11–3 Exploring Mendelian Genetics

A Summary of Mendel's Principles

- Genes are passed from parents to their offspring.
- If two or more forms (alleles) of the gene for a single trait exist, some forms of the gene may be dominant and others may be recessive.

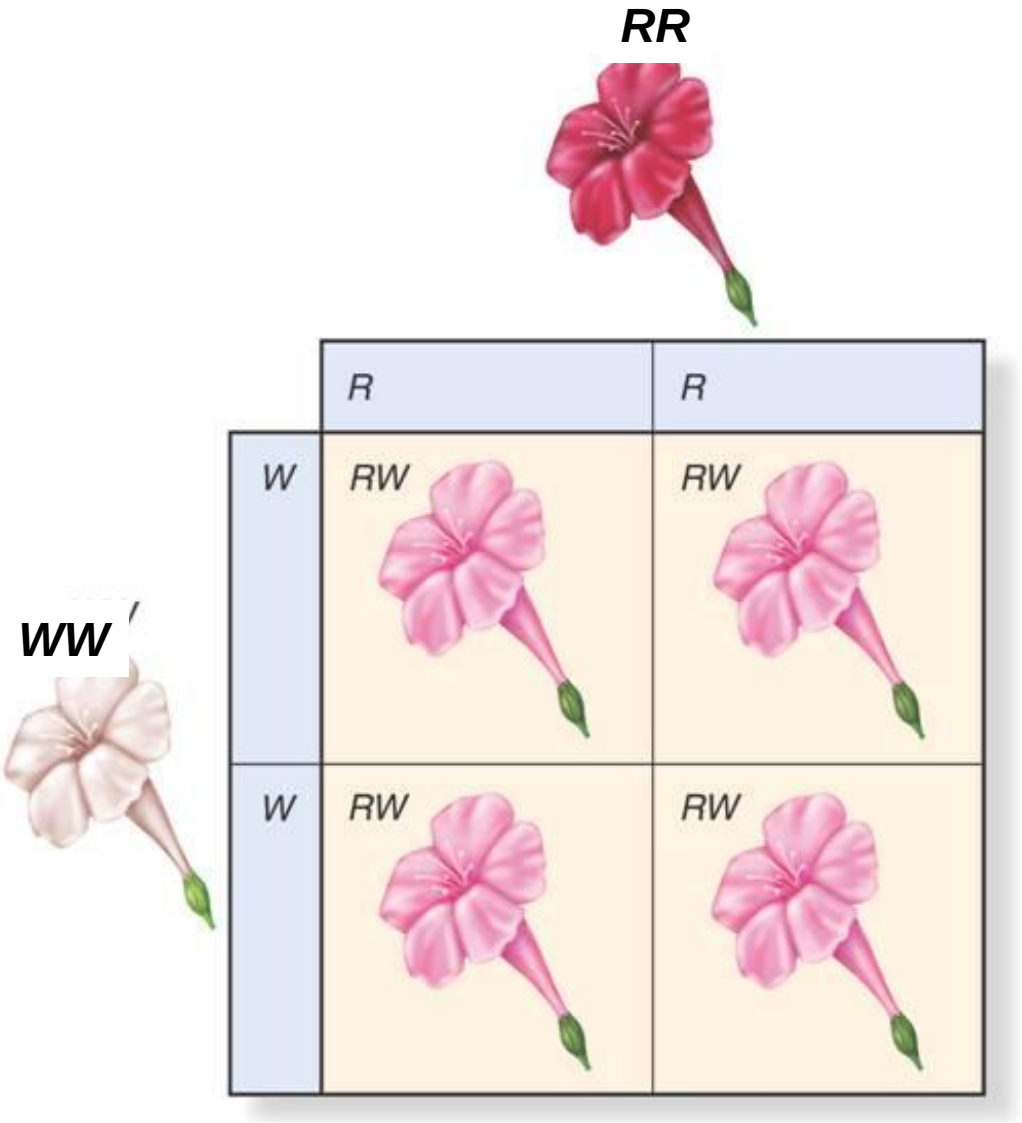
- In most sexually reproducing organisms, each adult has two copies of each gene. These genes are segregated from each other when gametes are formed.
- The alleles for different genes usually segregate independently of one another.

Some alleles are neither dominant nor recessive, and many traits are controlled by multiple alleles or multiple genes.

Incomplete Dominance

→one allele is not completely dominant over another.

→the heterozygous phenotype is between the two homozygous phenotypes.



Codominance

→both alleles contribute to the phenotype.

→the allele for black feathers in some variety of chicken, is codominant with the allele for white feathers.

→Heterozygous chickens are speckled with both black and white feathers.

Multiple Alleles

→a gene with more than two alleles.

→An individual can't have more than two alleles.
→More than two possible alleles can exist in a population.

Ex: rabbit's coat color is determined by a single gene that has at least four different alleles.

Different combinations of alleles result in the colors shown here.

Albino: cc

KEY

C = full color; dominant to all other alleles

c^{ch} = chinchilla; partial defect in pigmentation; dominant to c^h and c alleles

c^h = Himalayan; color in certain parts of the body; dominant to c allele

c = albino; no color; recessive to all other alleles

Polygenic Traits

→Traits controlled by two or more

Ex: Skin color in humans is a polygenic trait controlled by more than four different genes.

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2 Traits controlled by two or more genes are called

a. multiple-allele traits.

b. polygenic traits.

A c. codominant traits.

d. hybrid traits.

3 In four o'clock flowers, the alleles for red flowers and white flowers show incomplete dominance. Heterozygous four o'clock plants have

A a. pink flowers.

b. white flowers.

c. half white flowers and half red flowers.

d. red flowers.

4 A white male horse and a tan female horse produce an offspring that has large areas of white coat and large areas of tan coat. This is an example of

a. incomplete dominance.

b. multiple alleles.

A c. codominance.

d. a polygenic trait.

5 Mendel's principles apply to

a. pea plants only.

b. fruit flies only.

A c. all organisms.

d. only plants and animals.

11-4 Meiosis

Phases of Meiosis

Meiosis is a process of reduction division in which the number of chromosomes per cell is cut in half through the separation of homologous chromosomes in a diploid cell.

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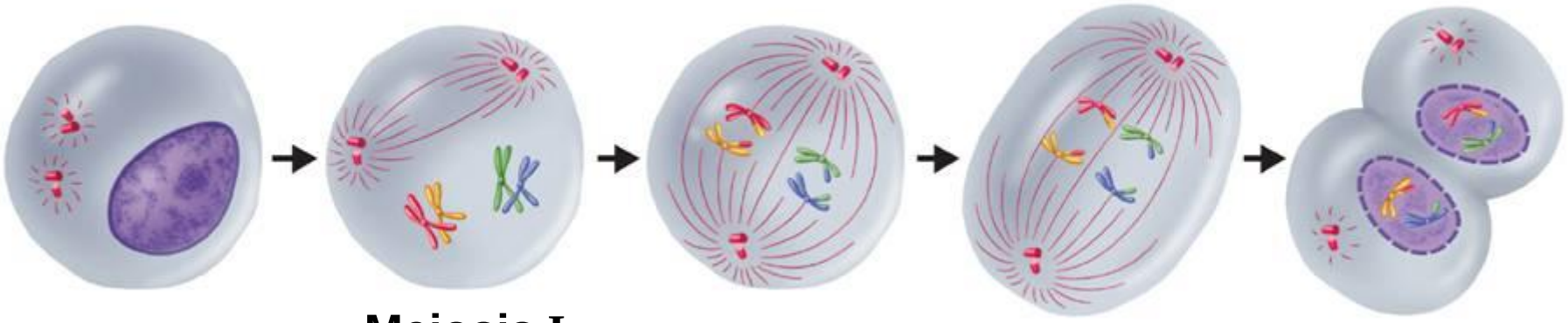
Meiosis I



Meiosis I

Interphase I

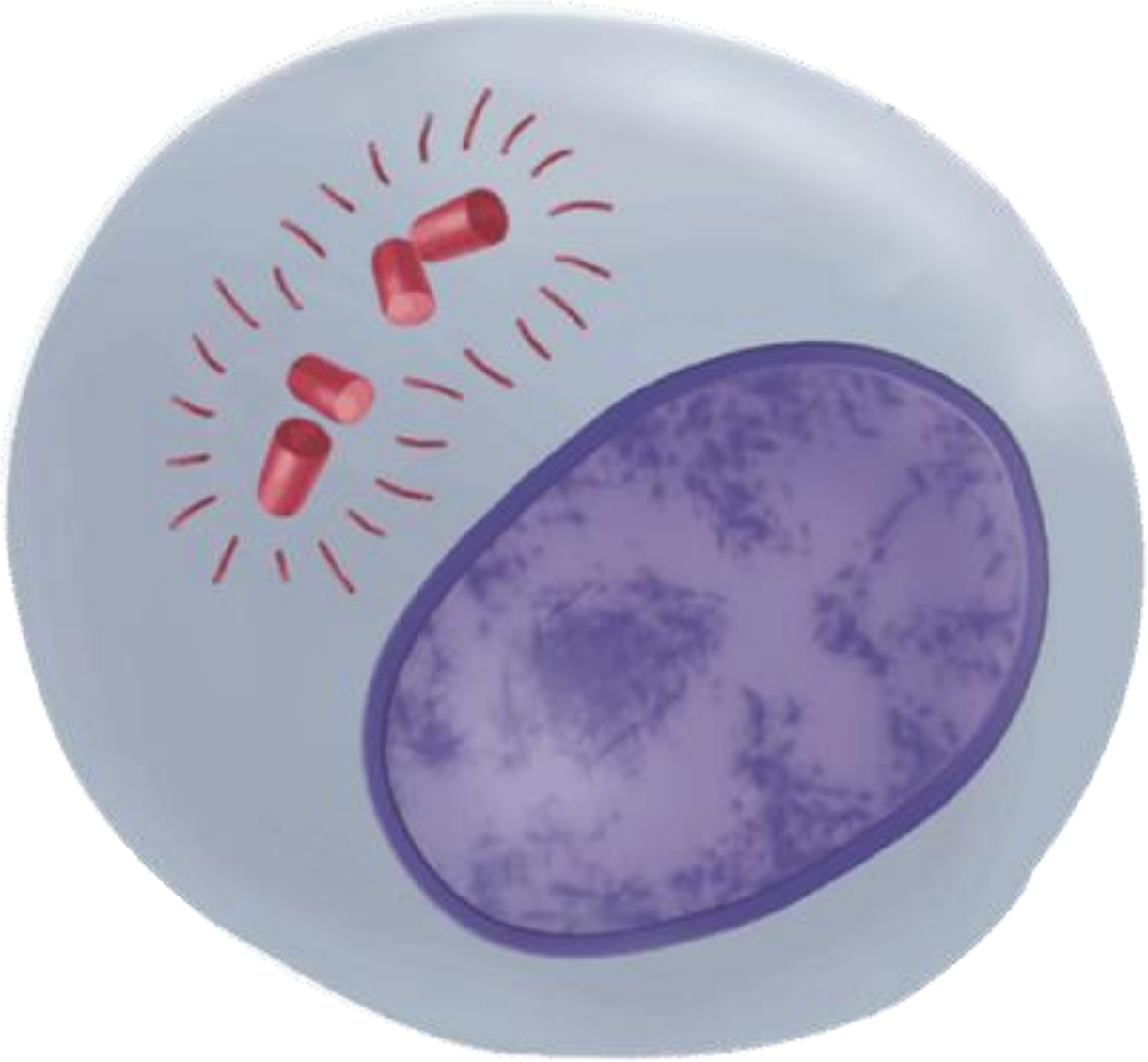
Prophase I

Metaphase I

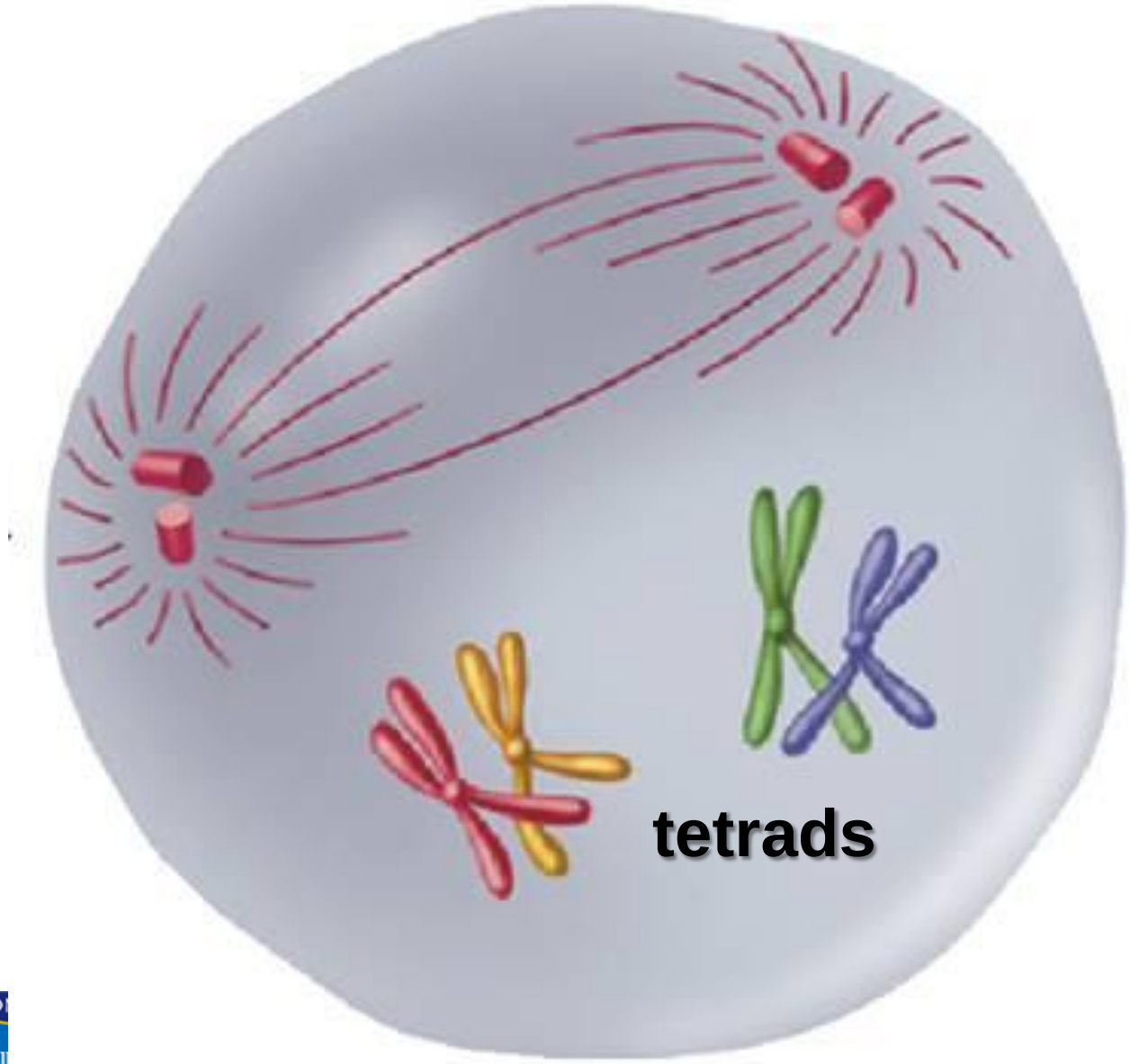
Anaphase I

Telophase I and Cytokinesis

Interphase I



MEIOSIS I
Prophase I



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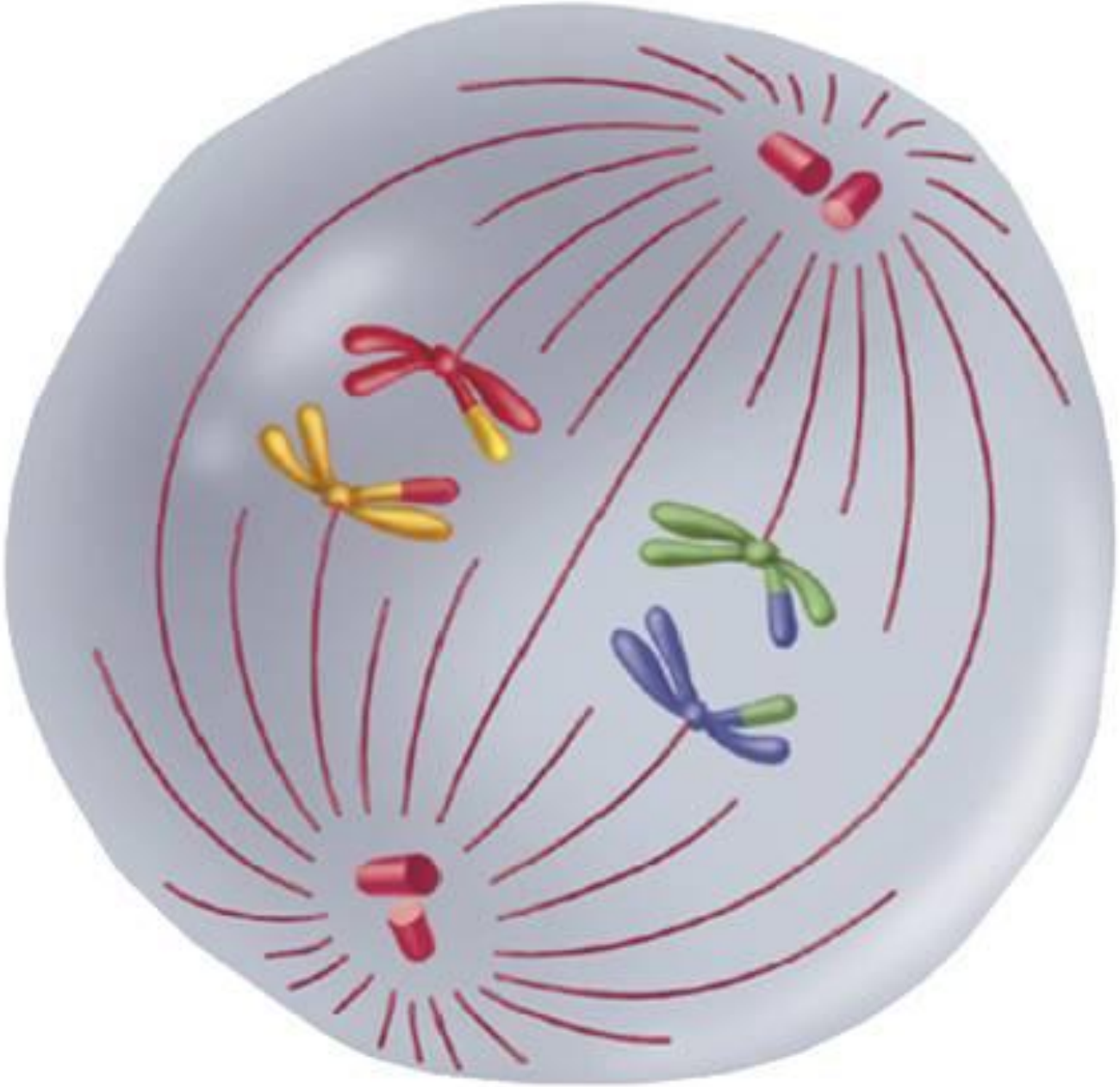
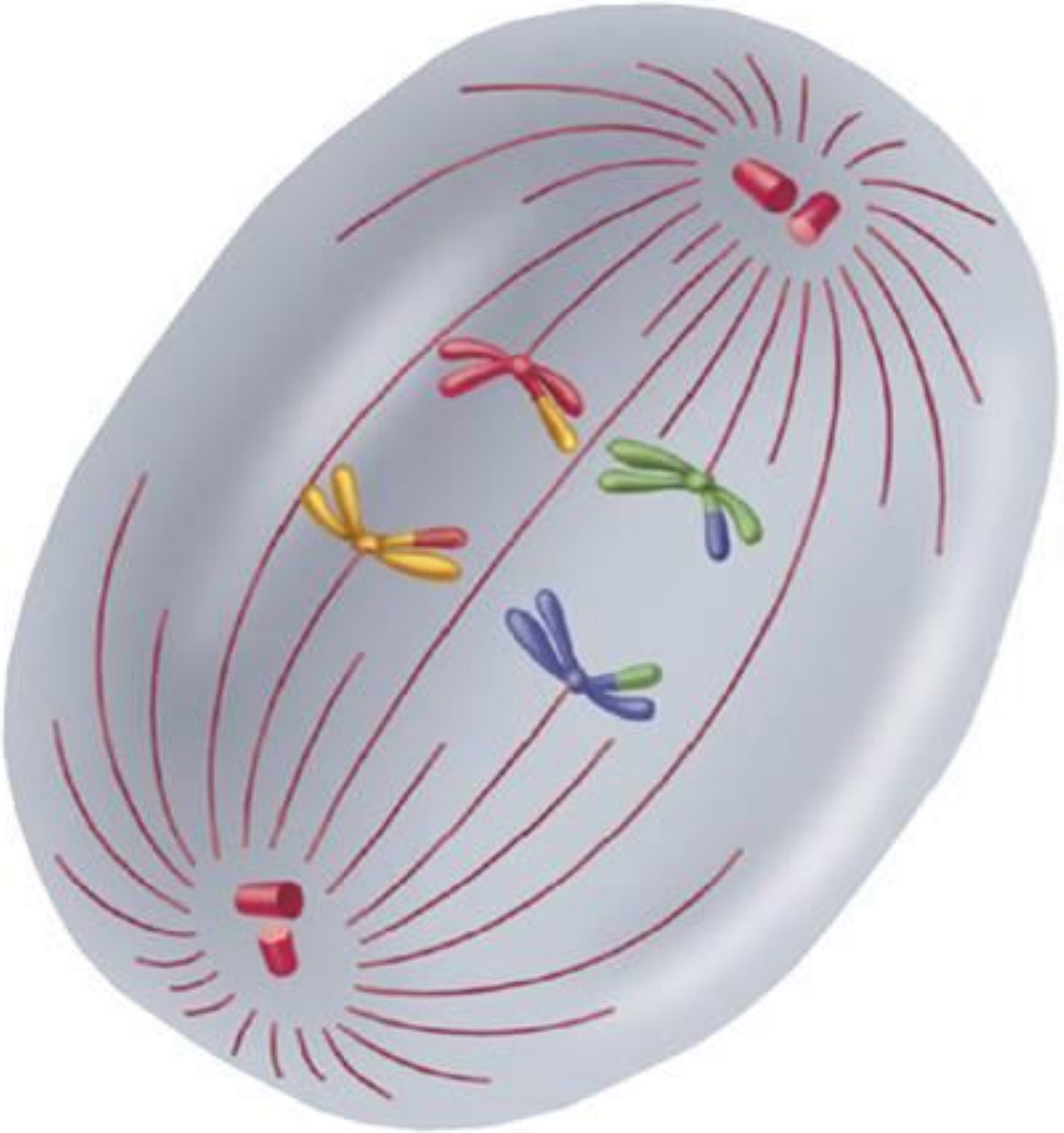
When homologous chromosomes form tetrads in meiosis I, they exchange portions of their chromatids in a process called **crossing-over**.

Crossing-over produces new combinations of alleles.

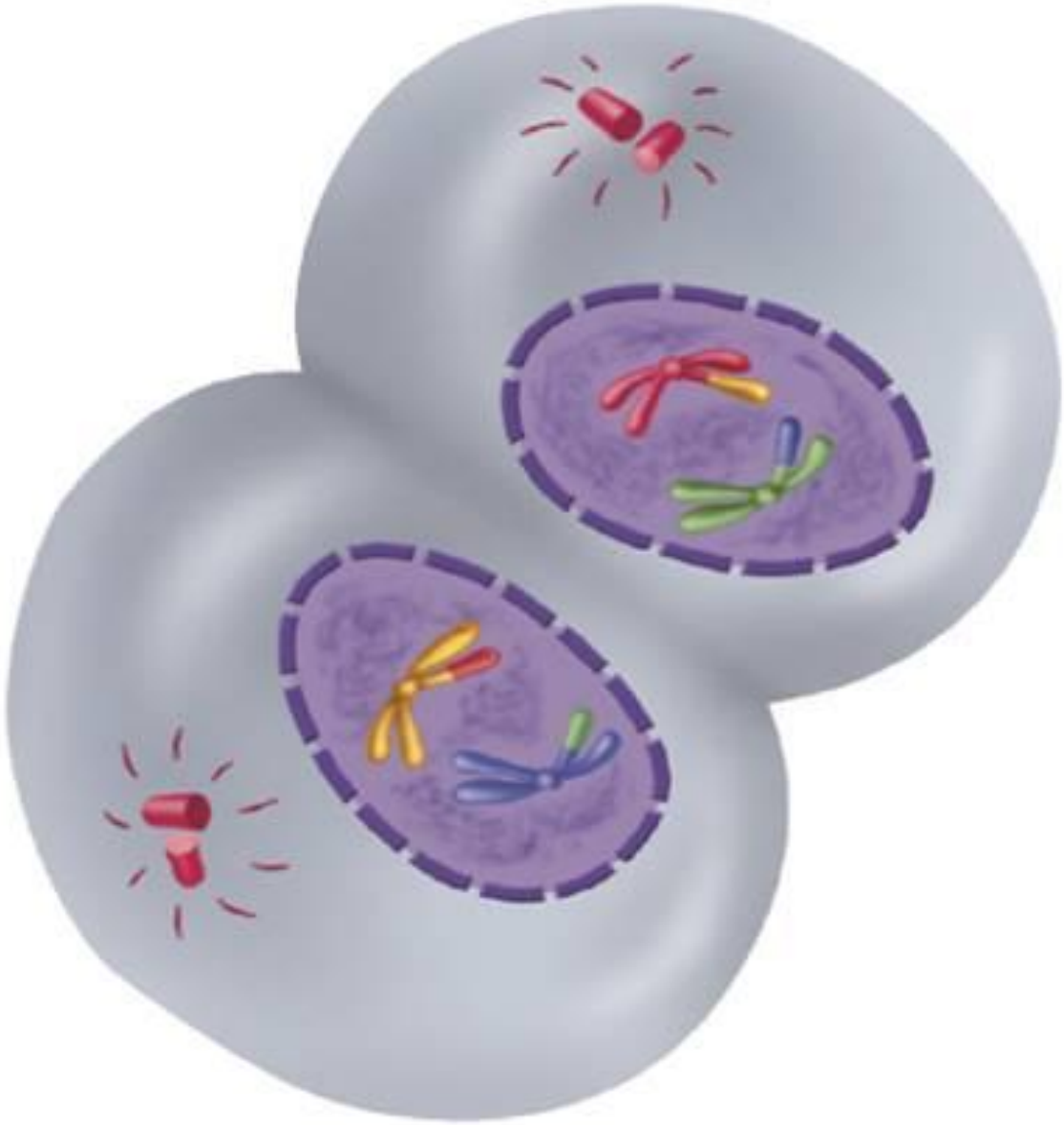
MEIOSIS I
Metaphase I



MEIOSIS I
Anaphase I



MEIOSIS I
Telophase I and Cytokinesis



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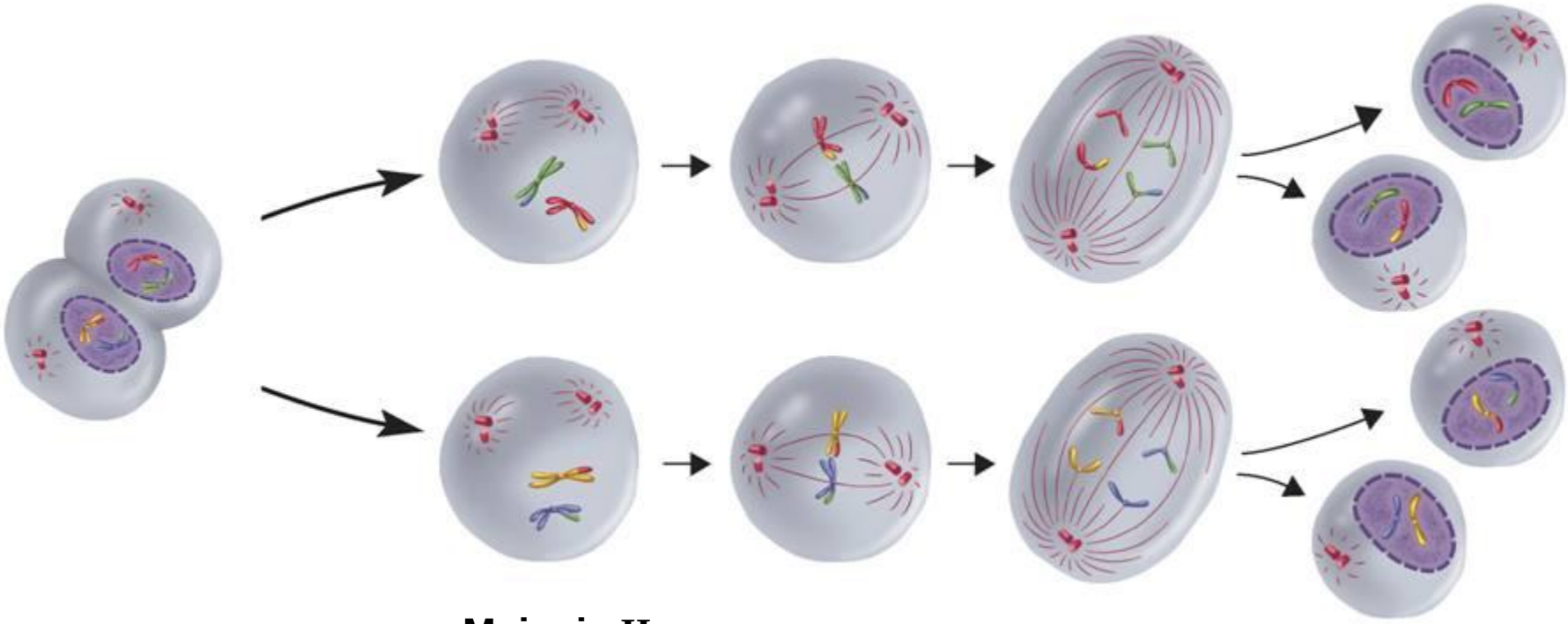
Meiosis II



Telophase I and Cytokinesis I

Meiosis II

Prophase II

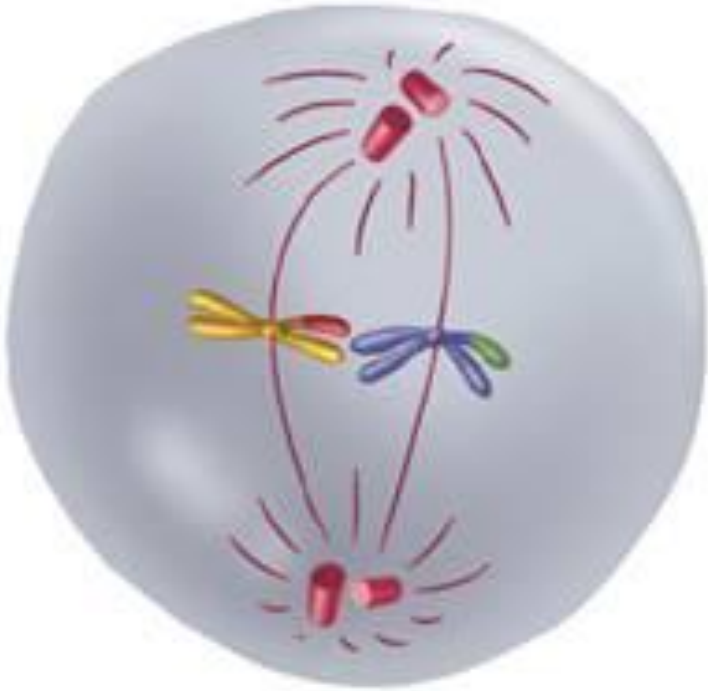
Metaphase II

Anaphase II

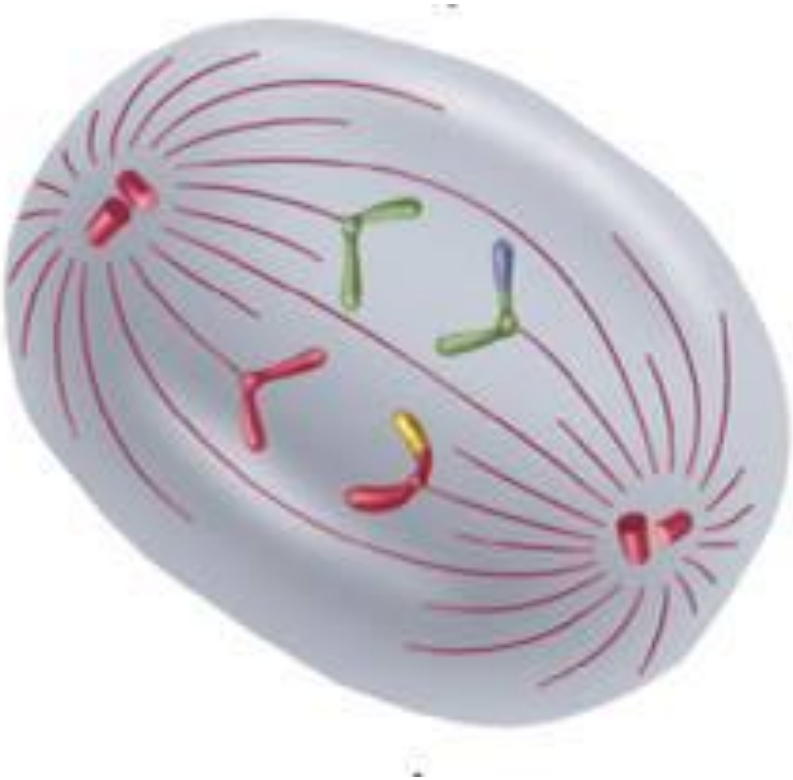
Telophase II and Cytokinesis

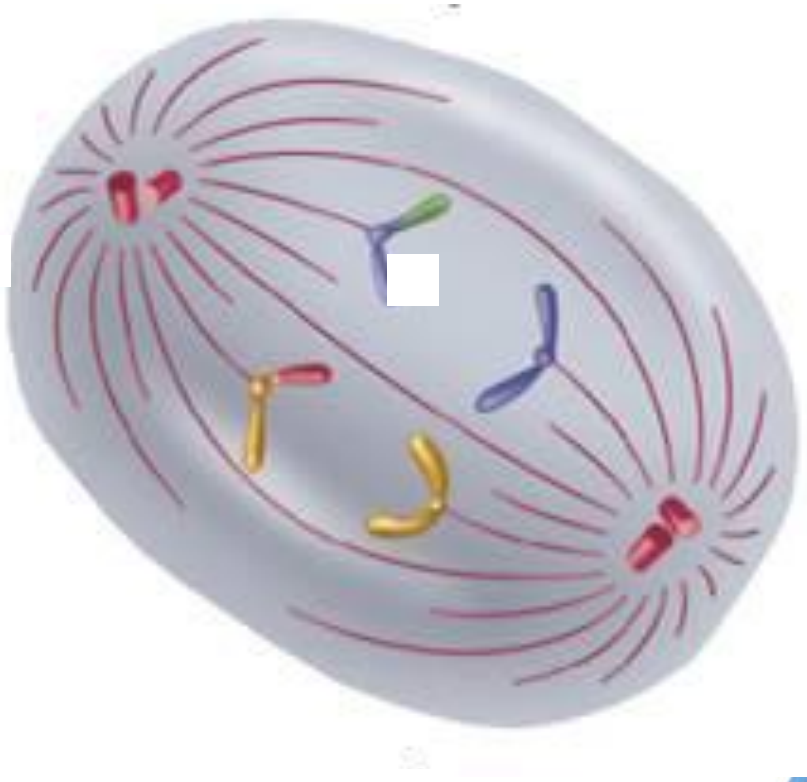
MEIOSIS II
Prophase II

MEIOSIS II
Metaphase II



MEIOSIS II
Anaphase II





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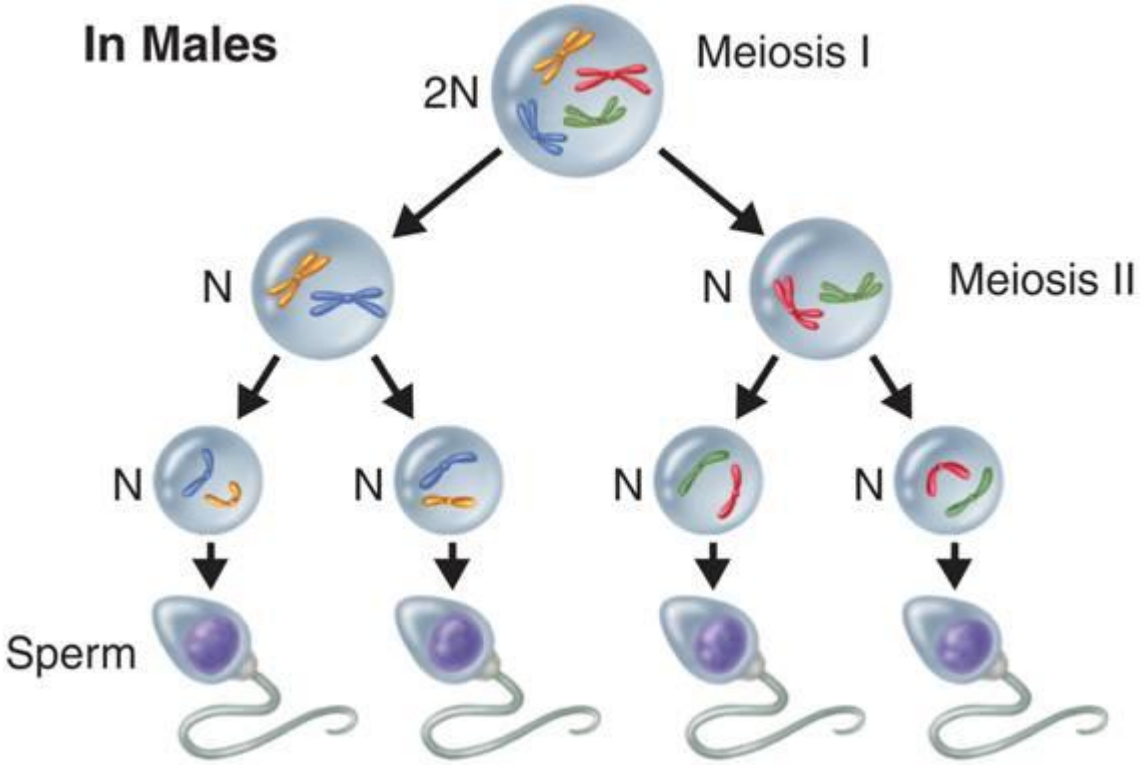
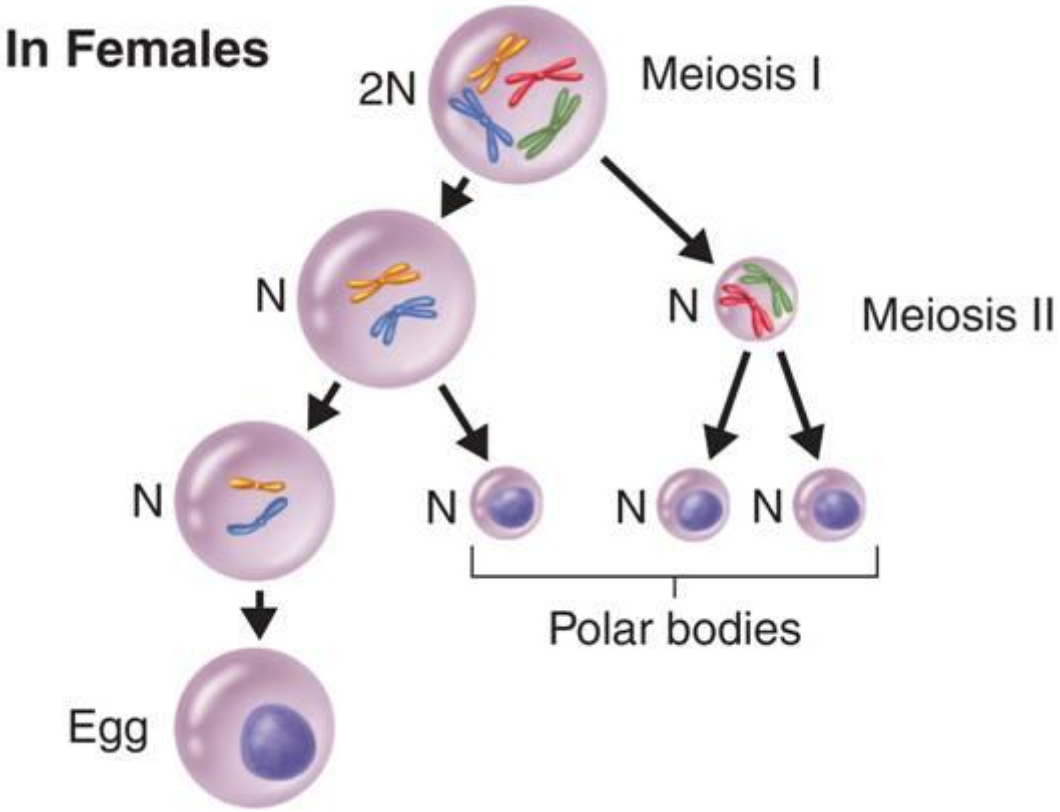
MEIOSIS II
Telophase II and Cytokinesis

Gamete Formation

→In males, meiosis results in four equal-sized gametes called sperm.



In many females, only one egg results from meiosis. The other three cells, called polar bodies, are usually not involved in reproduction.



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1 If the body cells of humans contain 46 chromosomes, a single sperm cell should have

a. 46 chromosomes.

A b. 23 chromosomes.

c. 92 chromosomes.

d. between 23 and 46 chromosomes.

2 During meiosis, the number of chromosomes per cell is cut in half through the separation of

a. daughter cells.

A b. homologous chromosomes.

c. gametes.

d. chromatids.

3 The formation of a tetrad occurs during

a. anaphase I.

b. metaphase II.

A c. prophase I.

d. prophase II.

4 In many female animals, meiosis results in the production of

a. only 1 egg.

A b. 1 egg and 3 polar bodies.

c. 4 eggs.

d. 1 egg and 2 polar bodies.

5 Compared to egg cells formed during meiosis, daughter cells formed during mitosis are

a. genetically different, while eggs are genetically identical.

b. genetically different, just as egg cells are.

c. genetically identical, just as egg cells are.

A d. genetically identical, while egg cells are genetically different.

END OF SECTION