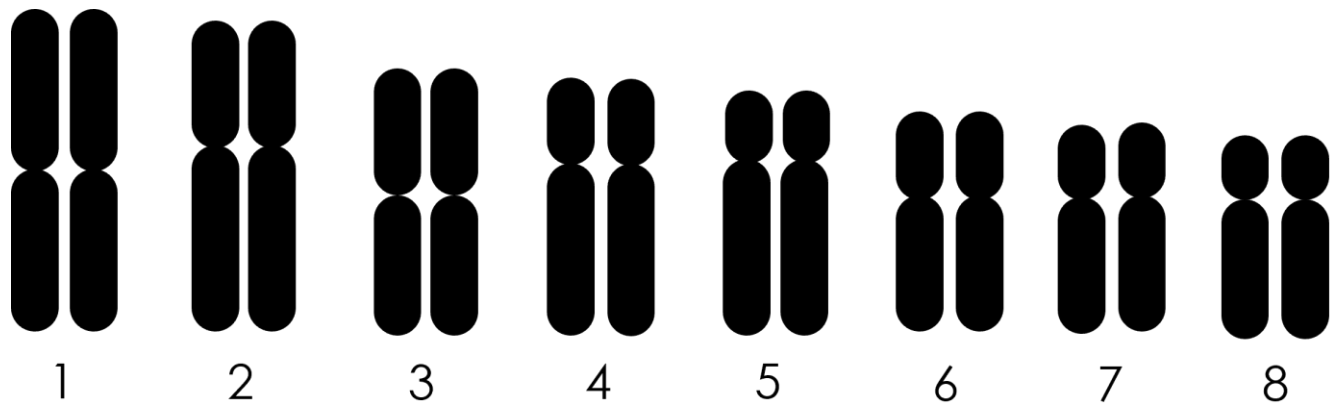


Give the NUMBER(S) of the chromosome(s) that are non-homologous.



Is this a male or female karyotype?

2

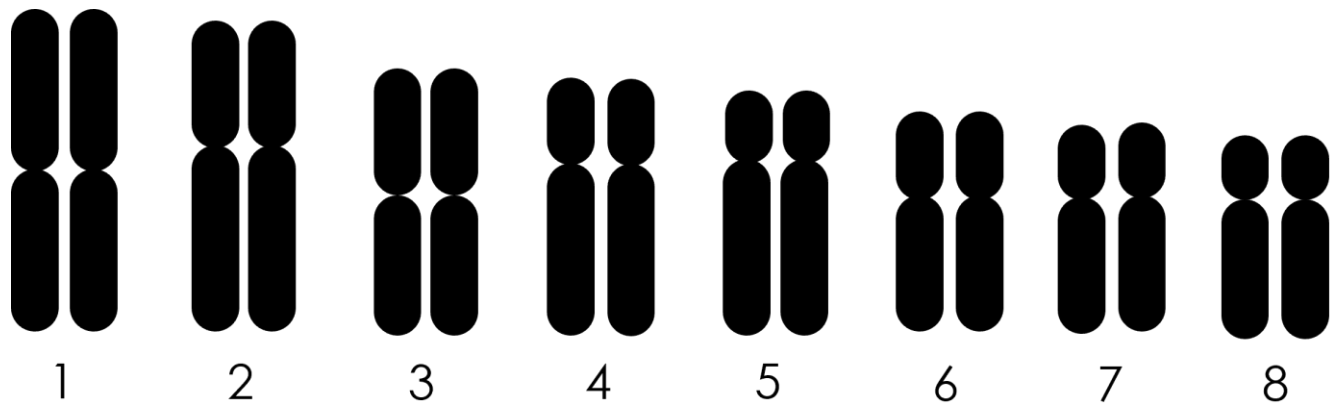


1 - 23

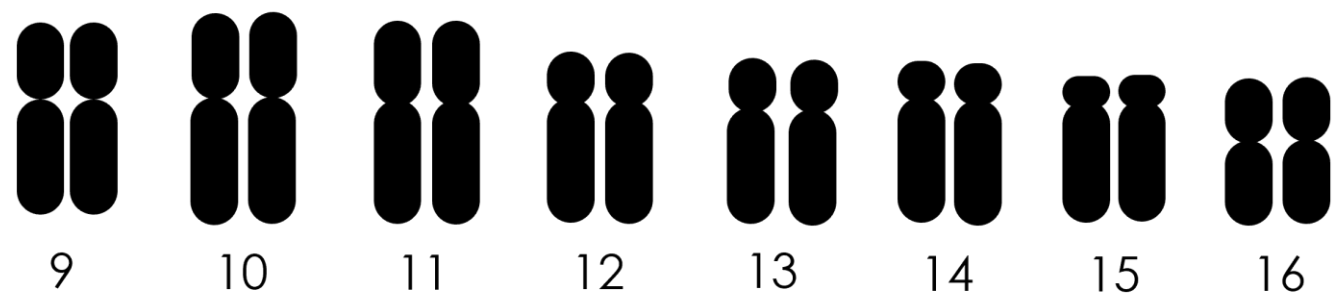
Give the NUMBER(S) of the chromosome(s) that are non-homologous.

Is this a male or female karyotype?

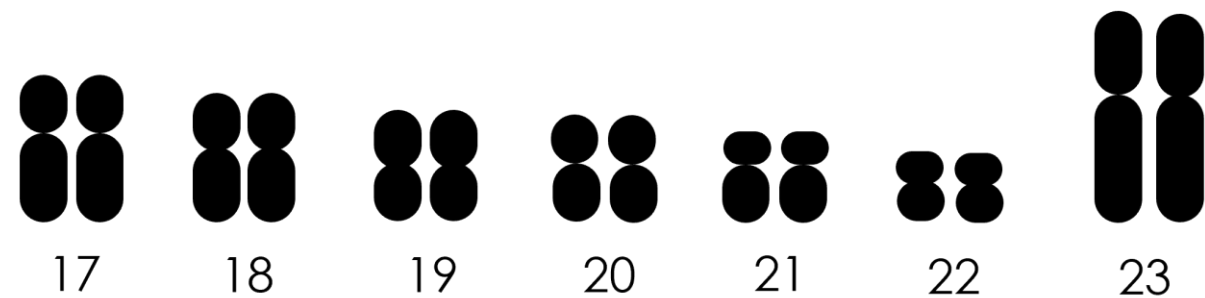
2



1 - 23

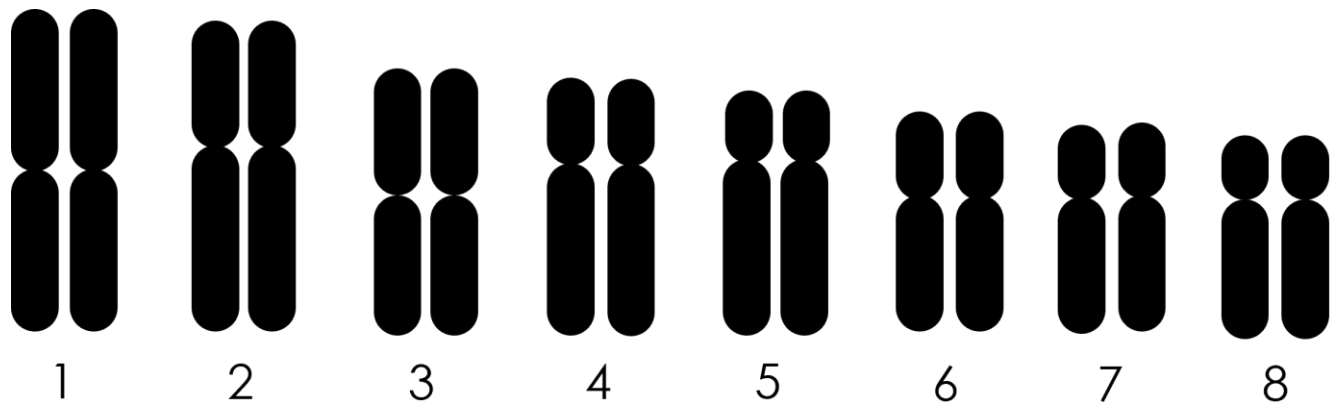


none

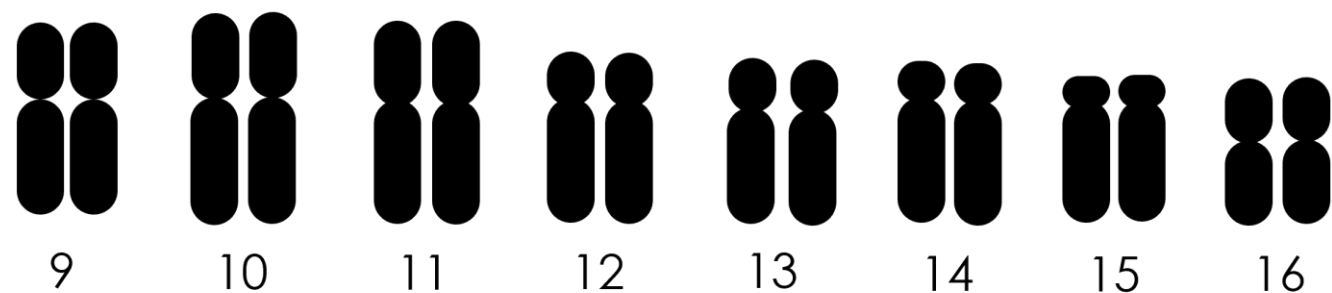


Is this a male or
female karyotype?

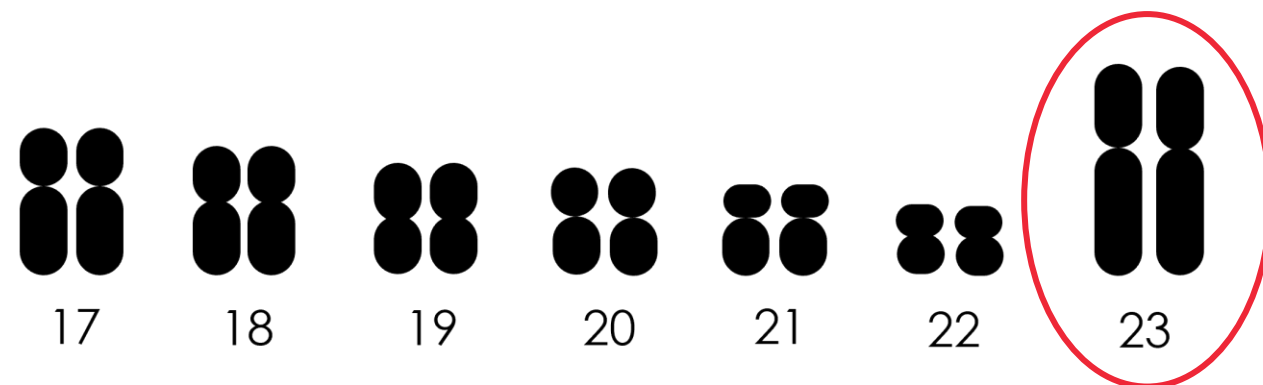
2



1 - 23



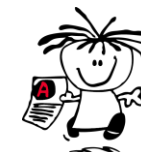
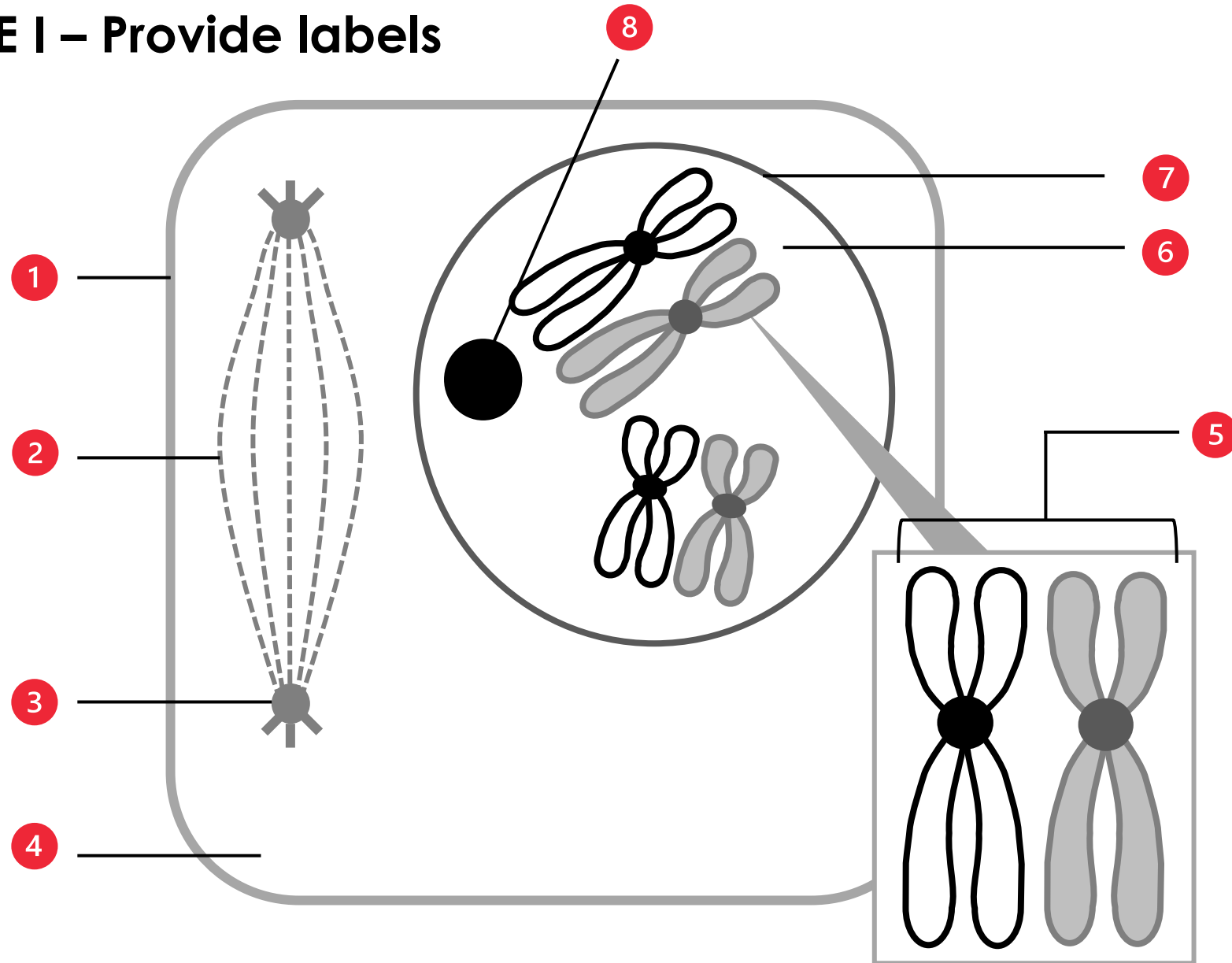
none



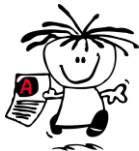
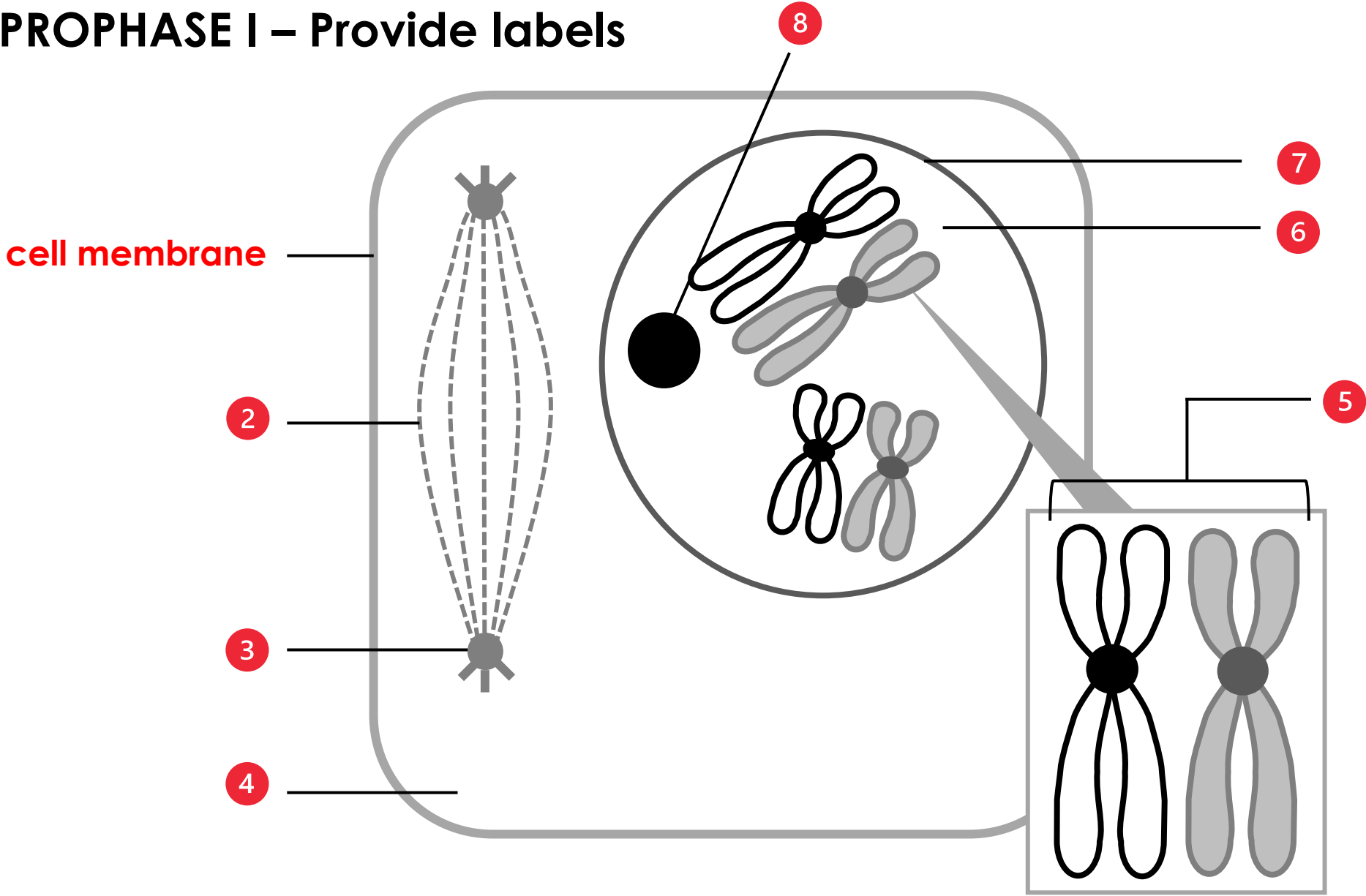
female

MEIOSIS

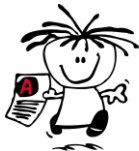
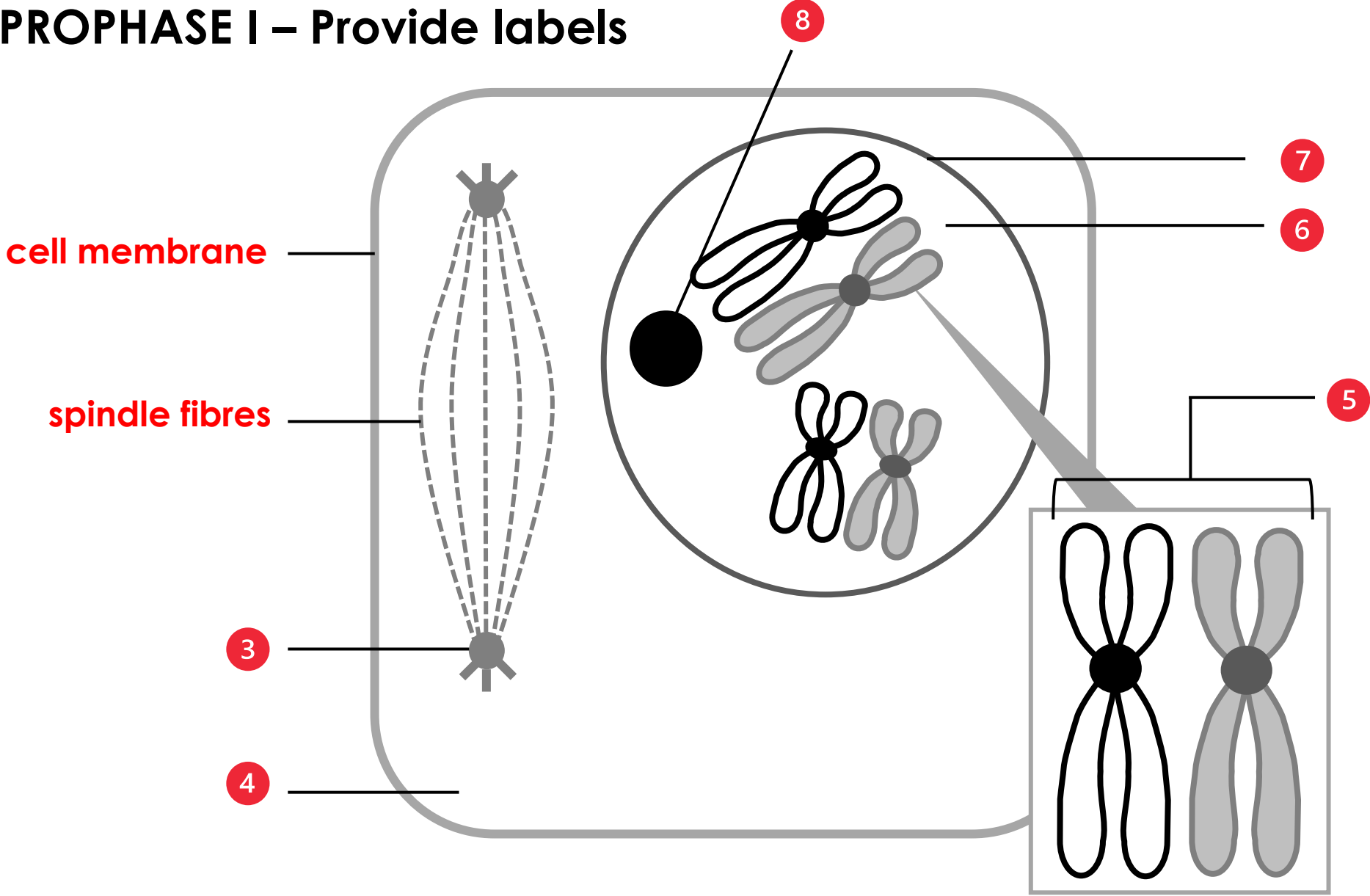
PROPHASE I – Provide labels



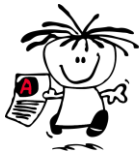
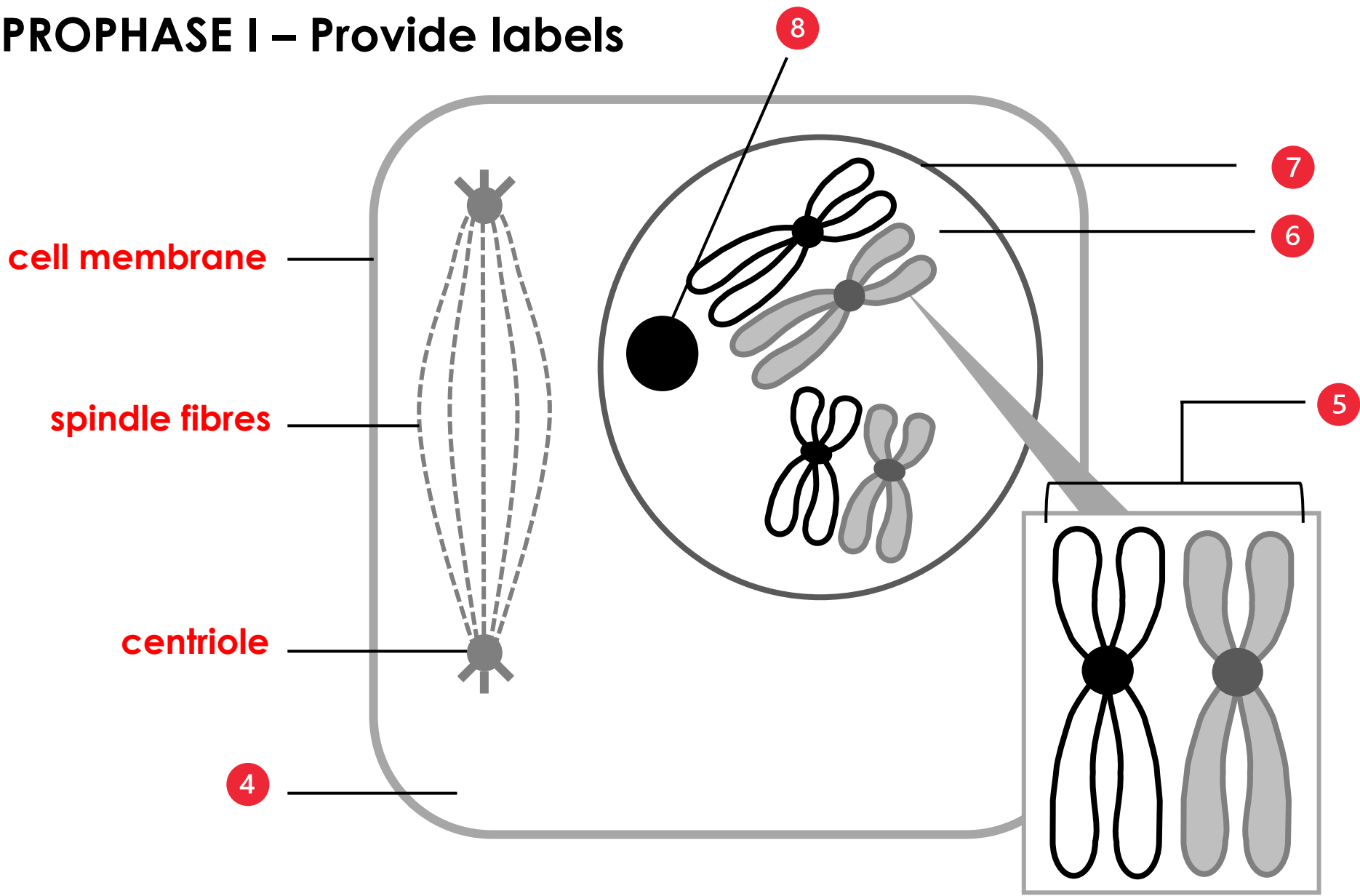
PROPHASE I – Provide labels



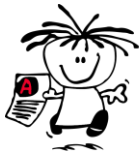
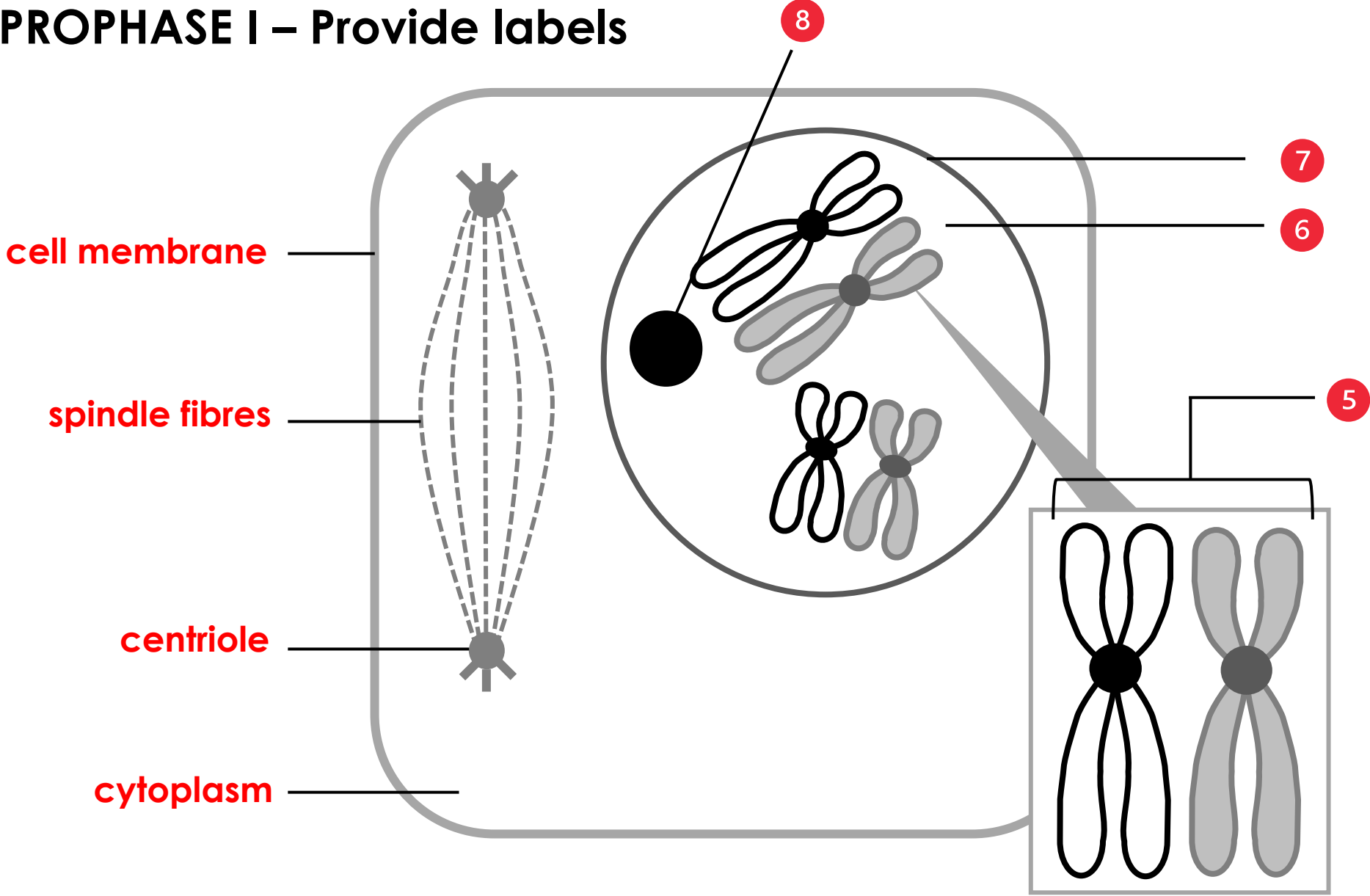
PROPHASE I – Provide labels



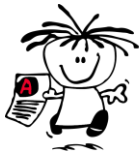
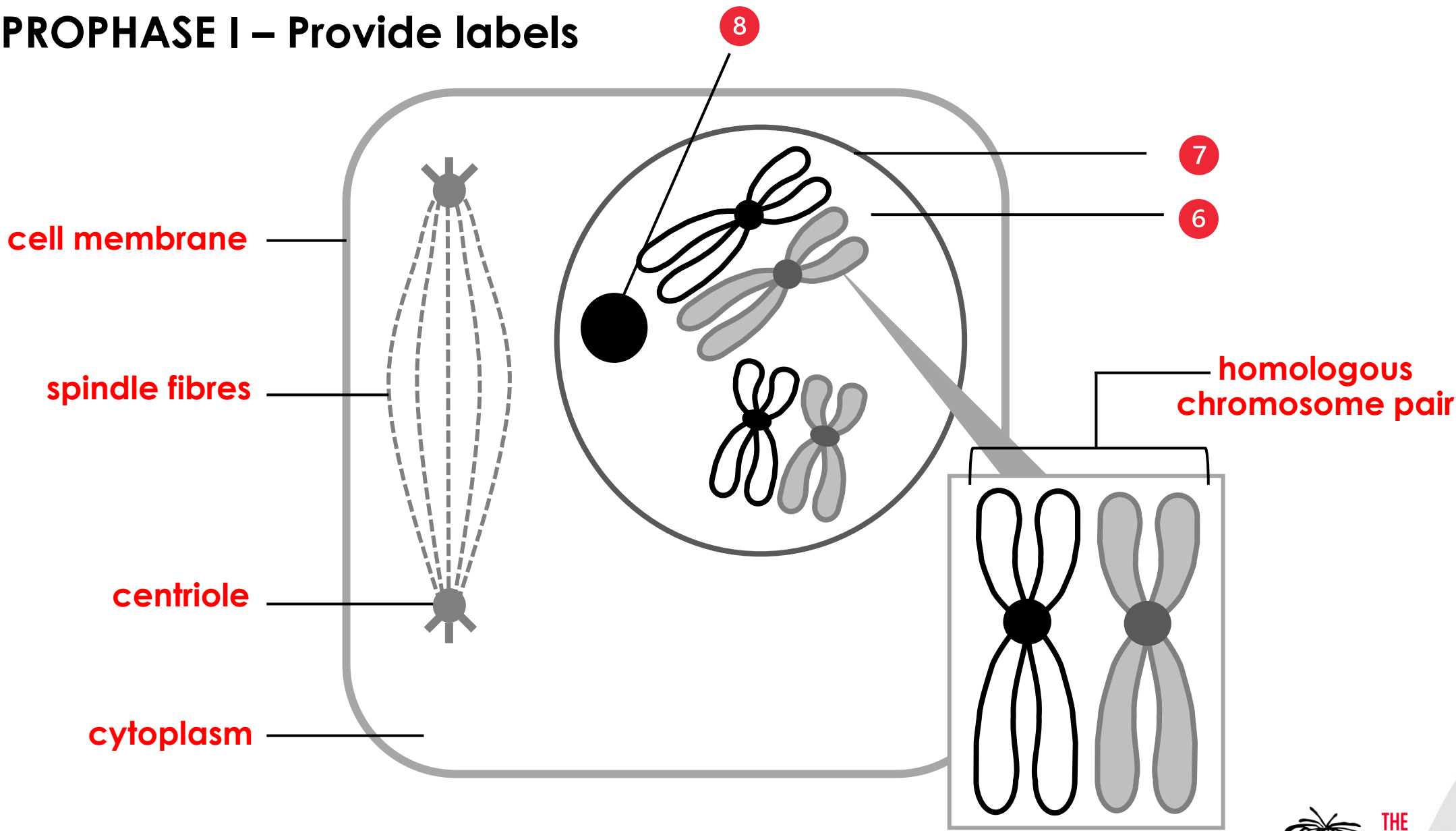
PROPHASE I – Provide labels



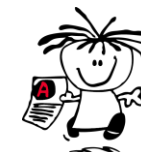
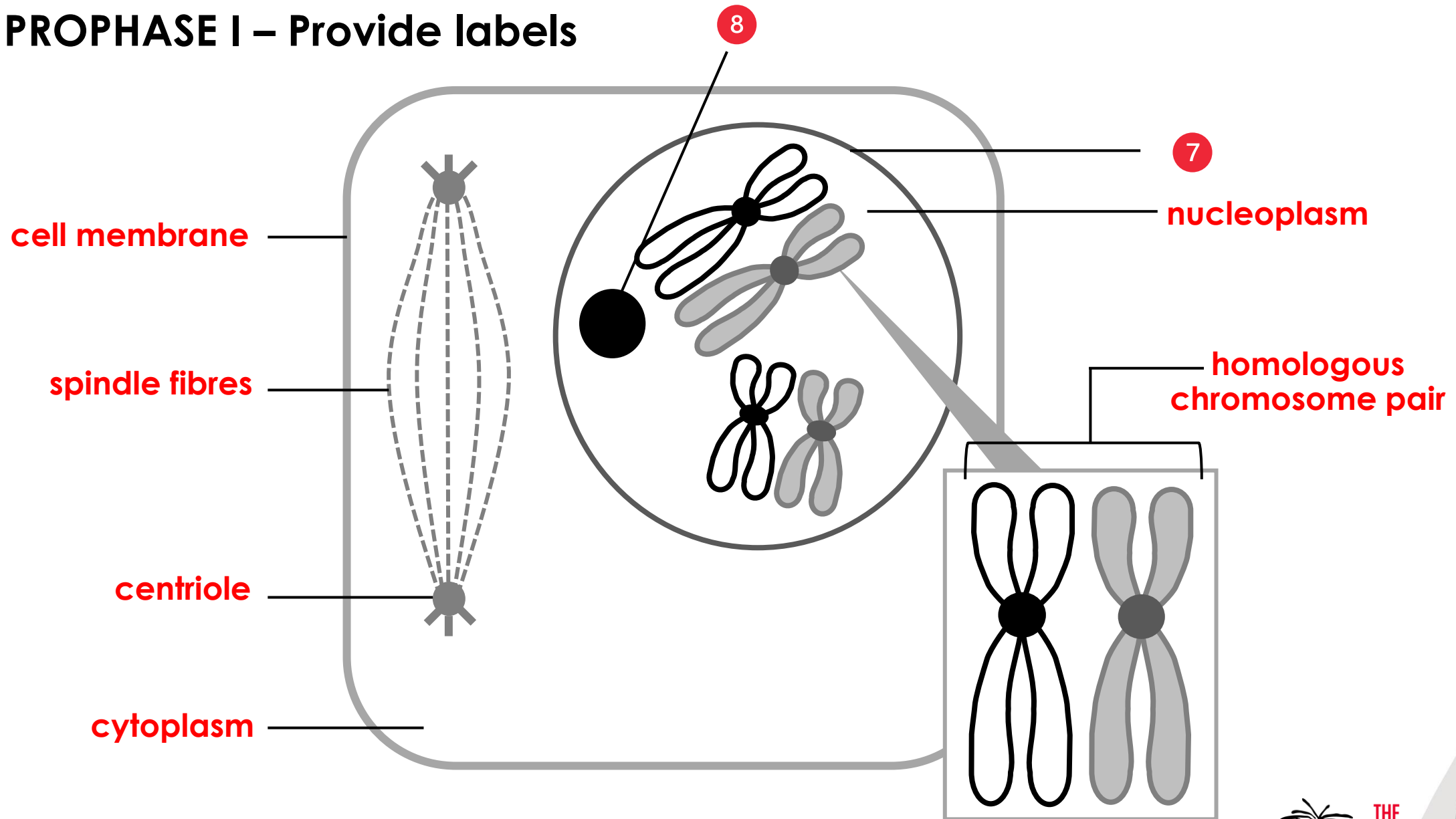
PROPHASE I – Provide labels



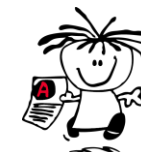
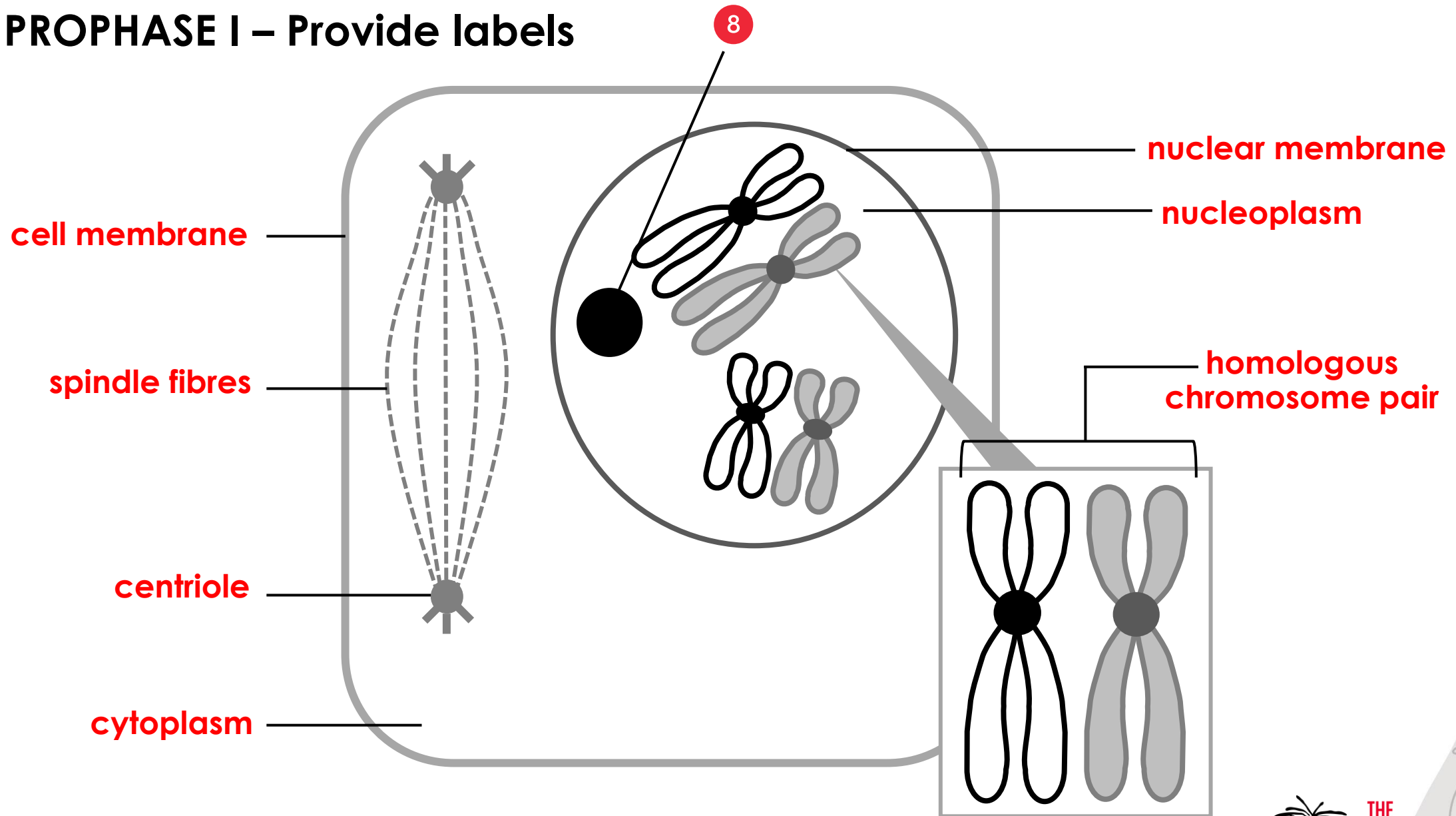
PROPHASE I – Provide labels



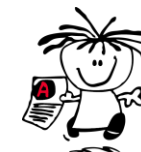
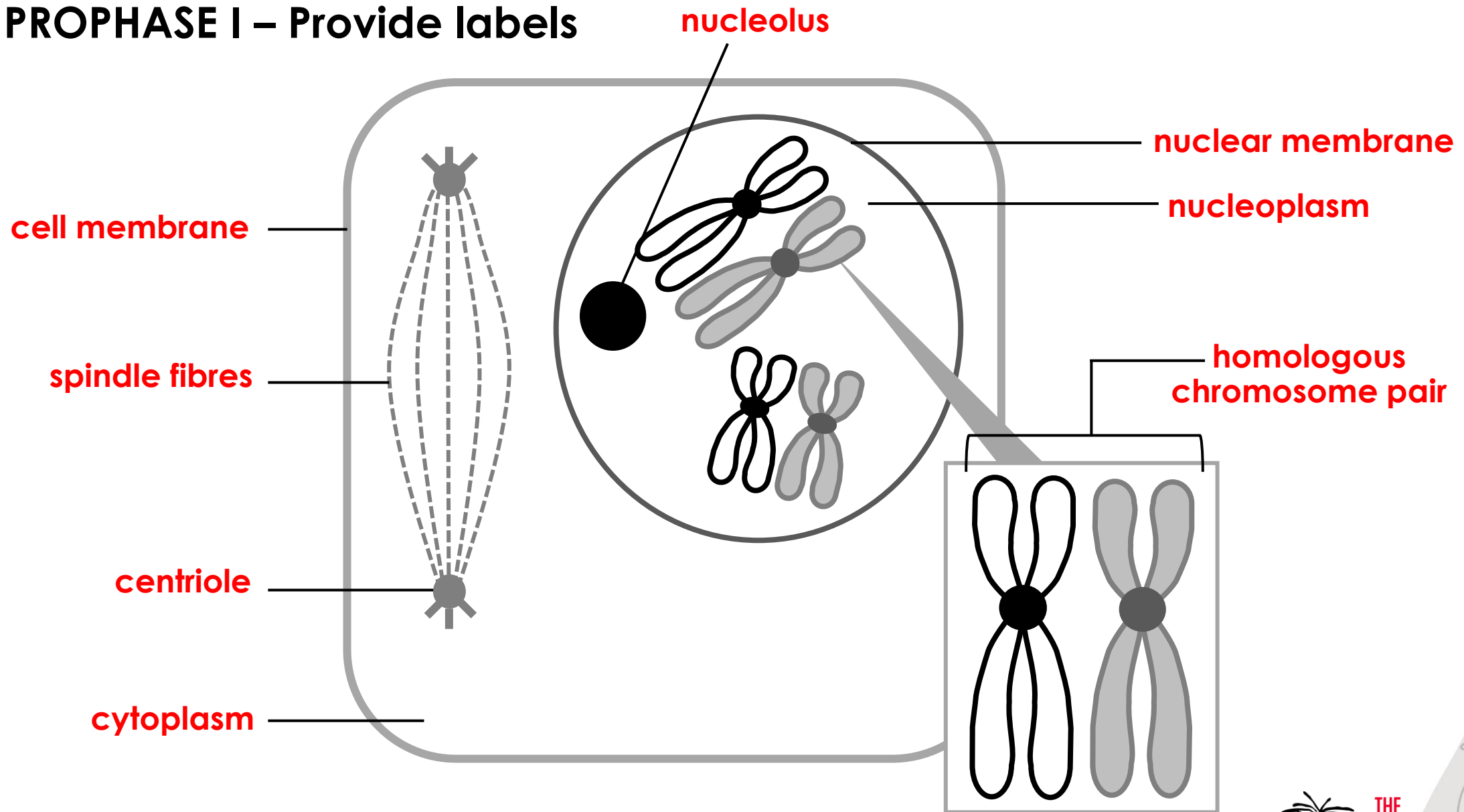
PROPHASE I – Provide labels



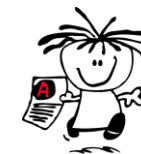
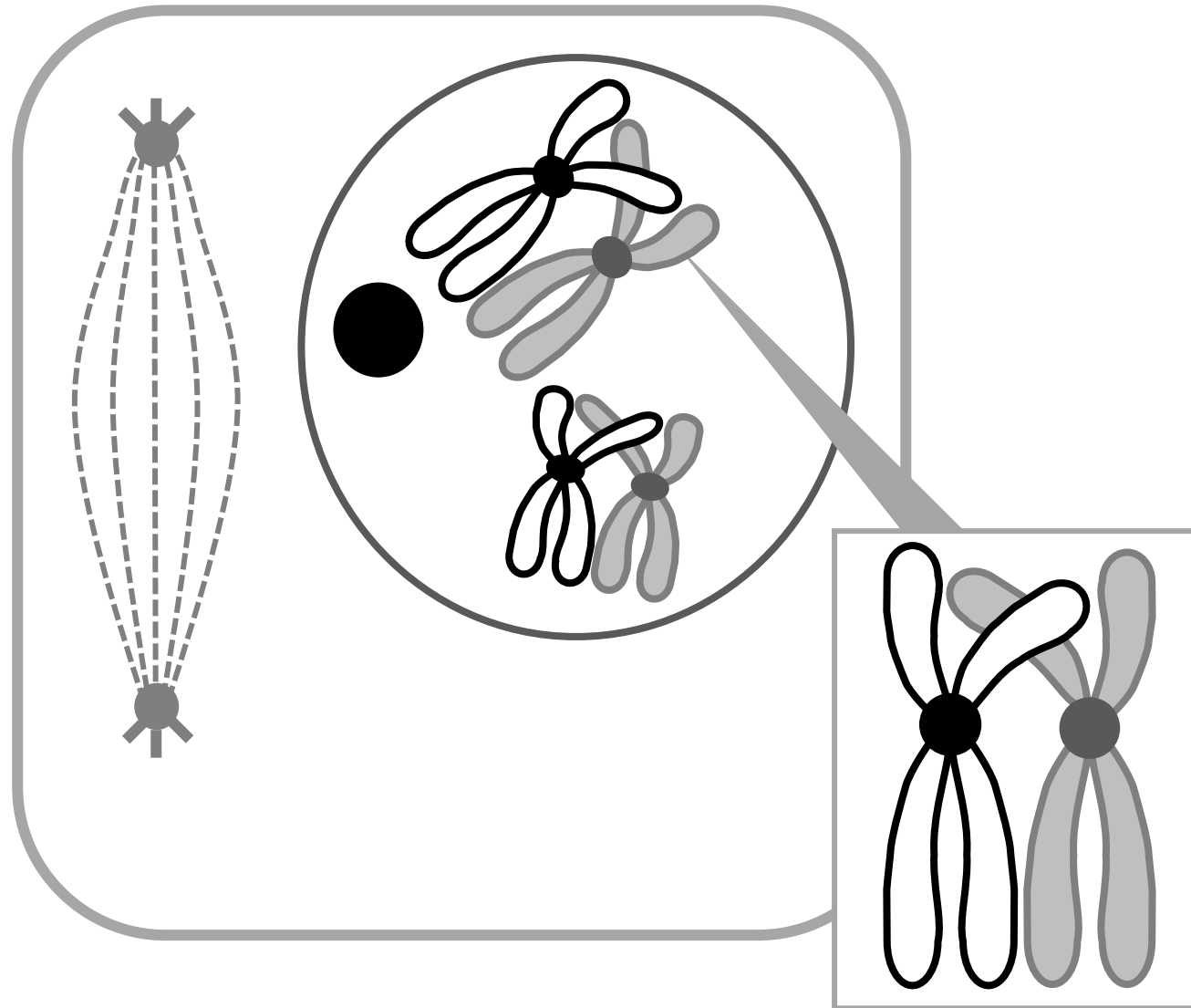
PROPHASE I – Provide labels



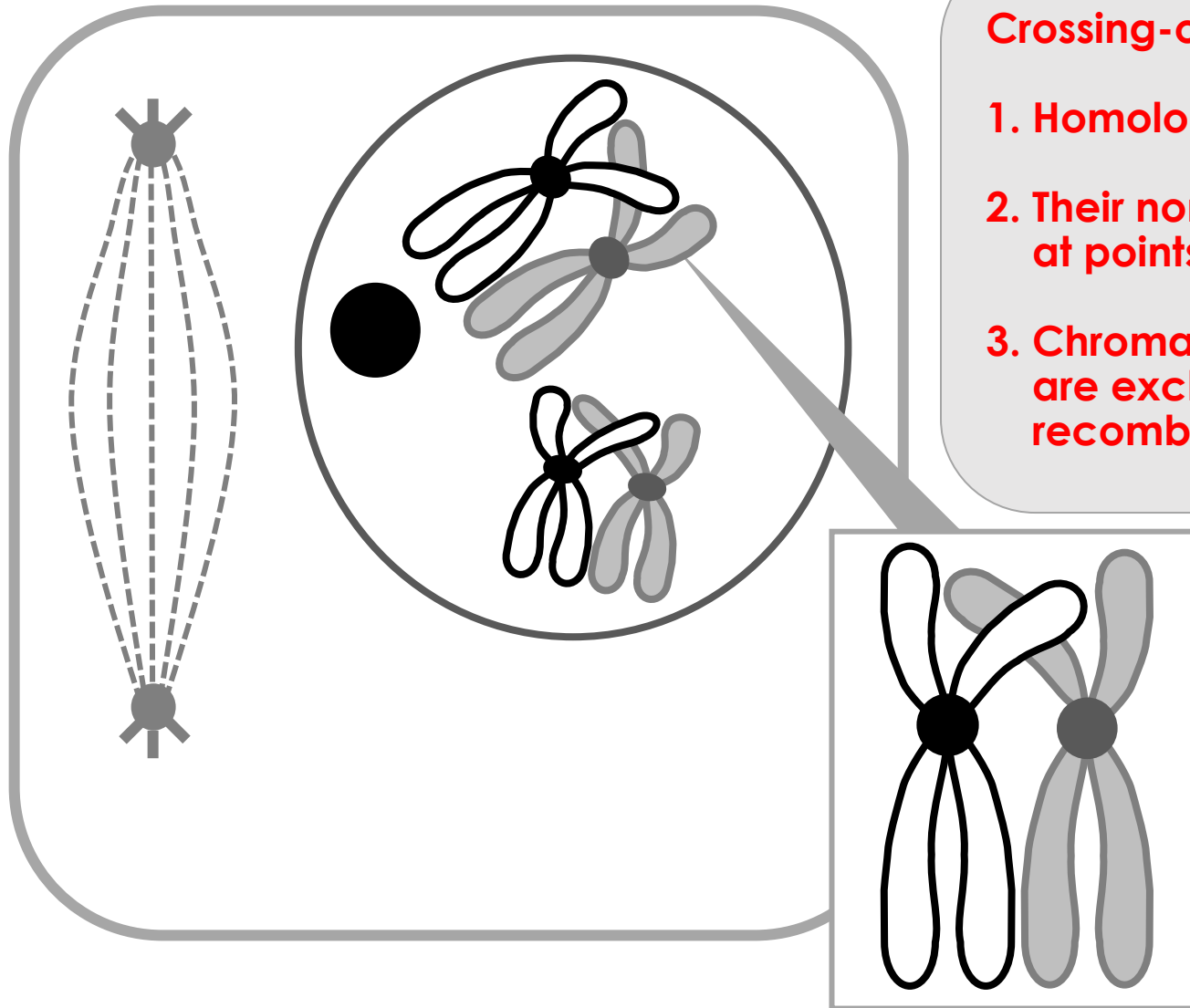
PROPHASE I – Provide labels



PROPHASE I – Name and describe this process

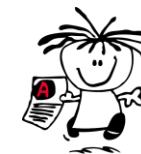


PROPHASE I – Name and describe this process

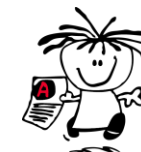
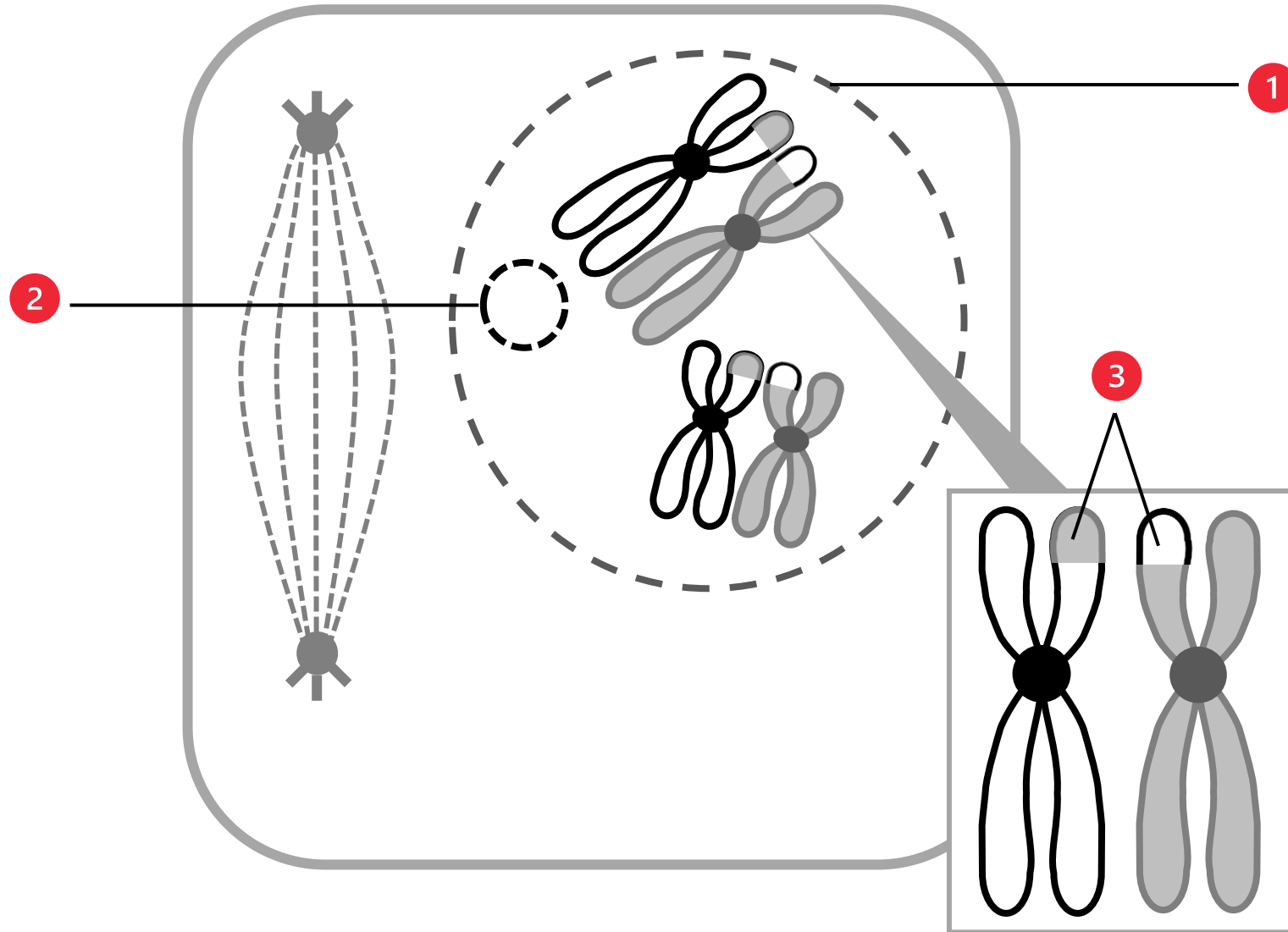


Crossing-over

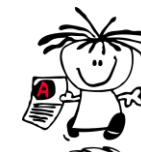
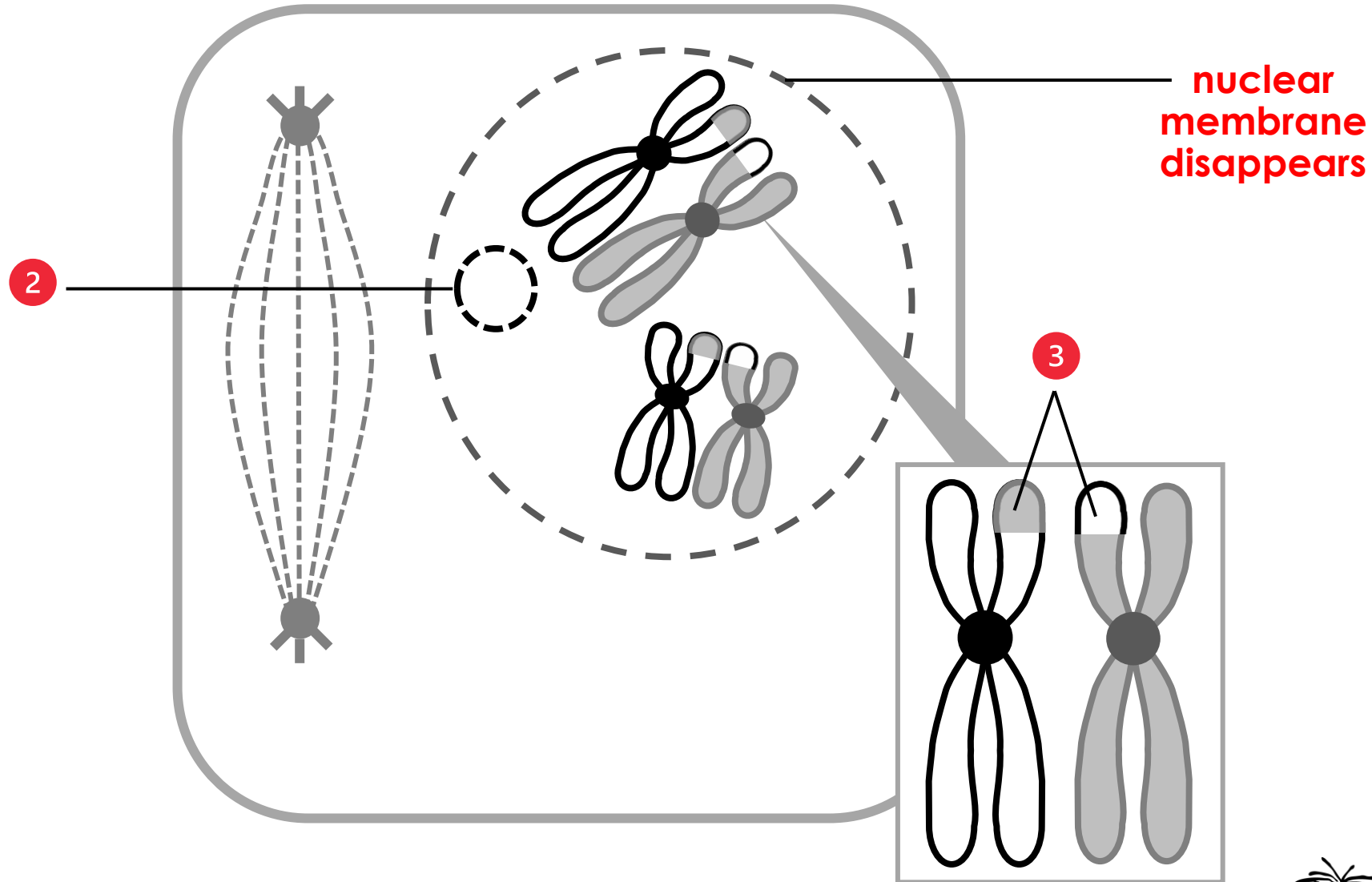
1. Homologous chromosomes lie side-by-side.
2. Their non-sister chromatids overlap and touch at points called chiasmata (singular: chiasma).
3. Chromatid segments (genetic information) are exchanged at the chiasmata to form recombinant chromatids.



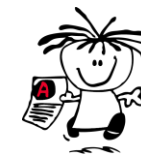
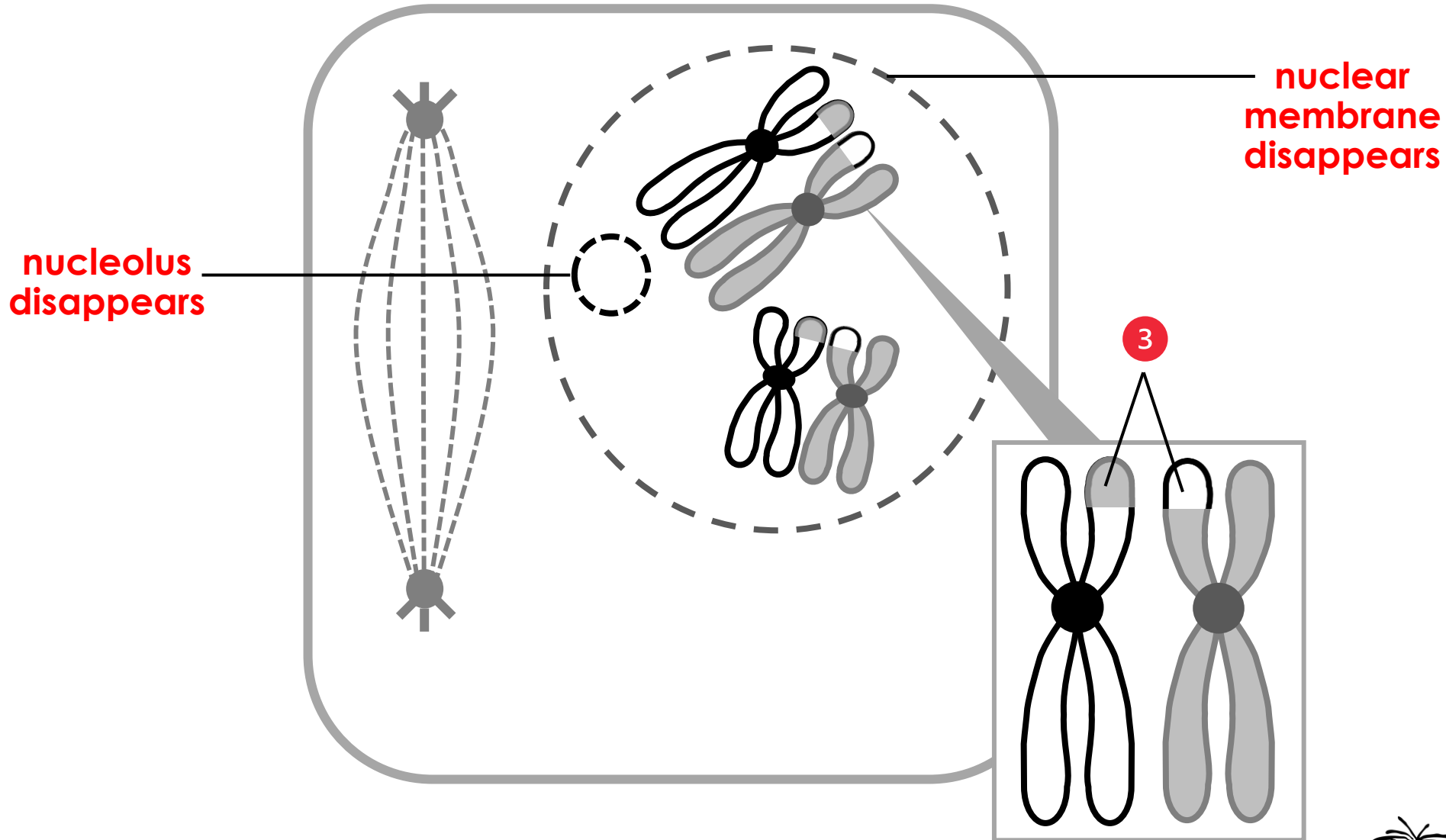
PROPHASE I – Provide labels for important steps/structures



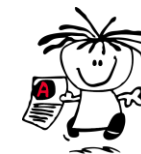
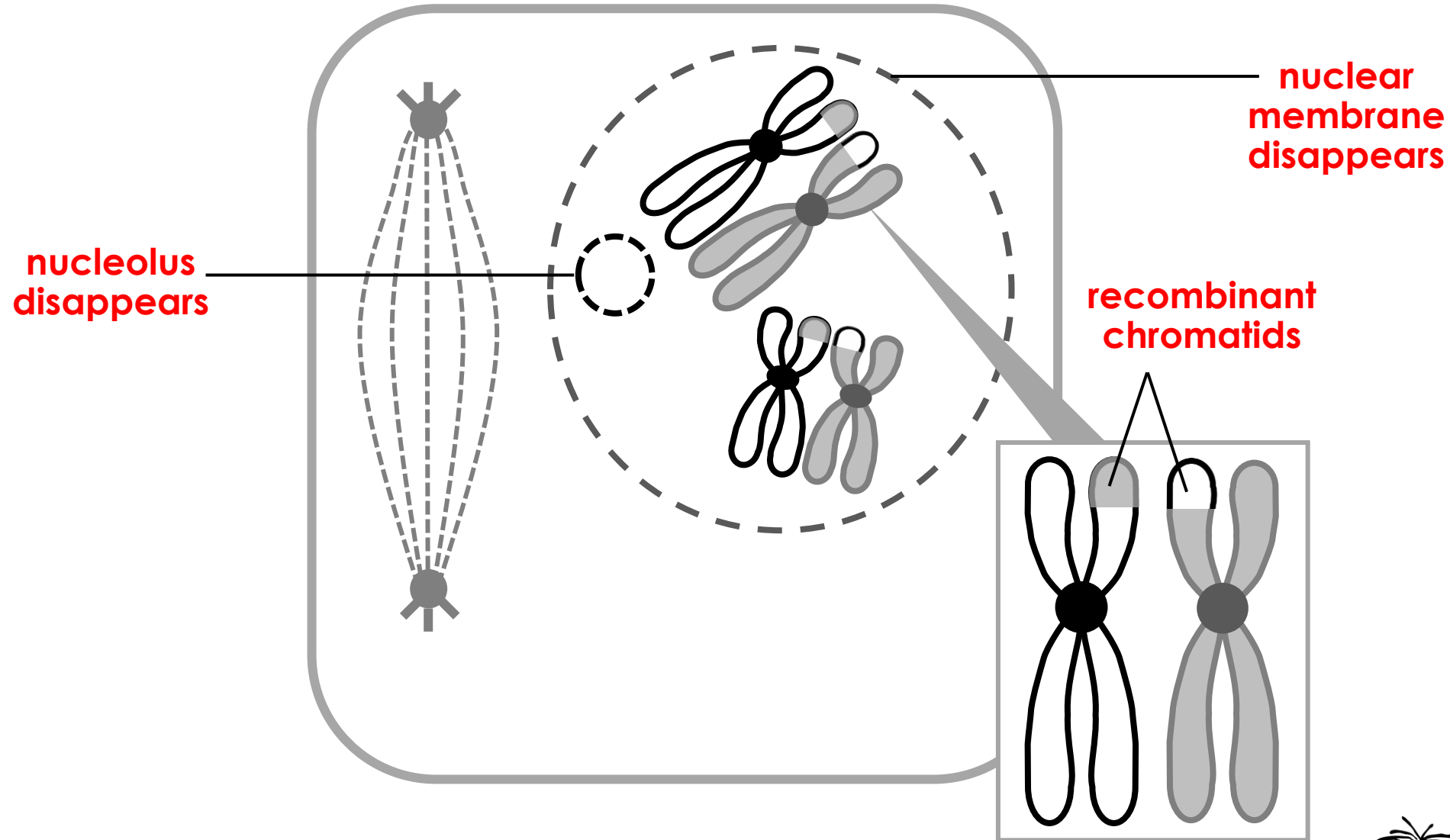
PROPHASE I – Provide labels for important steps/structures



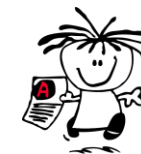
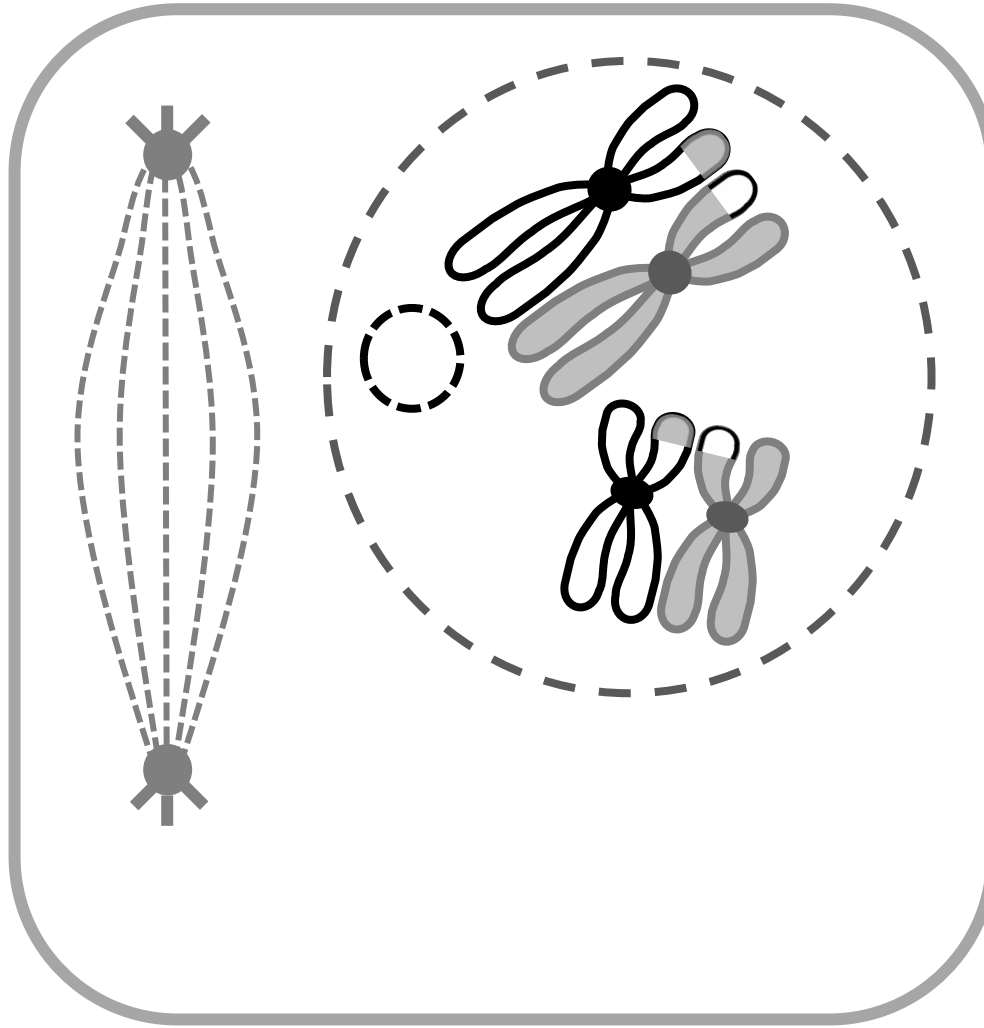
PROPHASE I – Provide labels for important steps/structures



PROPHASE I – Provide labels for important steps/structures

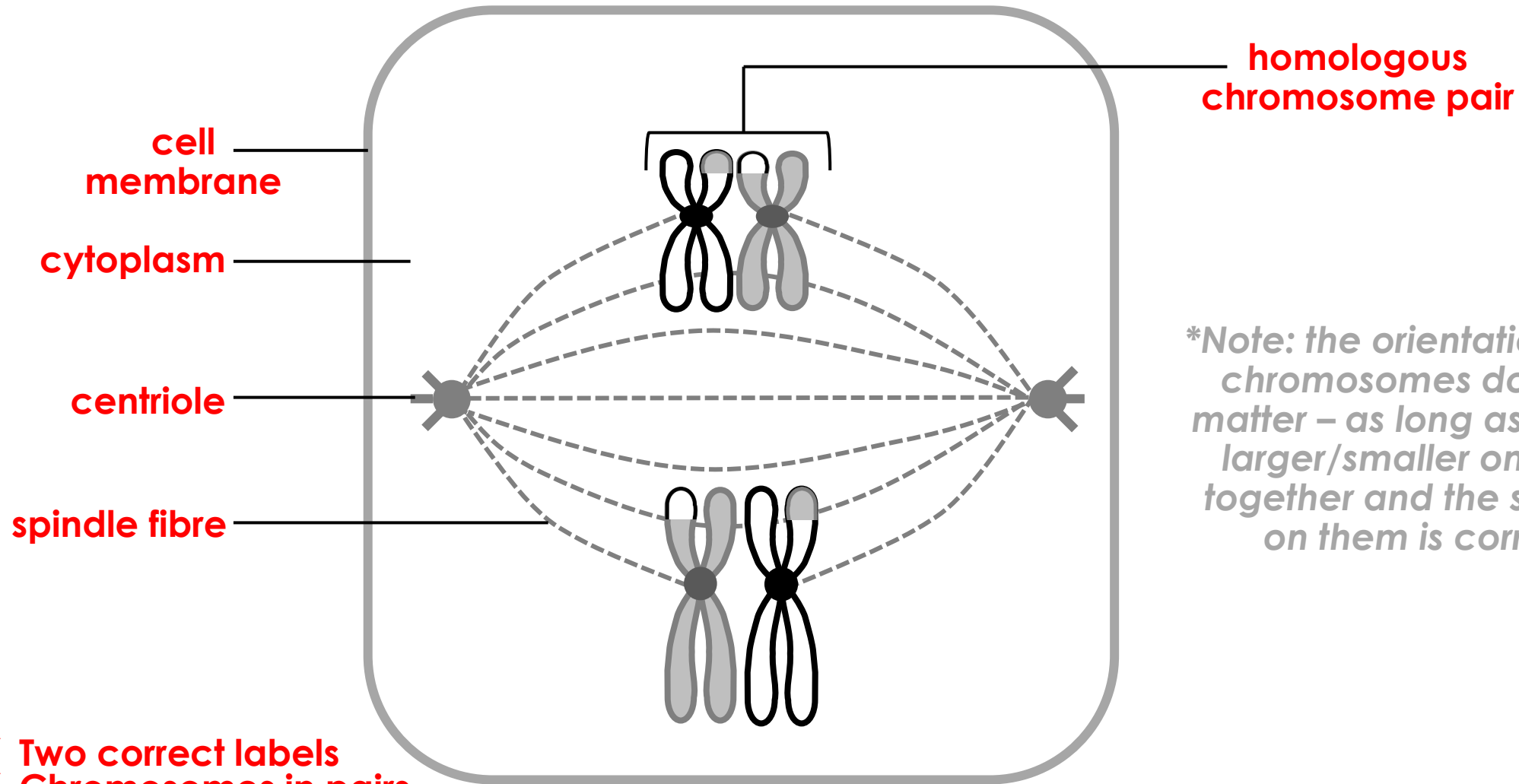


DRAW THIS CELL IN METAPHASE I



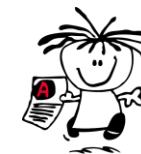
THE
ANSWER
SERIES *Your Key to Exam Success*

DRAW THIS CELL IN METAPHASE I

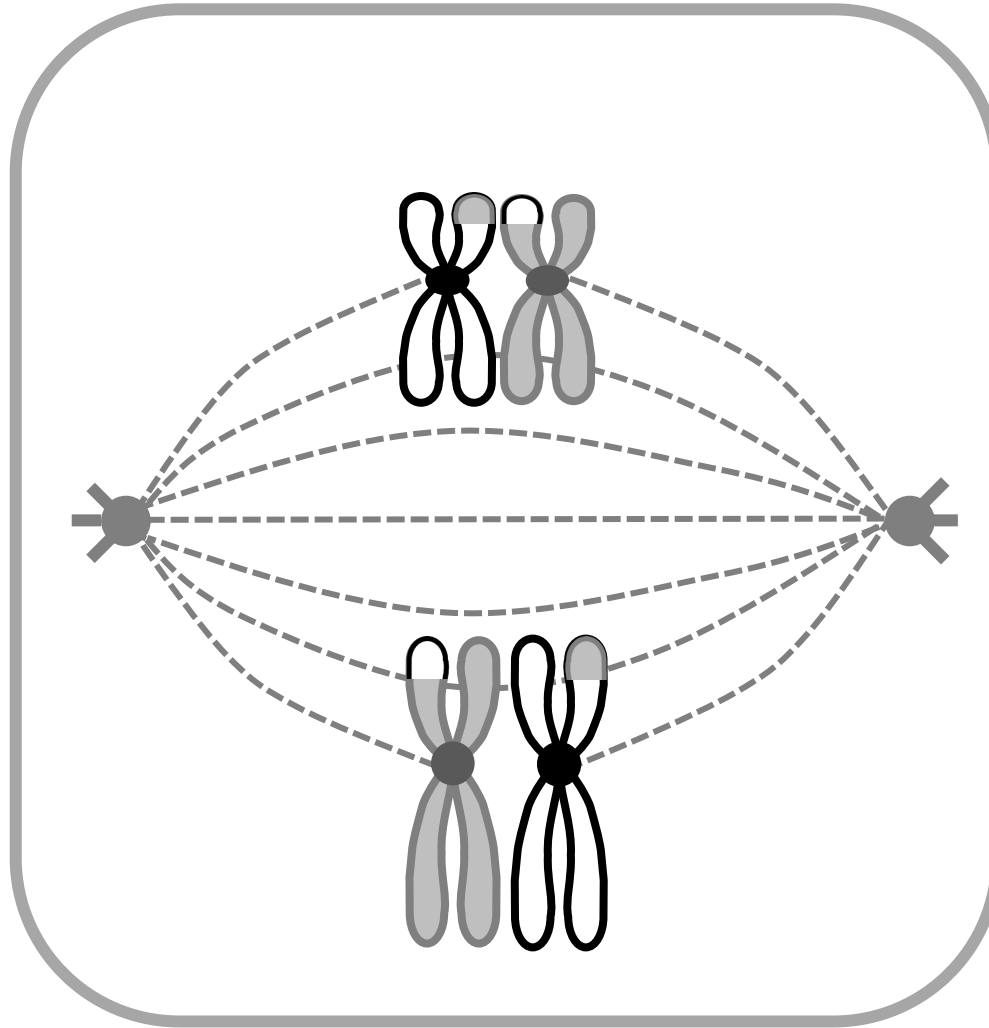


**Note: the orientation of the chromosomes does not matter – as long as the two larger/smaller ones are together and the shading on them is correct.*

- ✓ Two correct labels
- ✓ Chromosomes in pairs
- ✓ 2 pairs of homologous chromosomes visible
- ✓ Same size chromosomes together
- ✓ Correct shading of chromatids

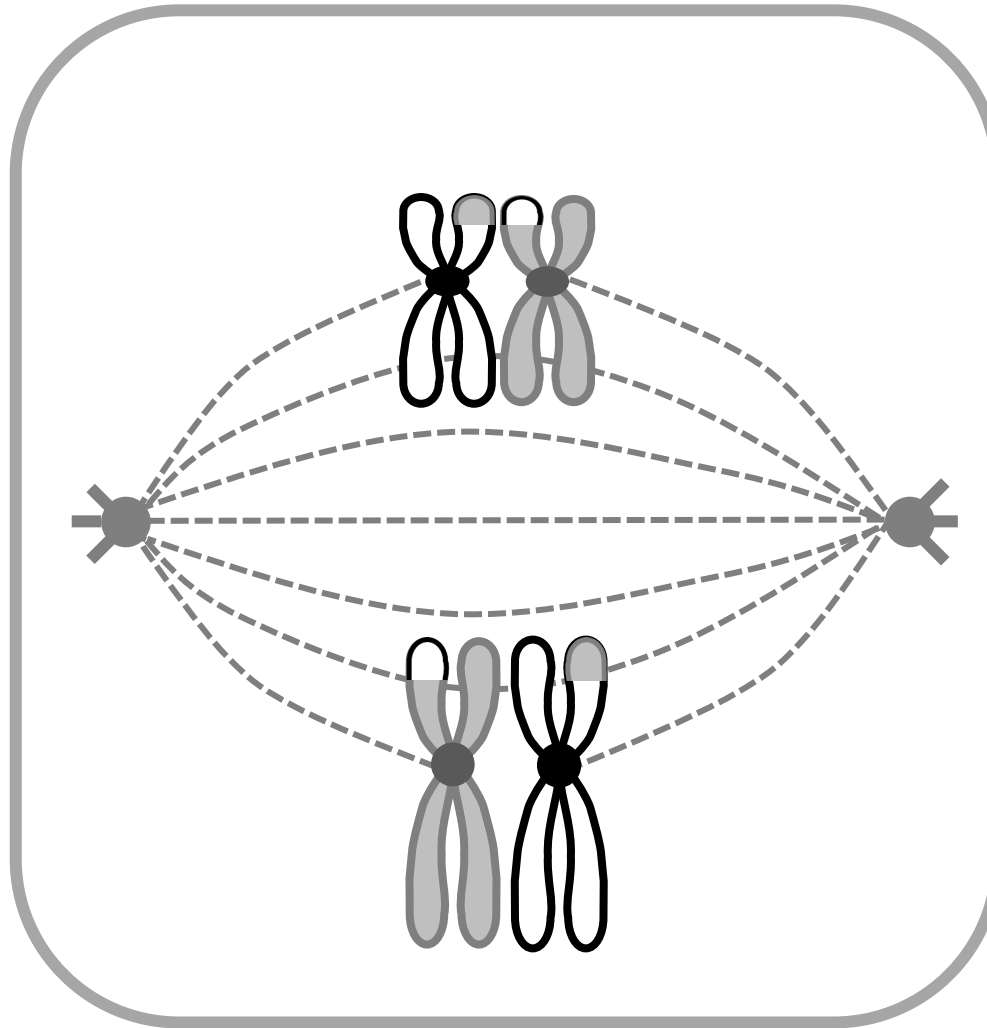


METAPHASE I



Give the NAME of the process that allows for genetic variation during this phase of meiosis.

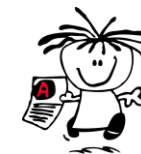
METAPHASE I



Random arrangement of chromosomes

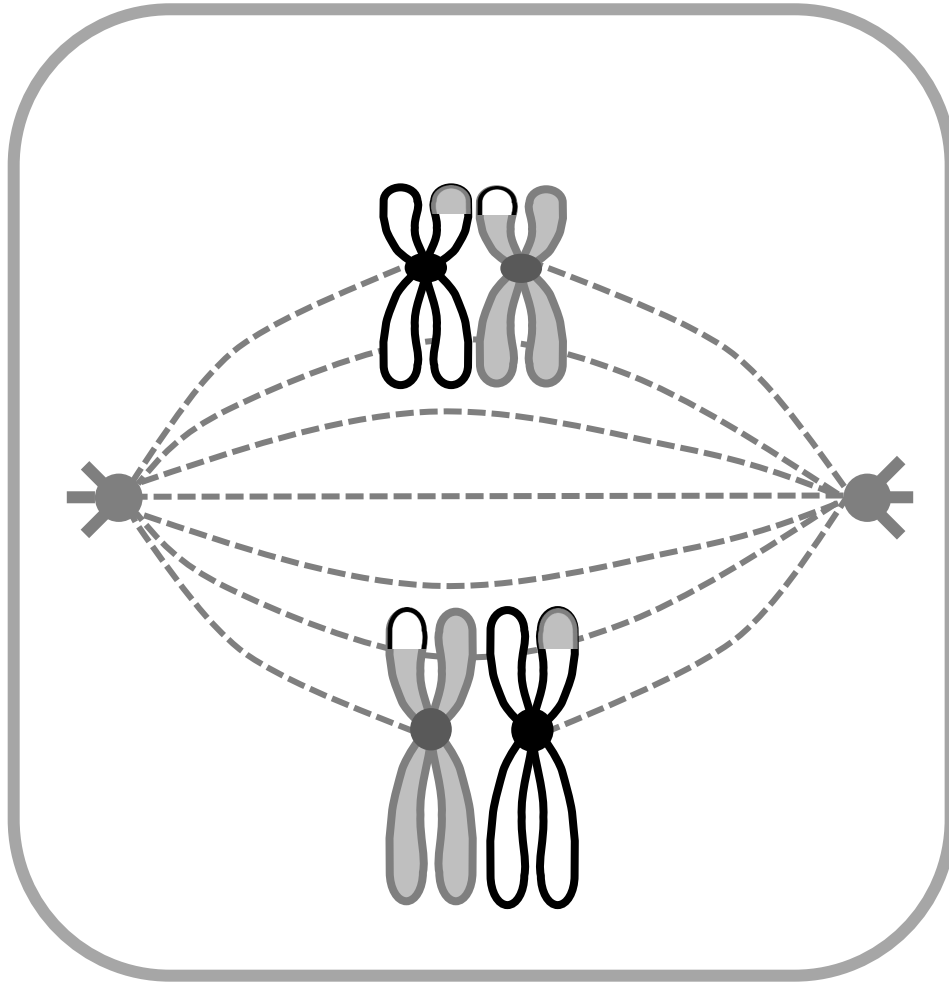
During Metaphase I, the homologous chromosomes arrange themselves on the equator of the cell in pairs.

Which chromosome lies on which side of the equator is random, i.e. any chromosome can face either pole.

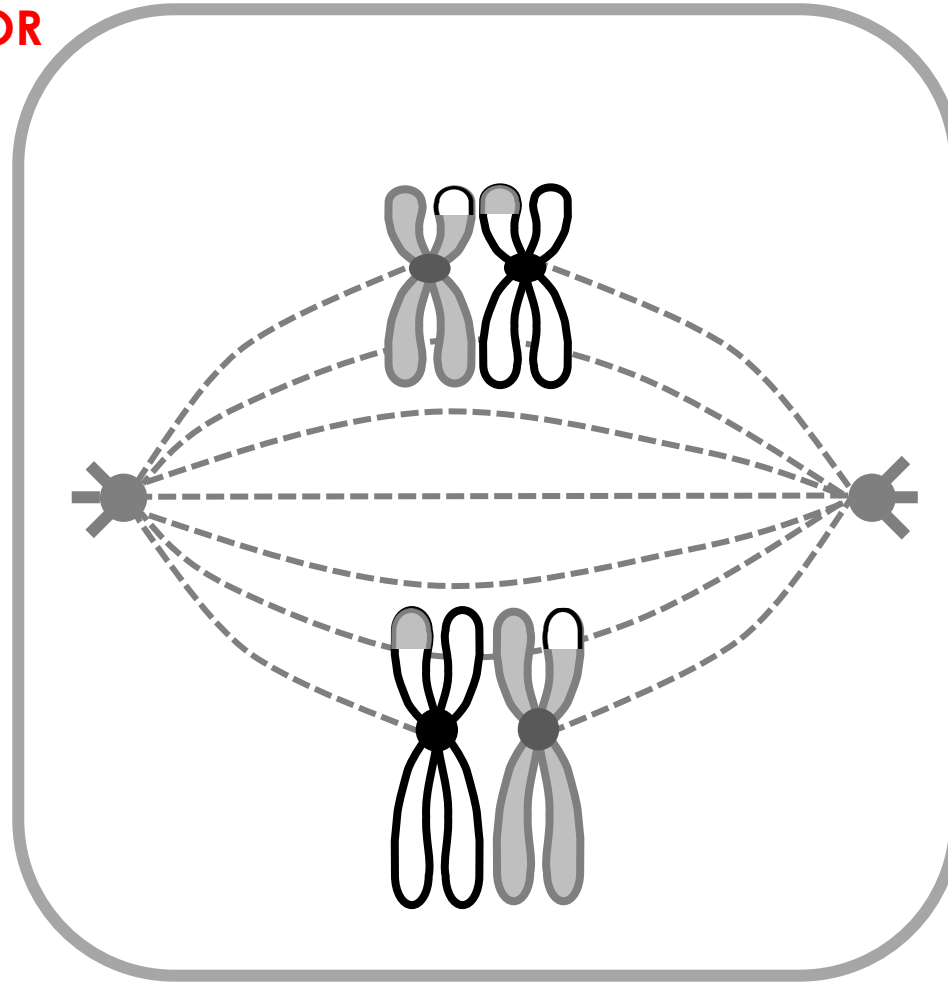


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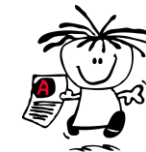
METAPHASE I – Random arrangement, e.g.



OR

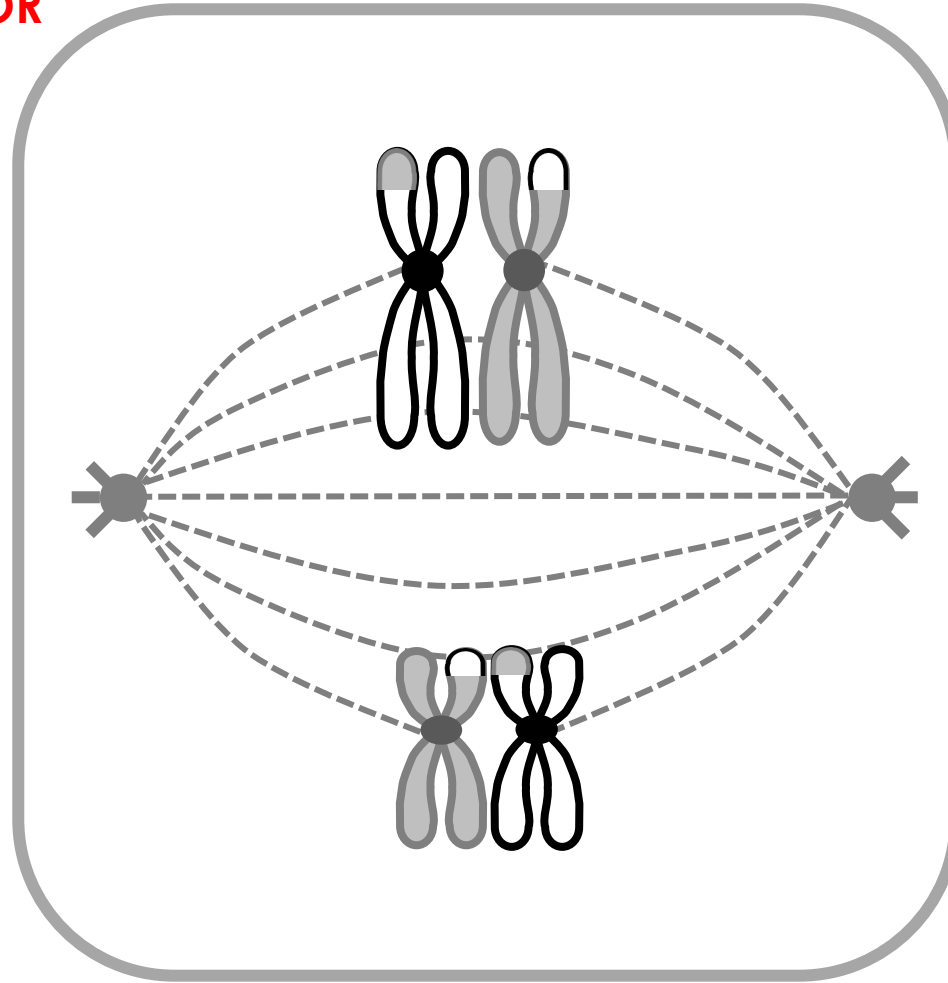
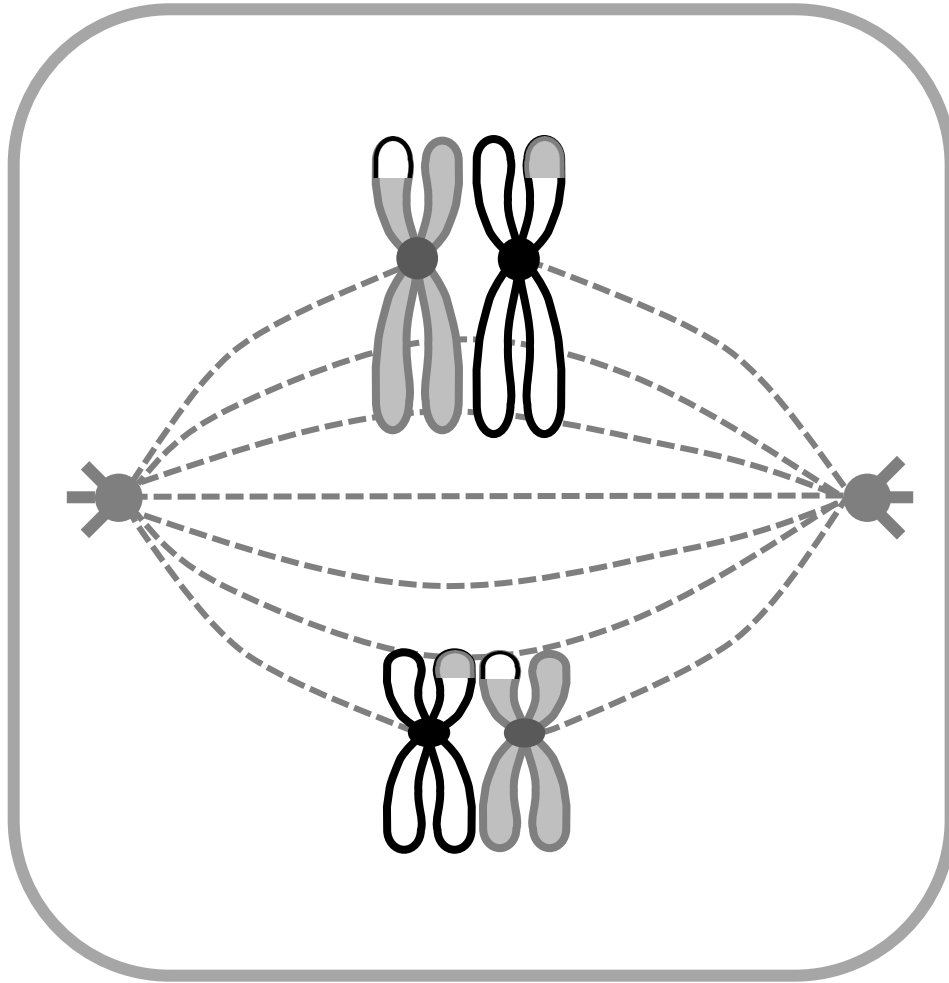


OR

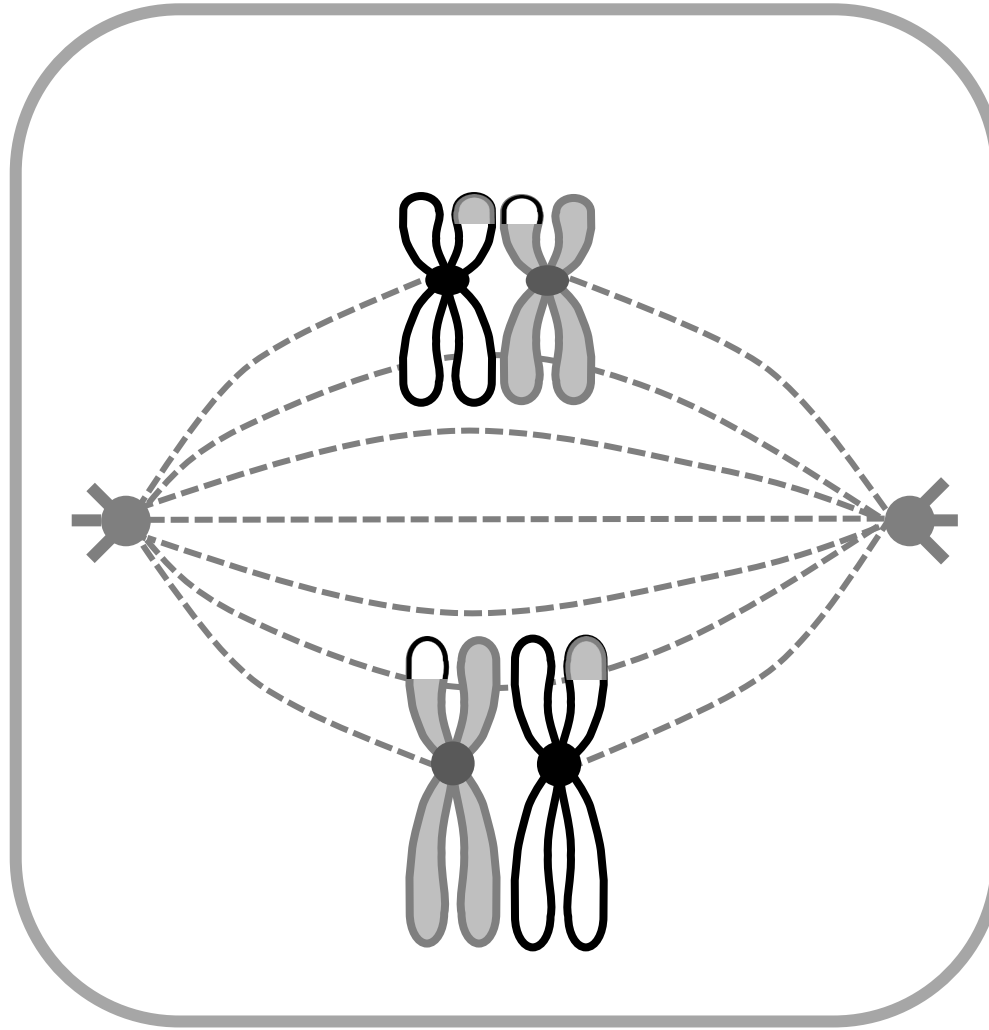


METAPHASE I – Random arrangement, e.g.

OR

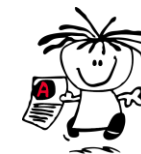
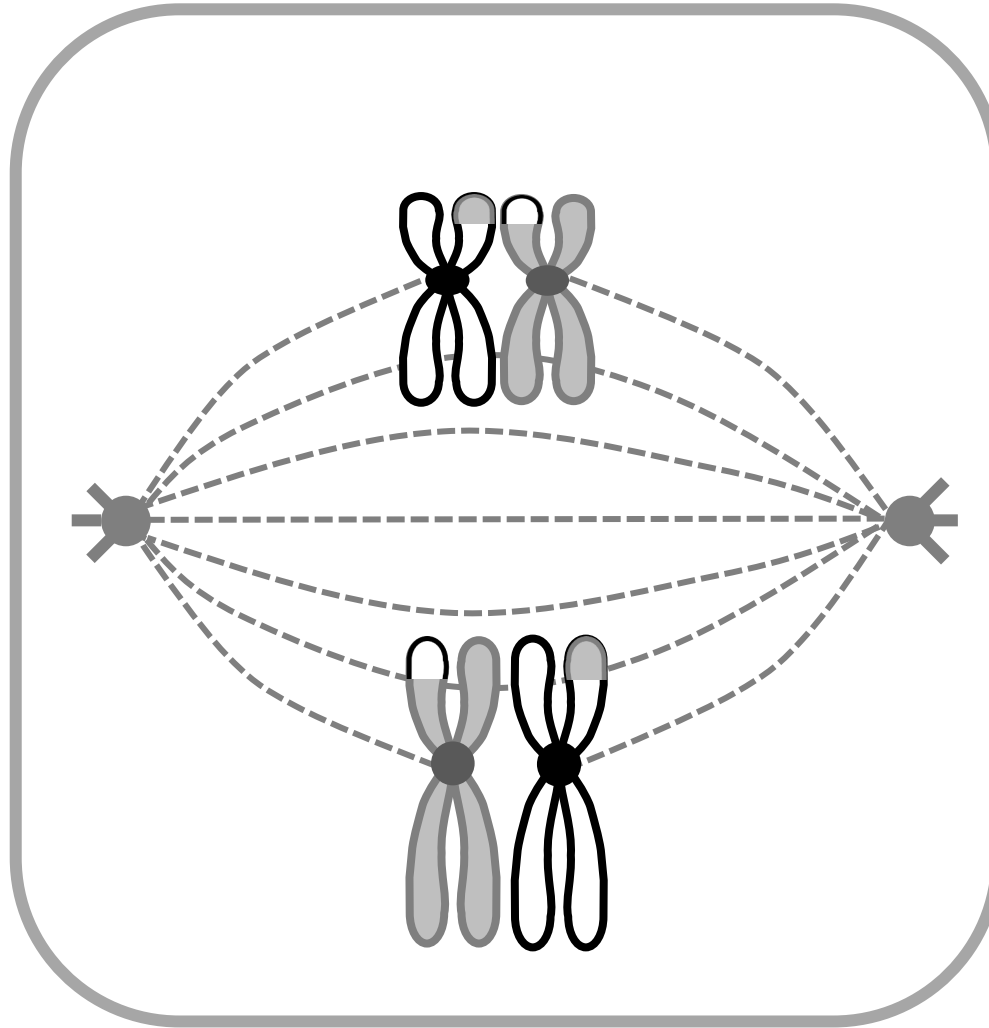


METAPHASE I – Draw this cell during Telophase I



METAPHASE I – Draw this cell during Telophase I

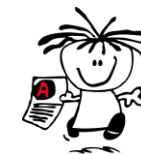
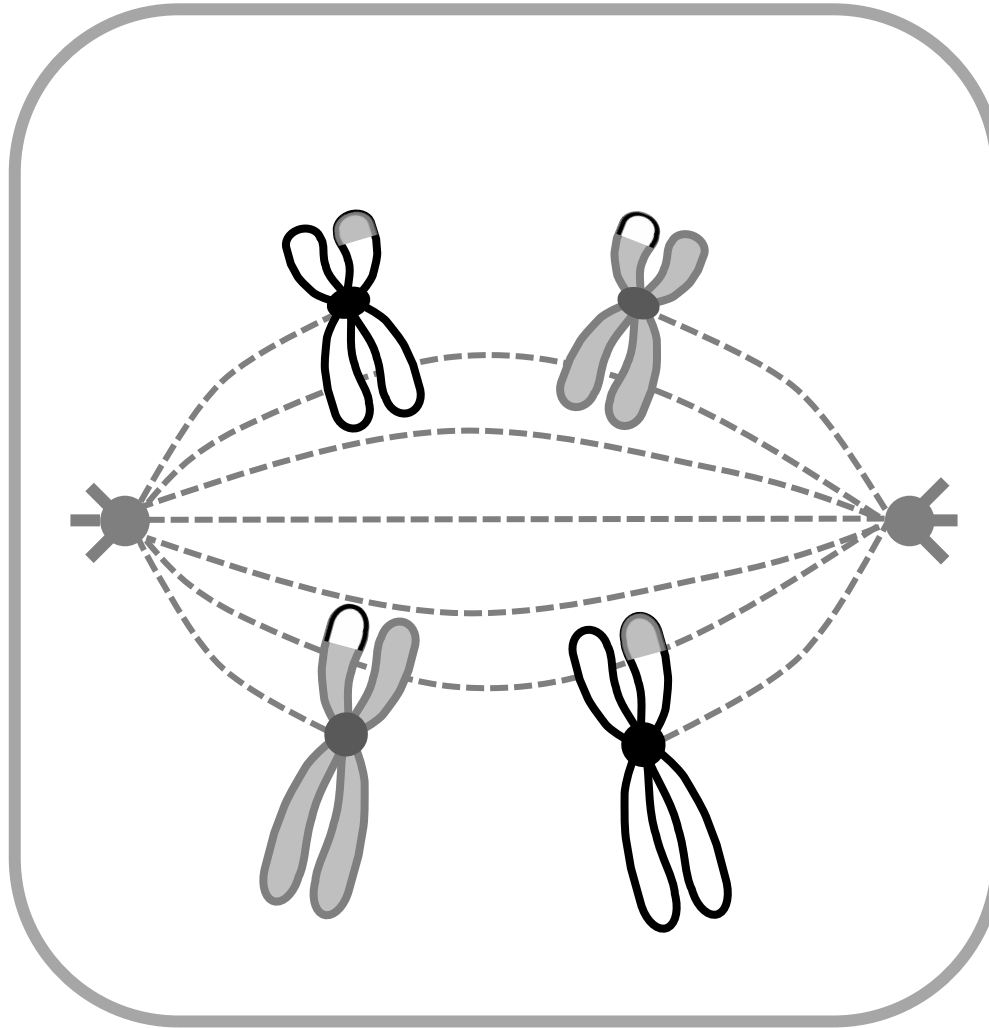
Visualise the
next few
phases:



METAPHASE I – Draw this cell during Telophase I

Visualise the
next few
phases:

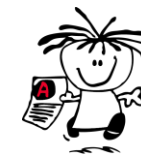
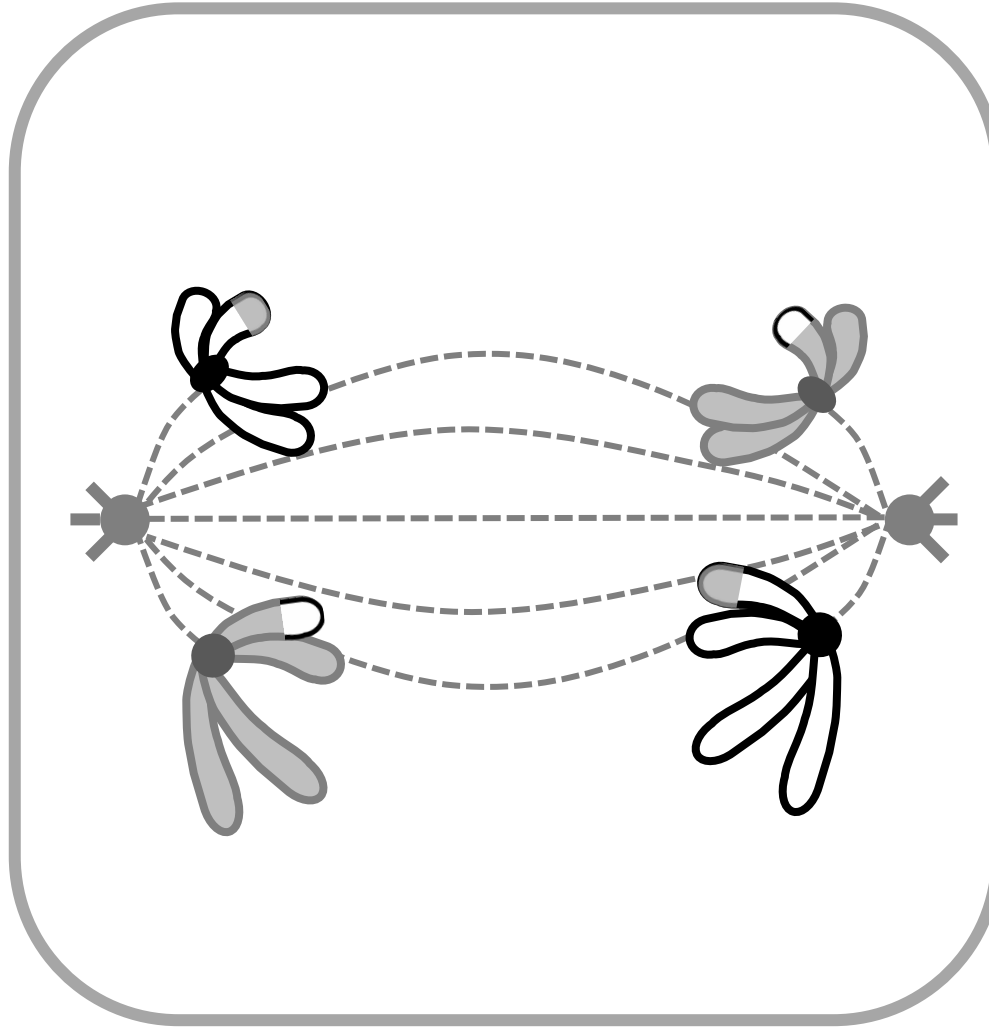
**ANAPHASE I
(beginning)**



METAPHASE I – Draw this cell during Telophase I

Visualise the
next few
phases:

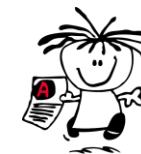
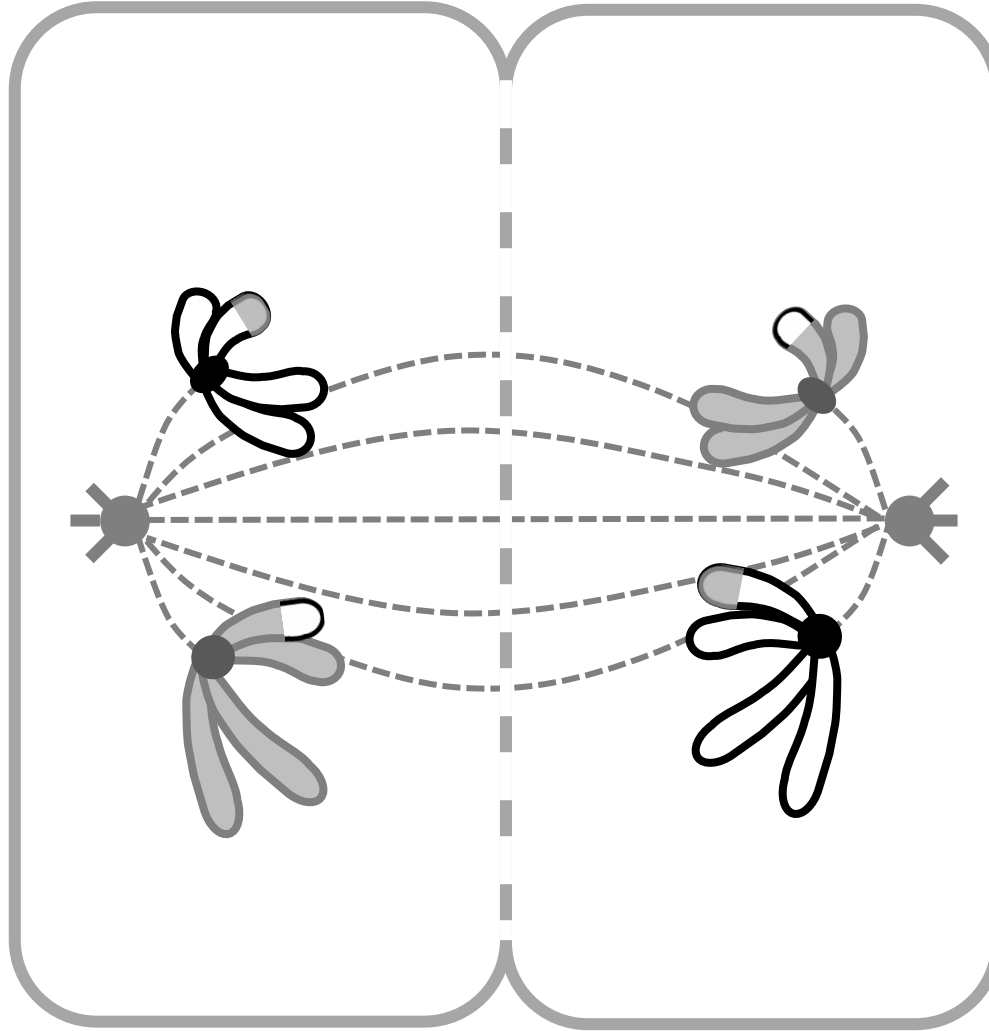
**ANAPHASE I
(end)**



METAPHASE I – Draw this cell during Telophase I

Visualise the
next few
phases:

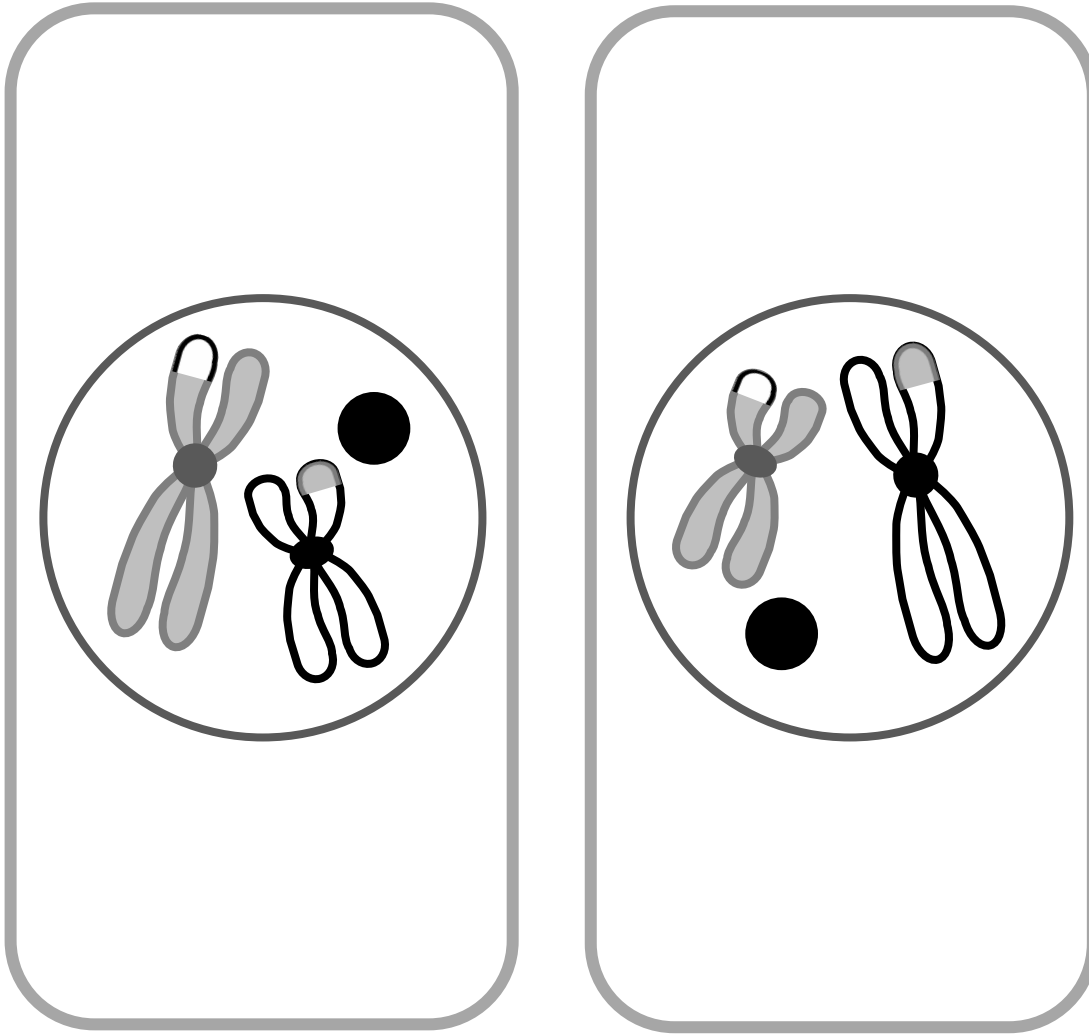
**TELOPHASE I
(beginning)**



METAPHASE I – Draw this cell during Telophase I

Visualise the next few phases:

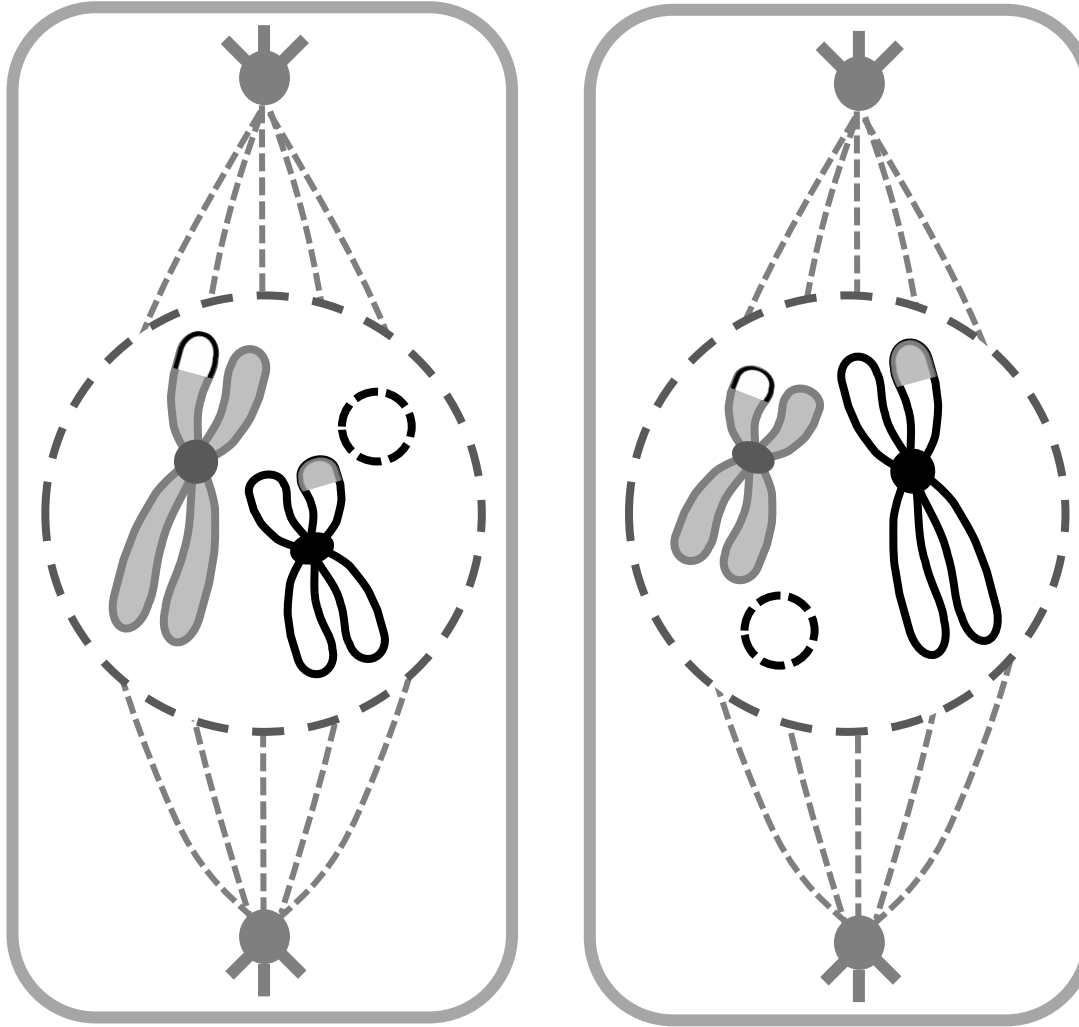
TELOPHASE I (end)



- ✓ Two cells shown
- ✓ Two chromosomes in each cell
- ✓ Shading of exchanged segments indicated
- ✓ Correct shading of chromatids in each cell

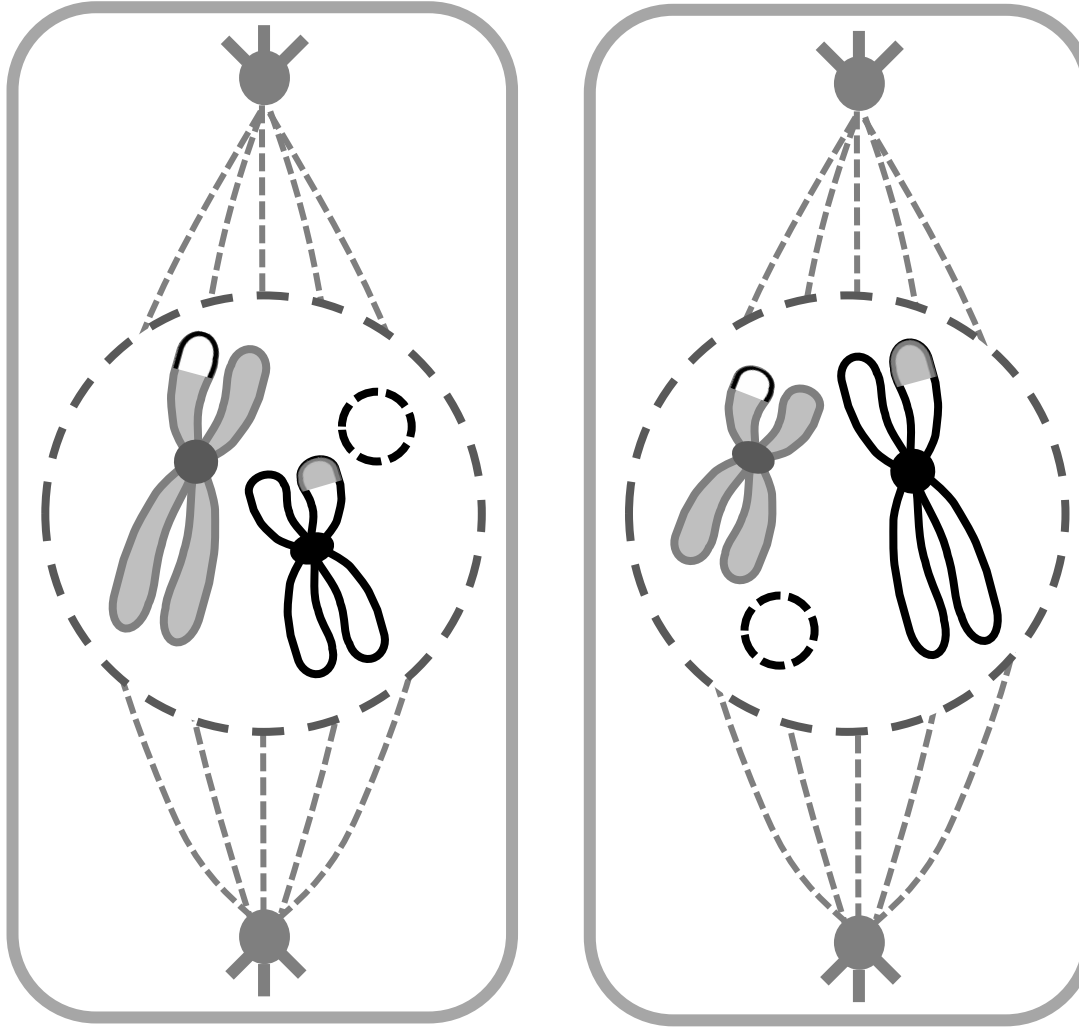


PROPHASE II



How many
chromosomes are
present in each of
these cells?

PROPHASE II



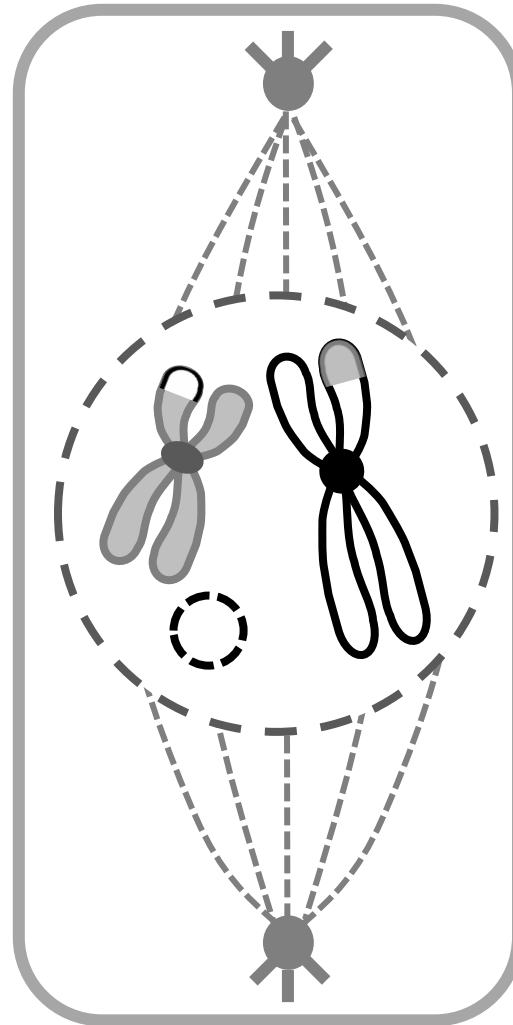
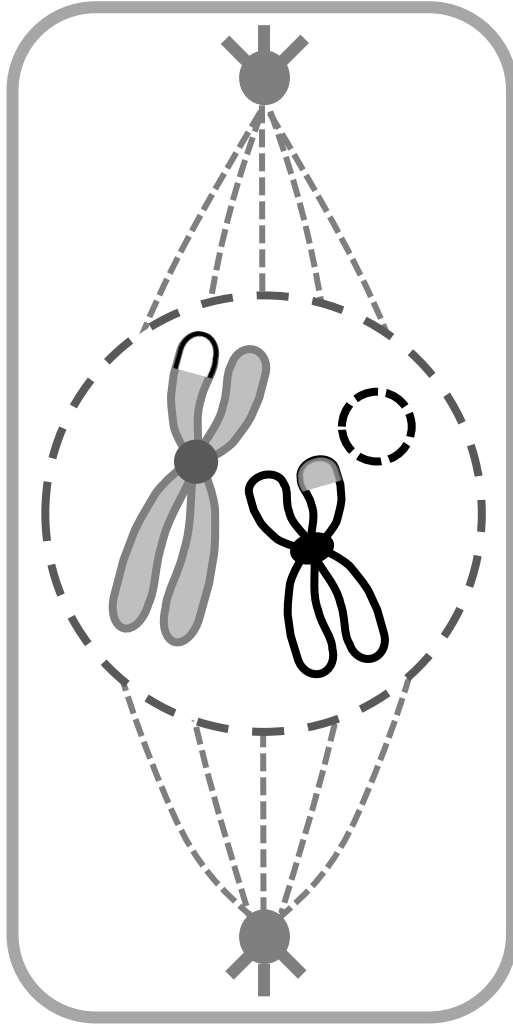
2

How many
chromatids are
present in each of
these cells?



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PROPHASE II



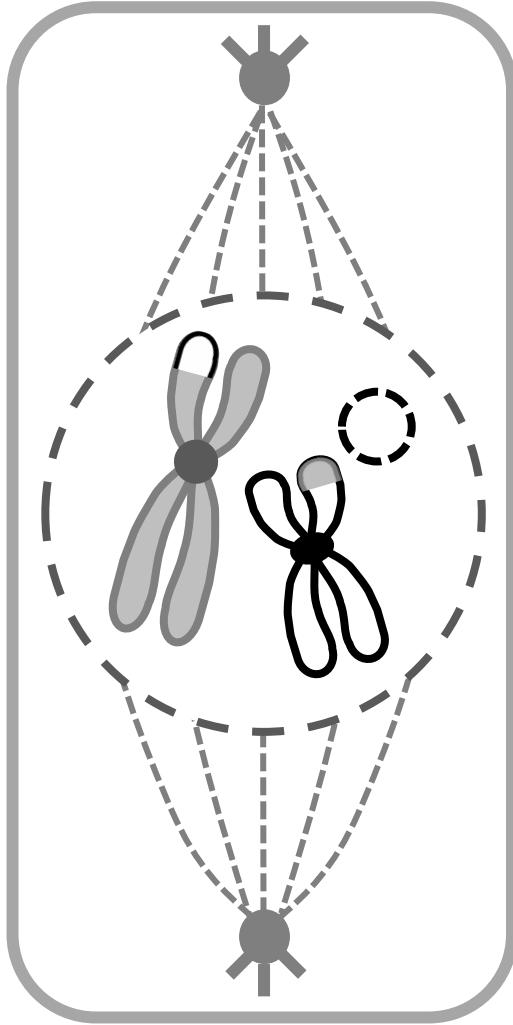
2

4

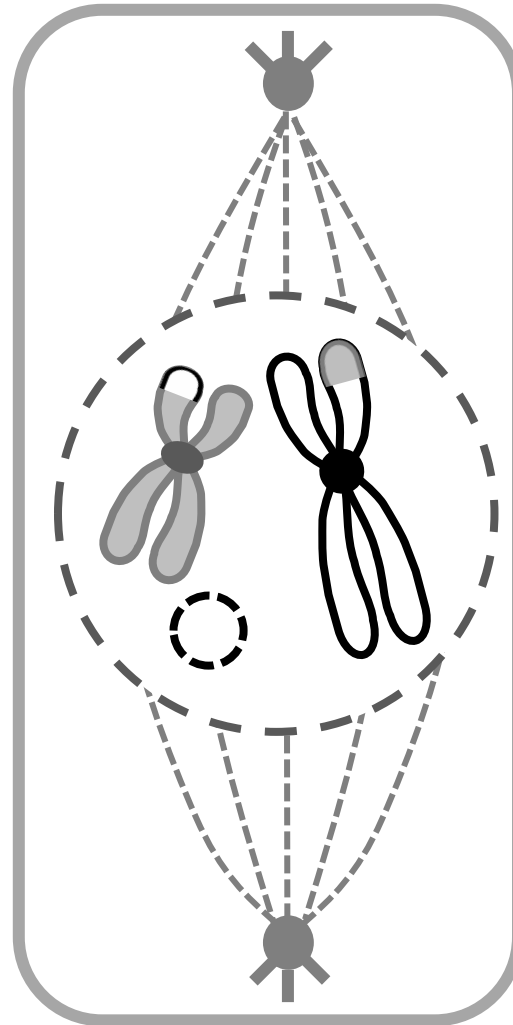


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PROPHASE II



CELL 1

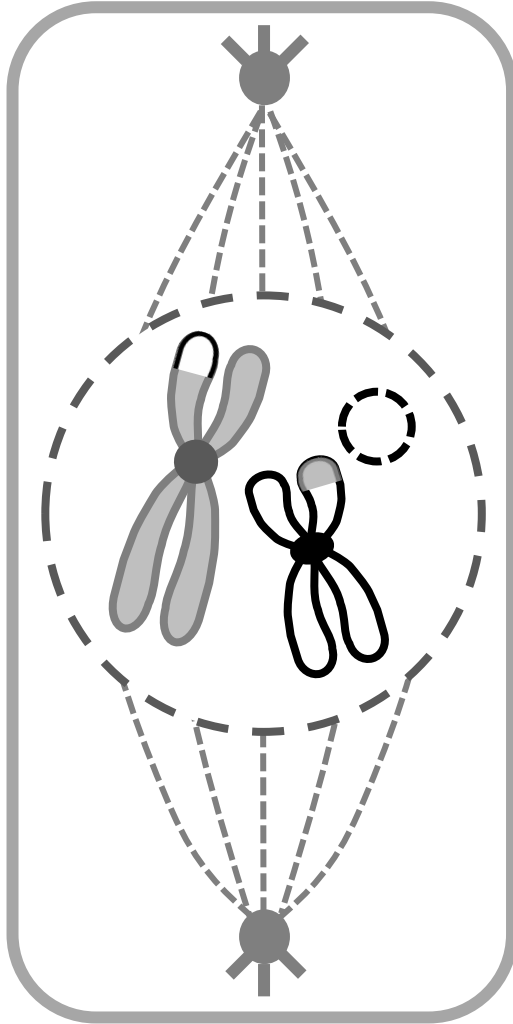


CELL 2

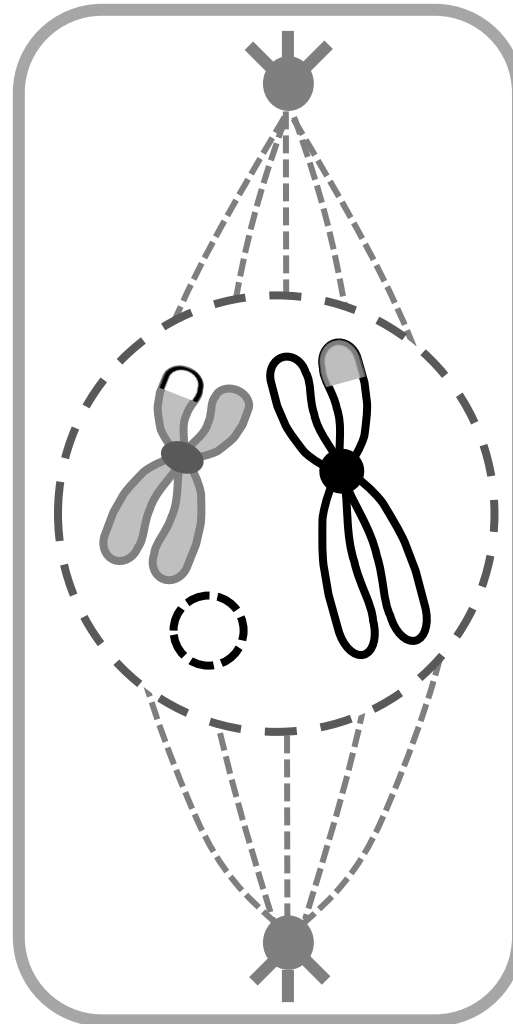
How many chromosomes will be present in each of the daughter cells that are produced from CELL 1 at the end of meiosis II?



PROPHASE II



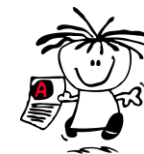
CELL 1



CELL 2

2

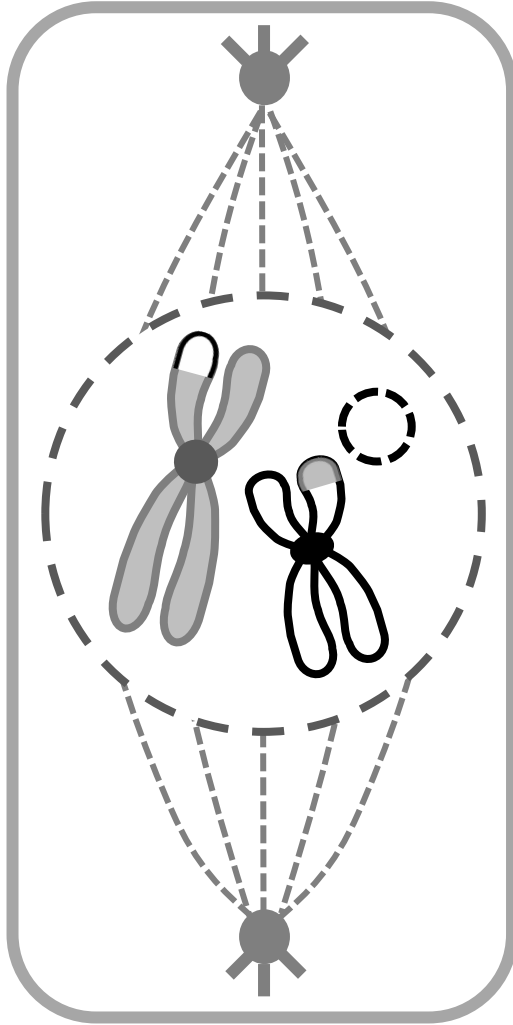
Draw a gamete
that will be
produced from
CELL 2.



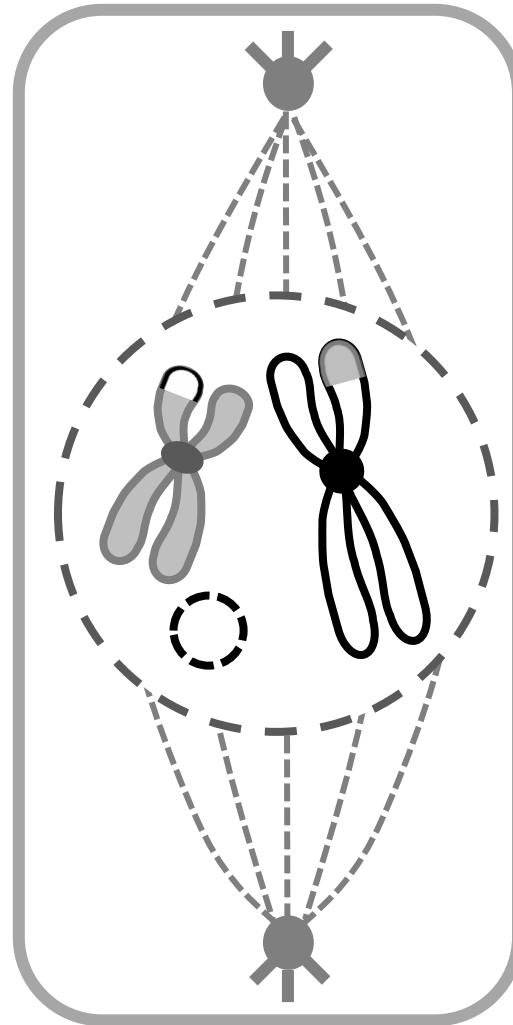
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PROPHASE II – Draw a gamete that will be produced by CELL 2

Visualise the
next few
phases:



CELL 1



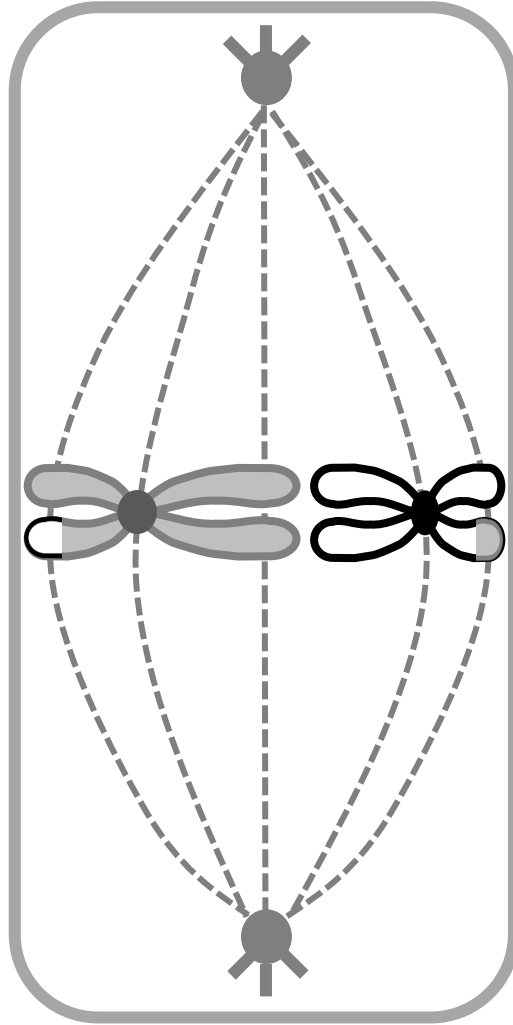
CELL 2



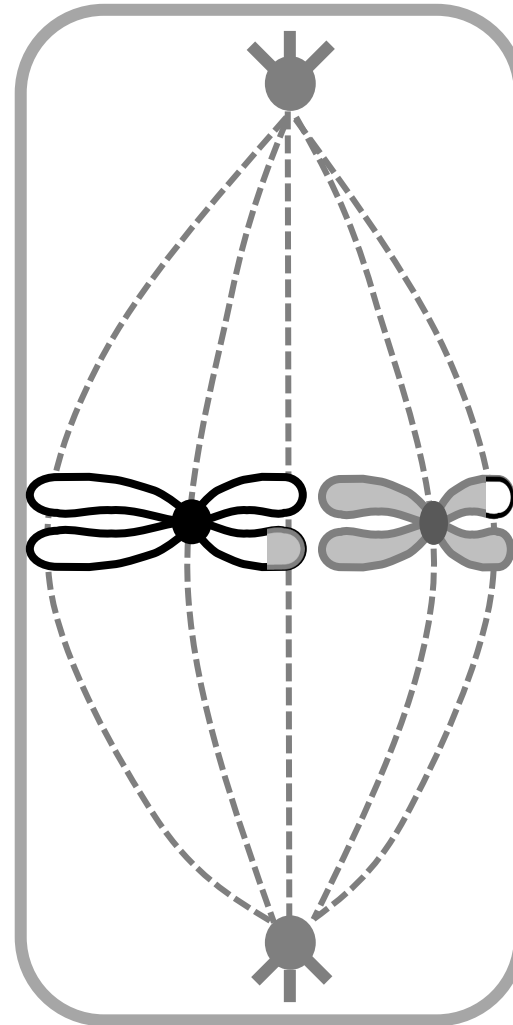
PROPHASE II – Draw a gamete that will be produced by CELL 2

Visualise the
next few
phases:

METAPHASE II



CELL 1



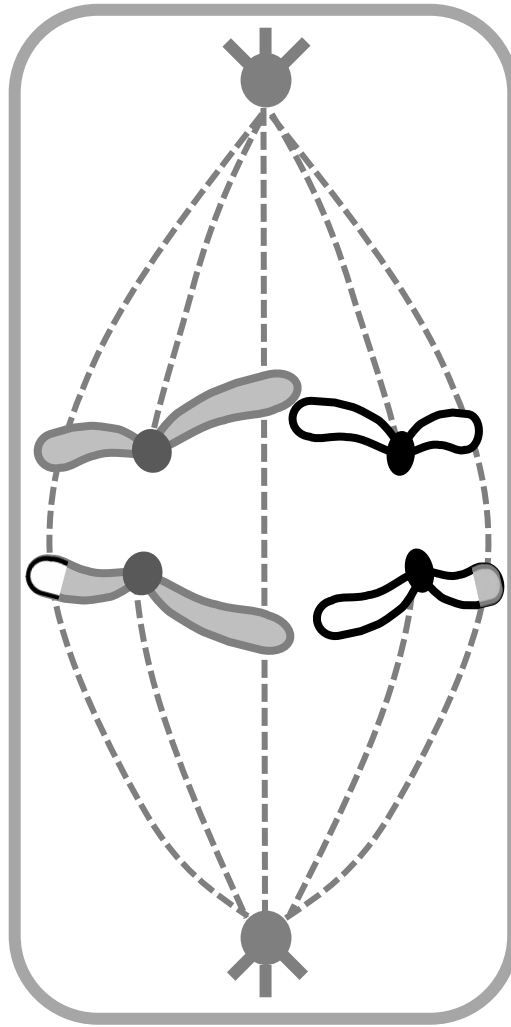
CELL 2



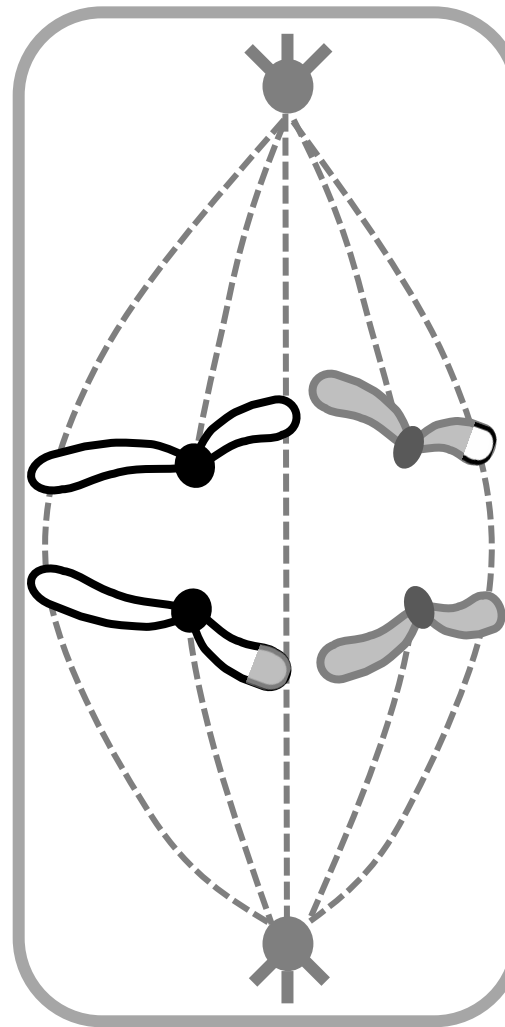
PROPHASE II – Draw a gamete that will be produced by CELL 2

Visualise the
next few
phases:

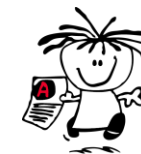
ANAPHASE II
(beginning)



CELL 1



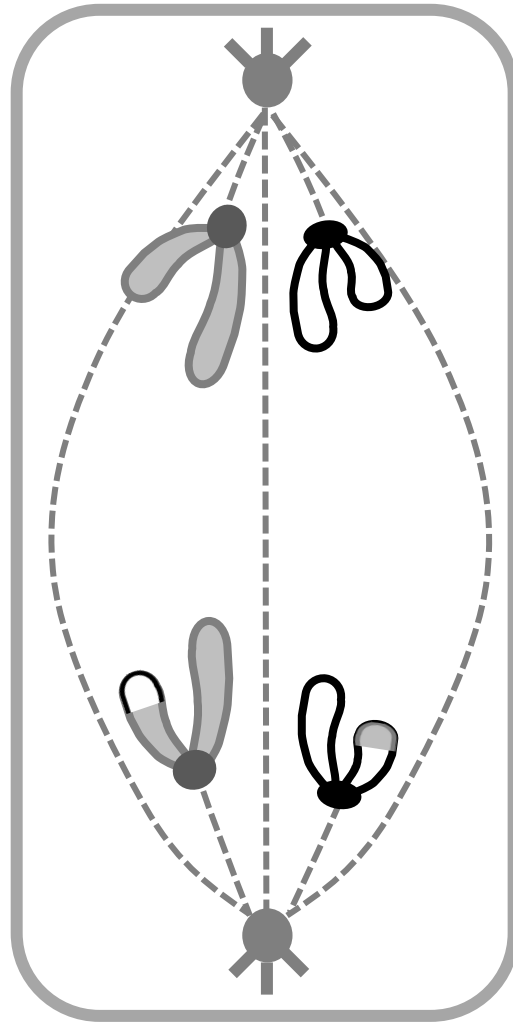
CELL 2



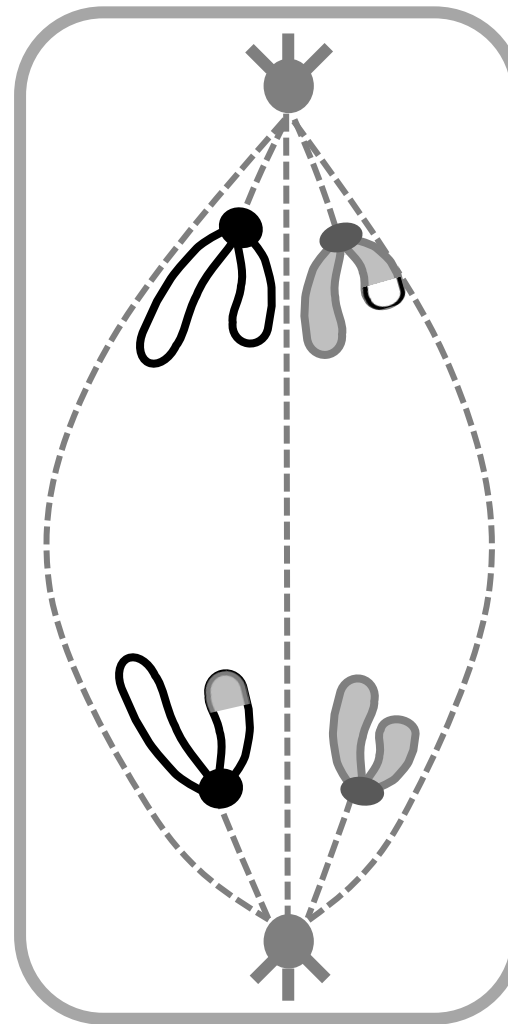
PROPHASE II – Draw a gamete that will be produced by CELL 2

Visualise the
next few
phases:

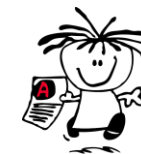
**ANAPHASE II
(end)**



CELL 1



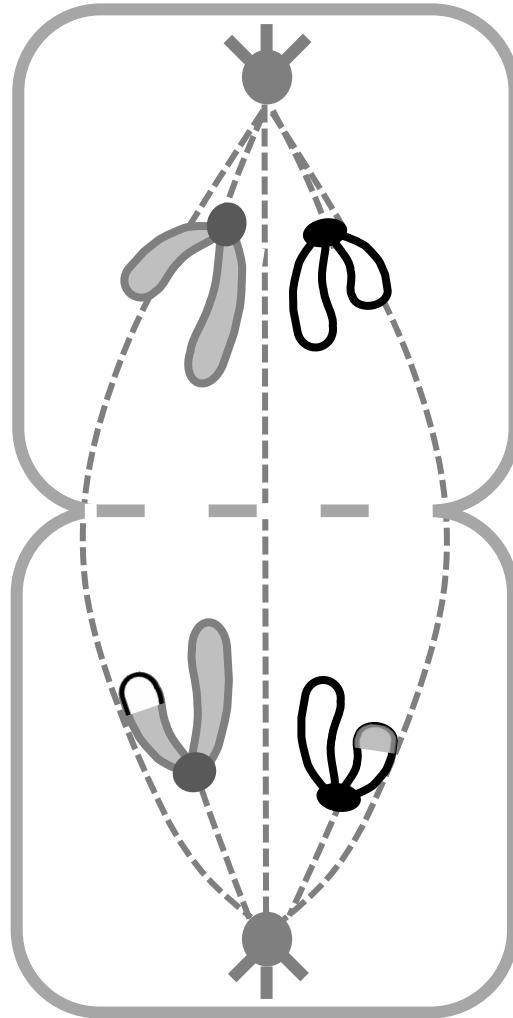
CELL 2



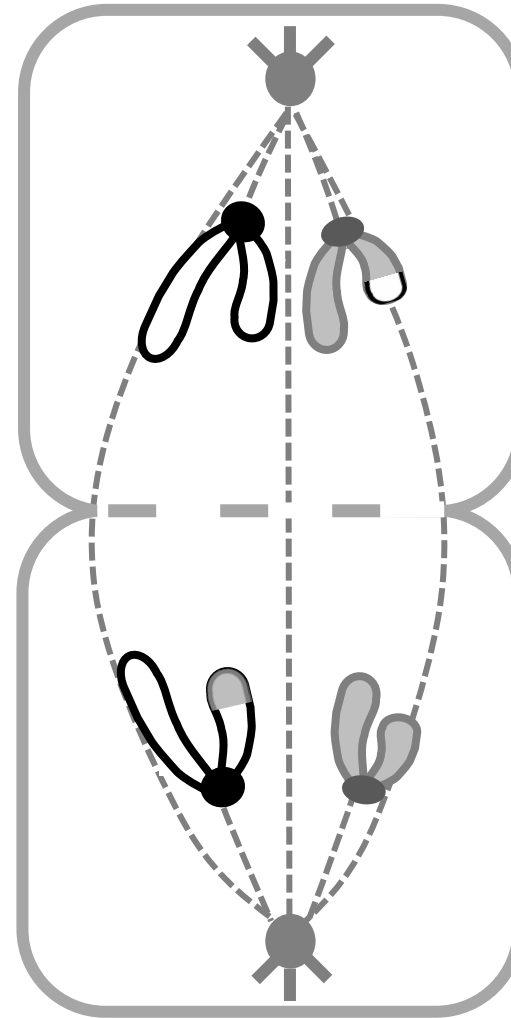
PROPHASE II – Draw a gamete that will be produced by CELL 2

Visualise the
next few
phases:

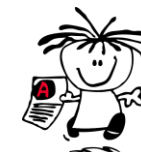
TELOPHASE II
(beginning)



CELL 1



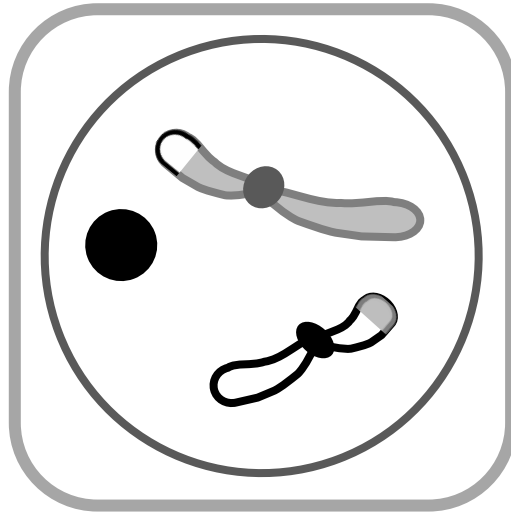
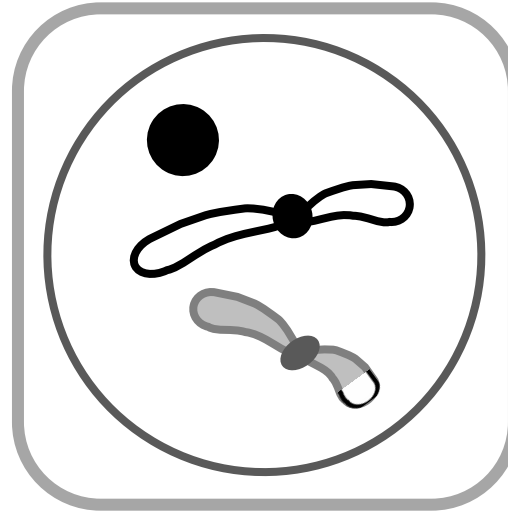
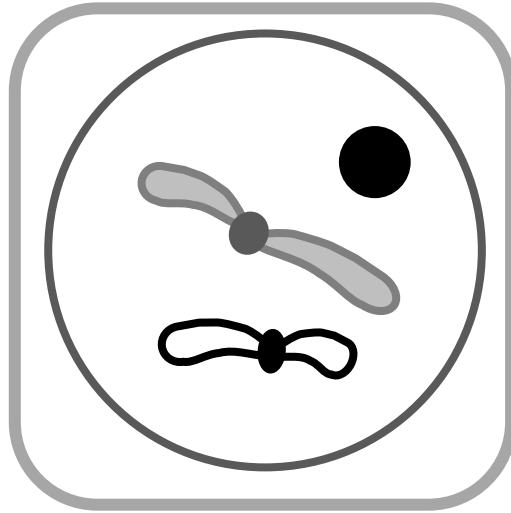
CELL 2



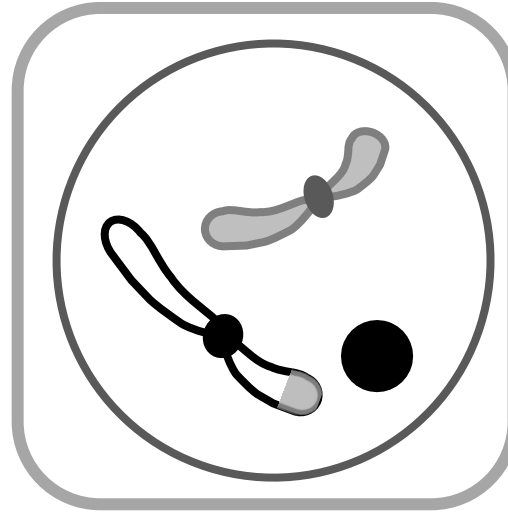
PROPHASE II – Draw a gamete that will be produced by CELL 2

Visualise the
next few
phases:

TELOPHASE II
(end)



CELL 1



CELL 2

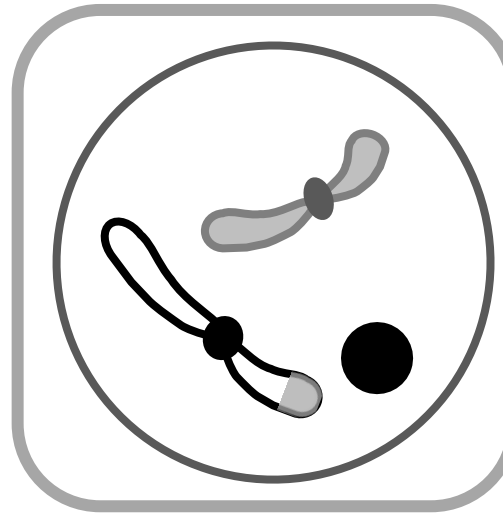
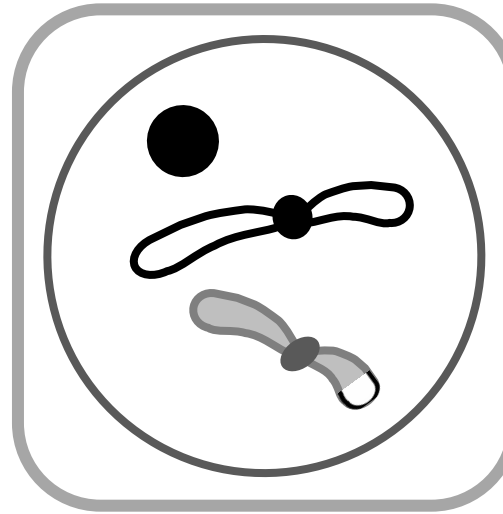


TELPOHASE II – Draw a gamete that will be produced by CELL 2

- ✓ One cell is drawn
- ✓ Only 2 unreplicated chromosomes present
- ✓ Short unreplicated chromosome with white segment in correct position
- ✓ Long unreplicated chromosome all white

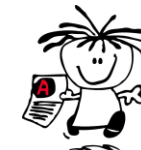
OR

- ✓ One cell is drawn
- ✓ Only 2 unreplicated chromosomes present
- ✓ Short unreplicated chromosome all grey
- ✓ Long unreplicated chromosome with grey segment in correct position



CELL 2

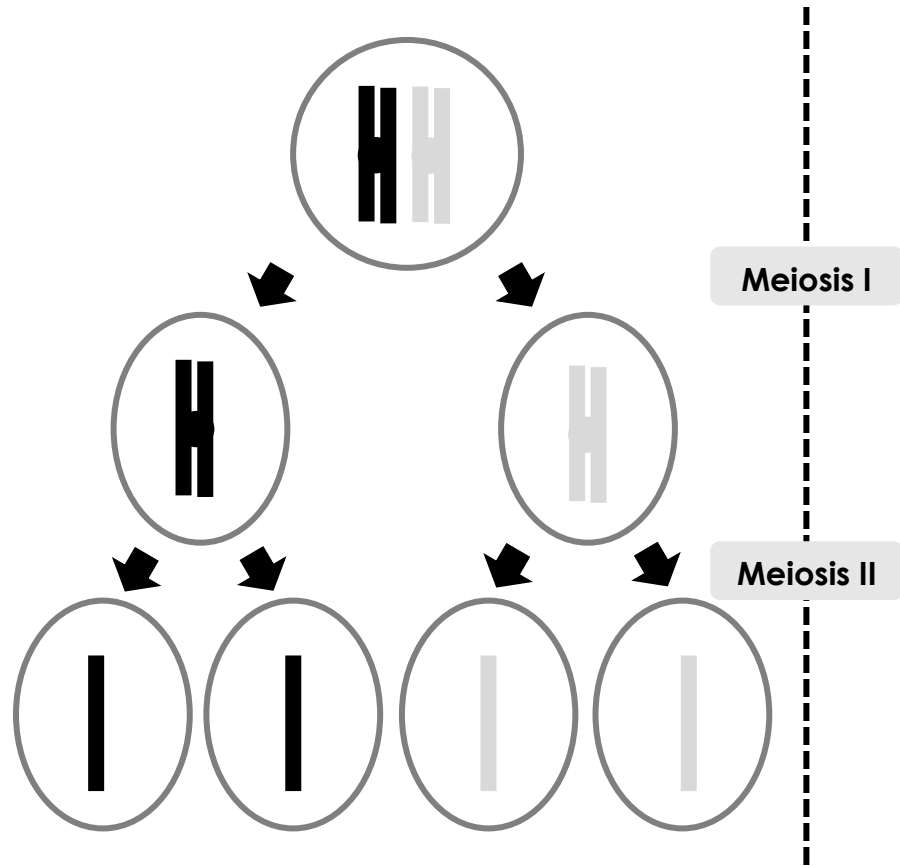
**NOTE: There are two possible gametes – draw any ONE*



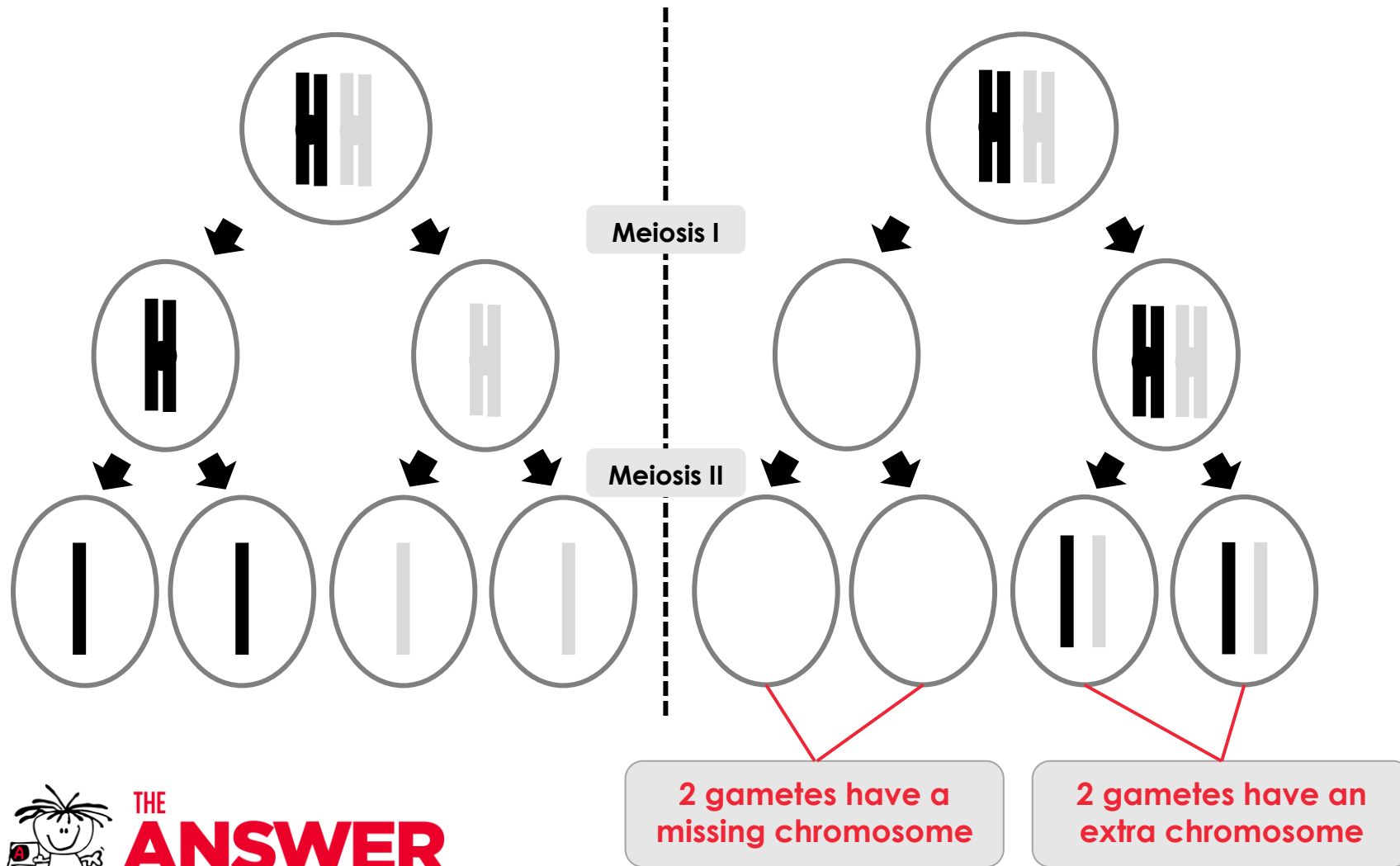
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ABNORMAL MEIOSIS

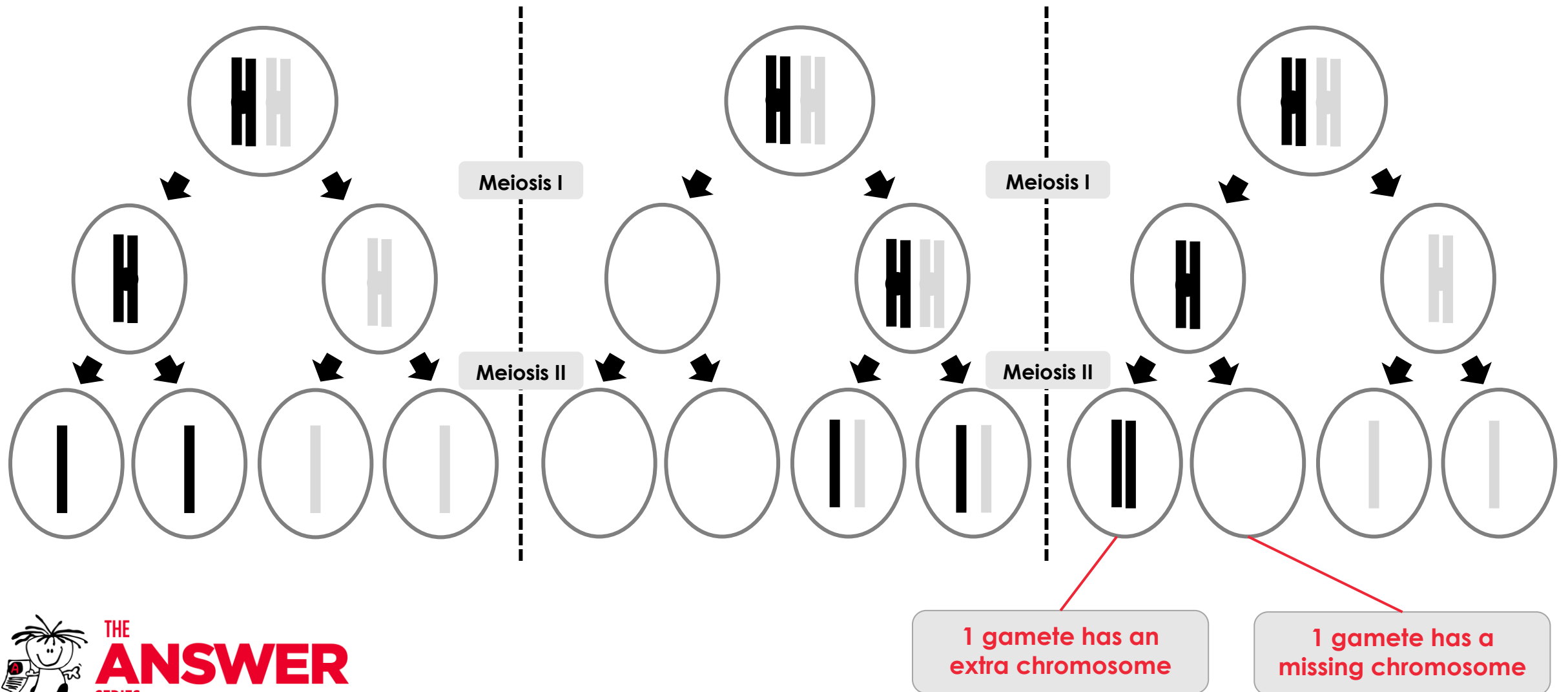
Normal disjunction during meiosis is shown.



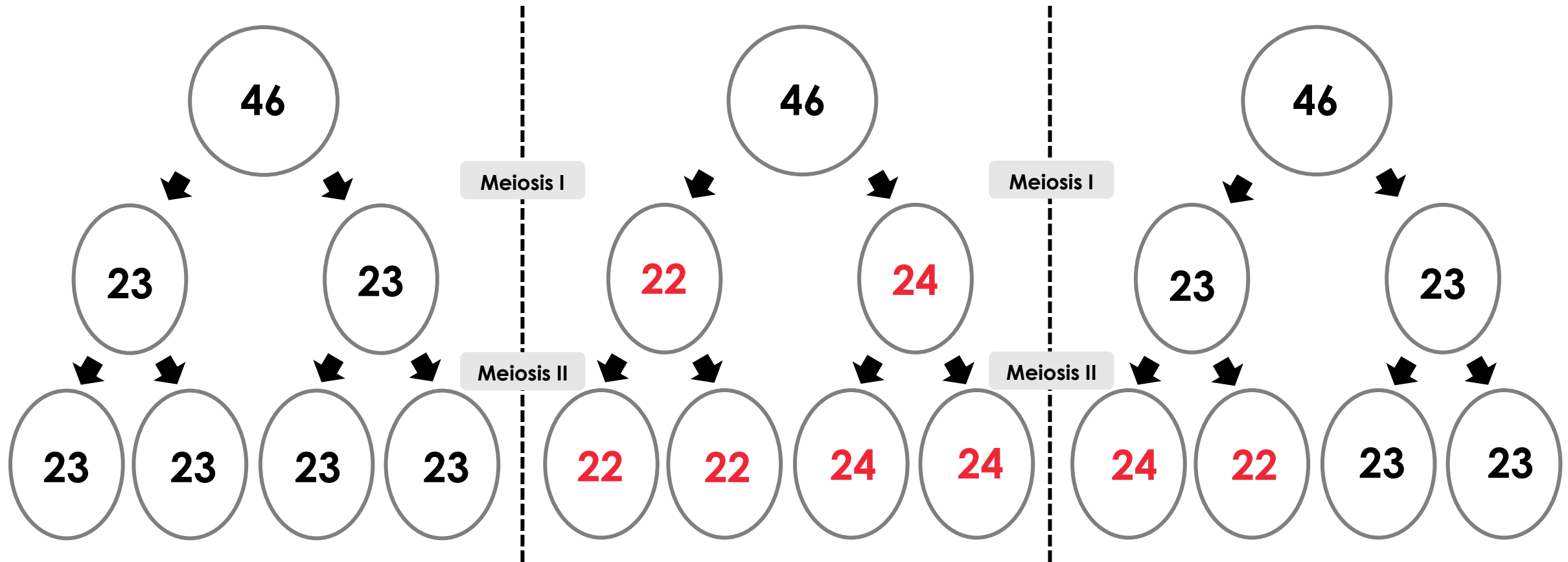
What happens when **non-disjunction** occurs in **meiosis I**?



What happens when **non-disjunction** occurs in **meiosis II**?



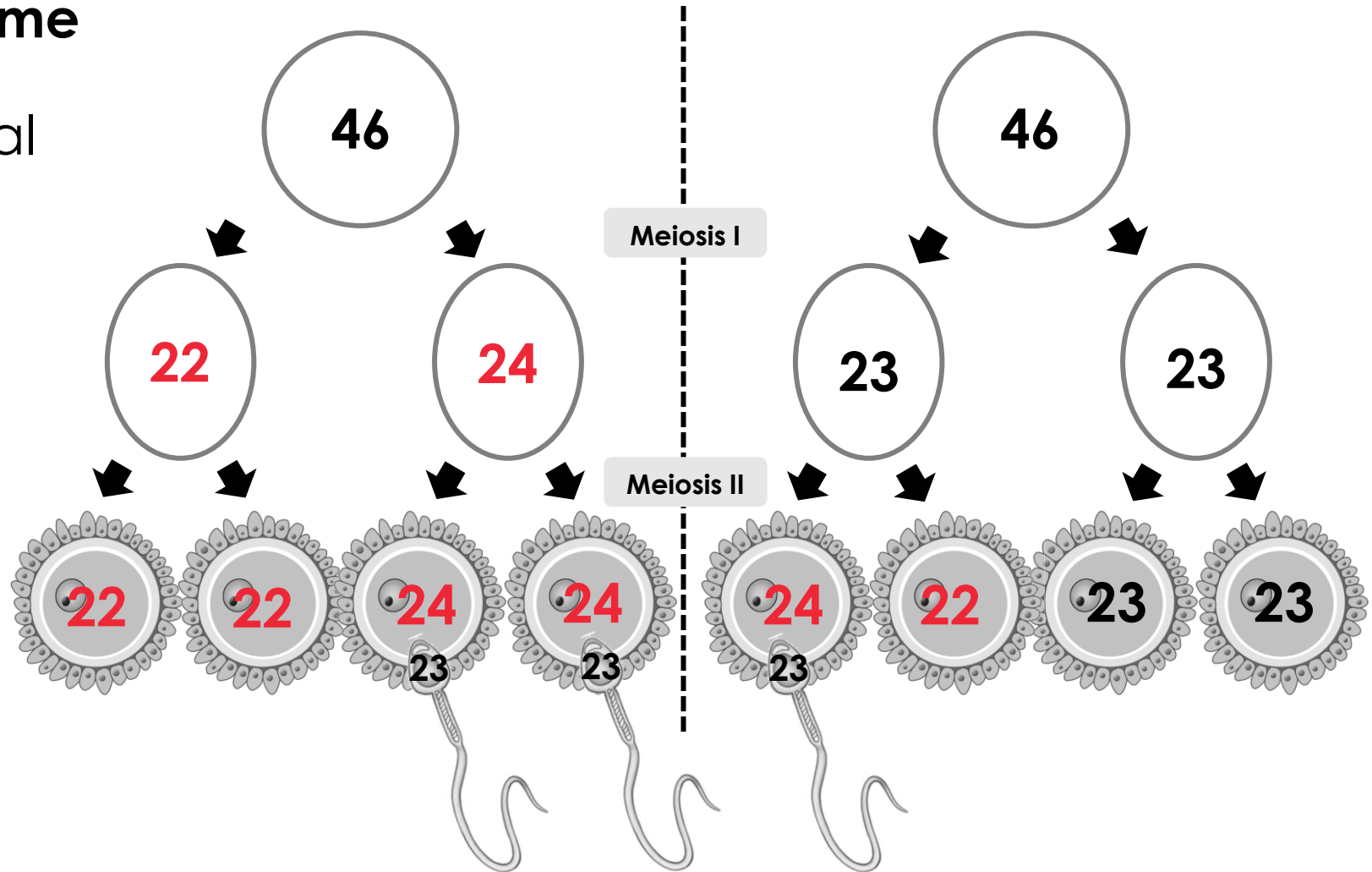
Non-disjunction causes **chromosome mutations** – a change in the structure or **number of chromosomes in a cell**.



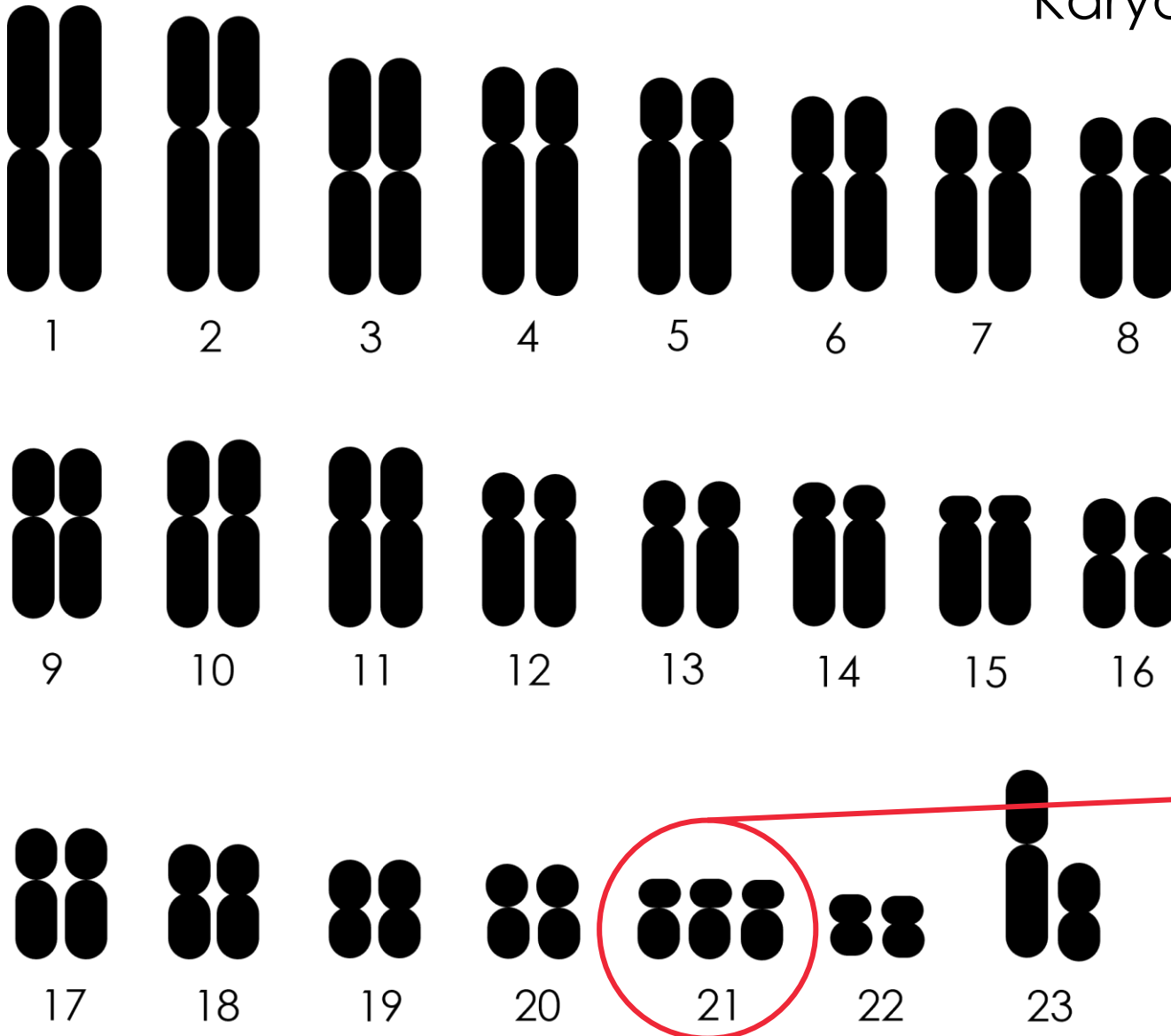
Non-disjunction of certain chromosomes leads to specific **genetic disorders**, e.g.

- non-disjunction of **chromosome 21**
- causes **Down Syndrome**

Fertilisation by a normal sperm cell leads to an individual with **47 chromosomes** ($2n$)



Karyotype for Down Syndrome

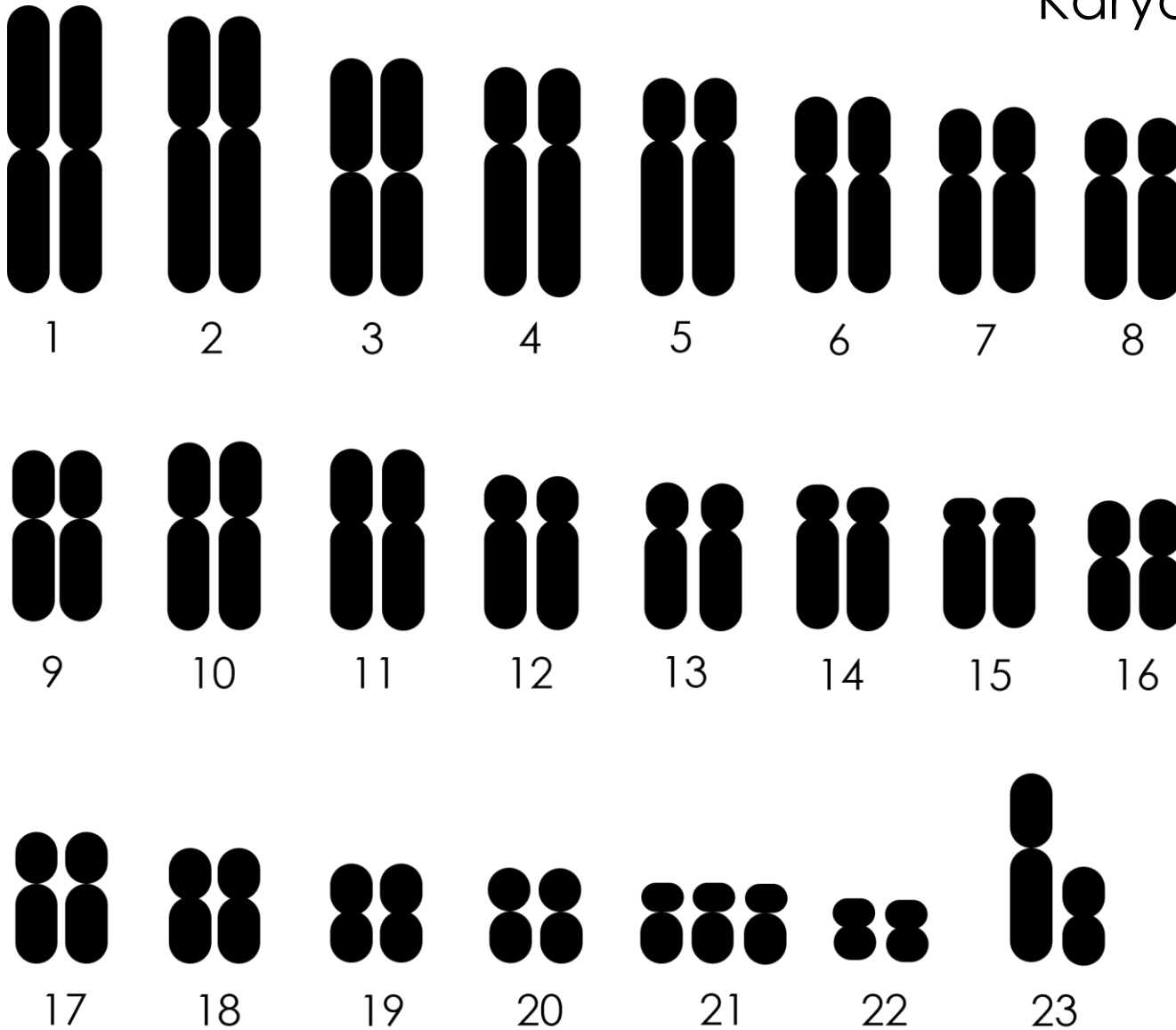


**3 copies of
chromosome 21**

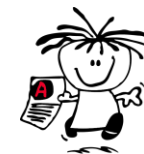


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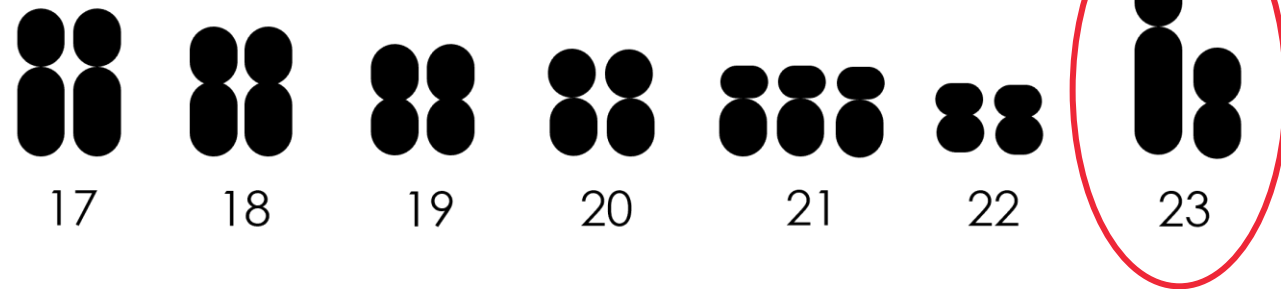
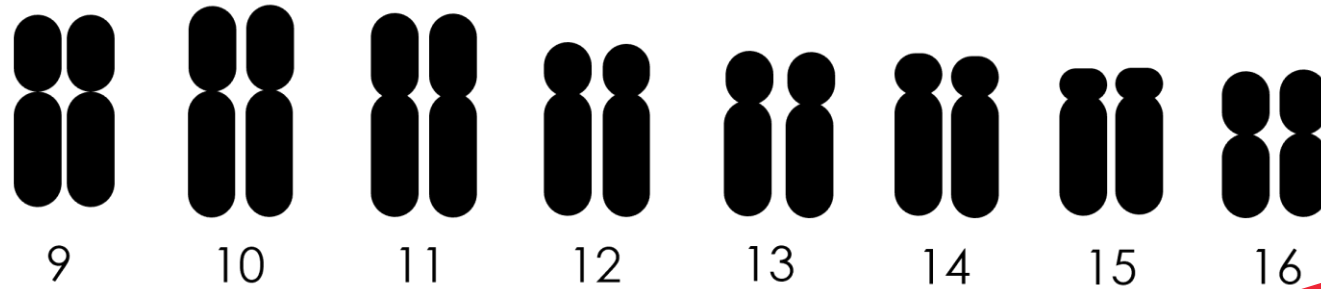
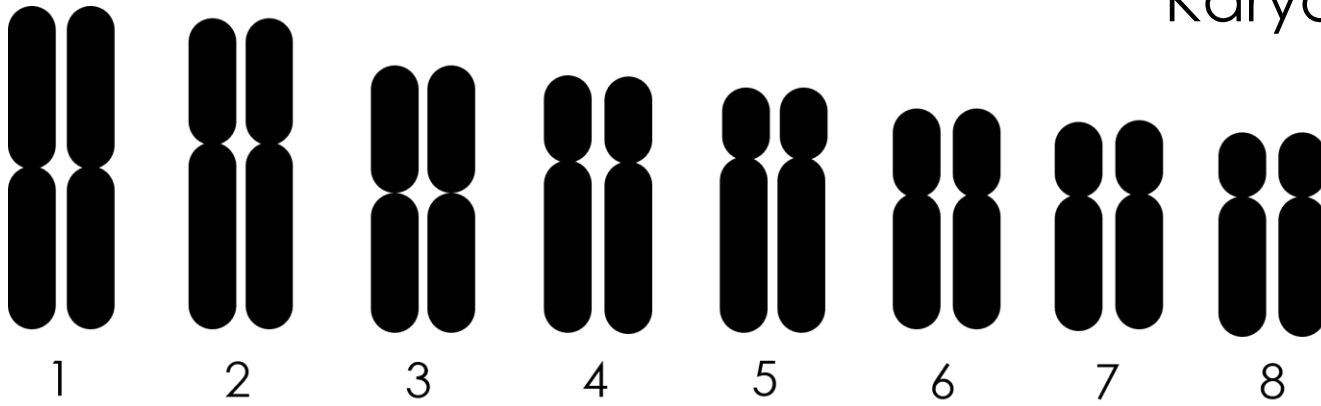
Karyotype for Down Syndrome



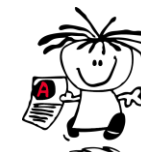
Is this individual with Down Syndrome a male or female?



Karyotype for Down Syndrome



male



END