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ALIVE

Basics of genetics

Microbiology

GENETICS

- A science that examines the laws of heredity and variability.
- It belongs to the biological sciences.
- Its foundations were laid by Johann Gregor Mendel (1822 - 1884).

HEREDITY AND VARIABILITY

- Heredity: ability of an organism to store a set of hereditary information (genes) and the ability to pass that set on from generation to generation.
- Variability: diversity of living organisms and their ability to respond to environmental conditions in a different way (adaptation).

GENETIC INFORMATION

- Genetic information: information written in the structure of a DNA molecule that allows an organism to form a certain trait in its specific form. Genetic information is written using a genetic code.
- Genetic code: Method of writing genetic information through the order of nitrogen bases in the structure of DNA (A, T, C, G).

GENE, GENOME, GENOTYPE AND PHENOTYPE

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- Gene: basic unit of genetic information. It carries complete genetic information for the emergence of a certain trait.
- Genome: set of all the genes of an organism.
- Genotype: set of all the genes of a living organism.
- Phenotype: A set of all the signs of an organism that have manifested in its.

GENE, GENOME, GENOTYPE AND PHENOTYPE

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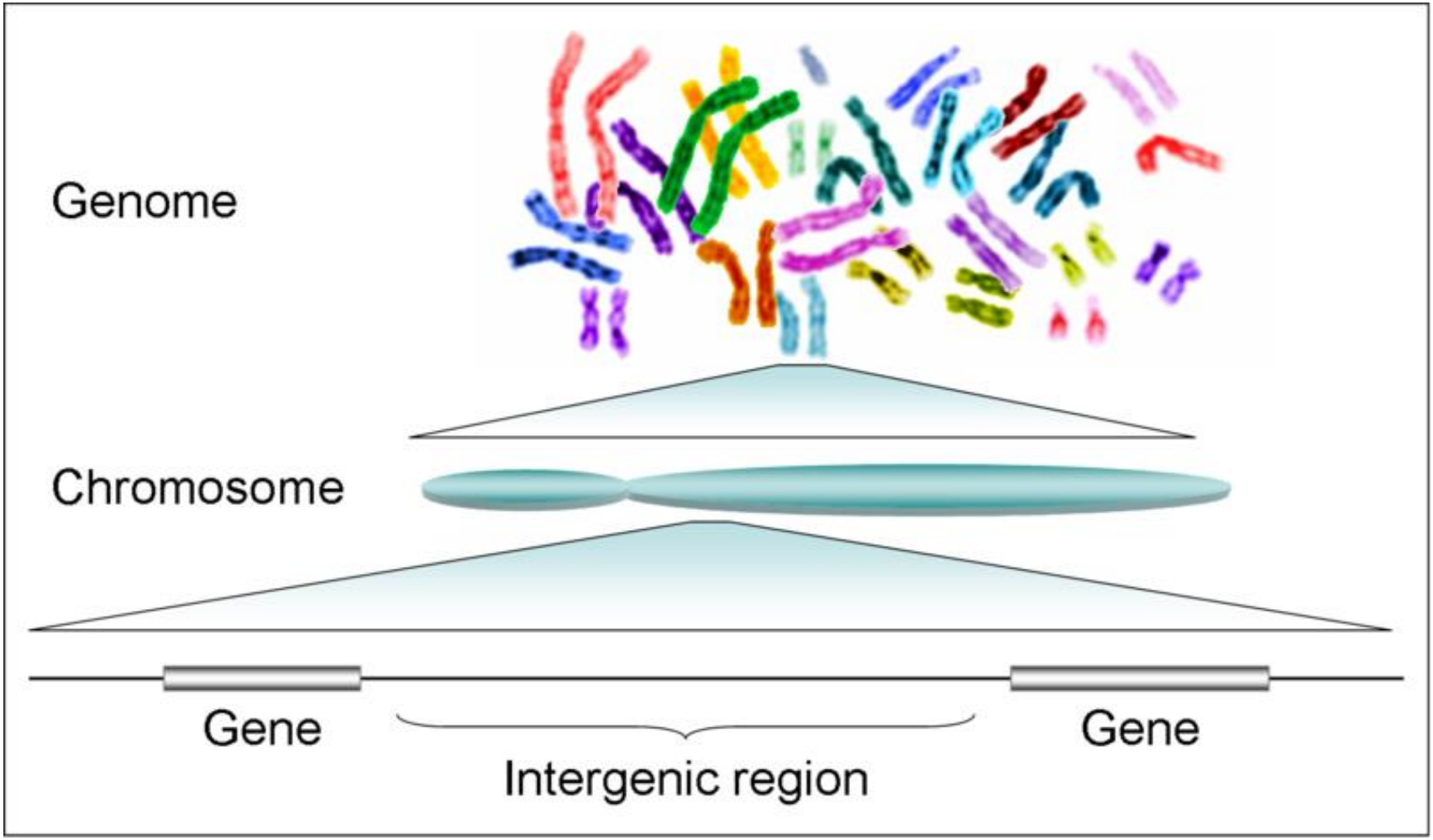


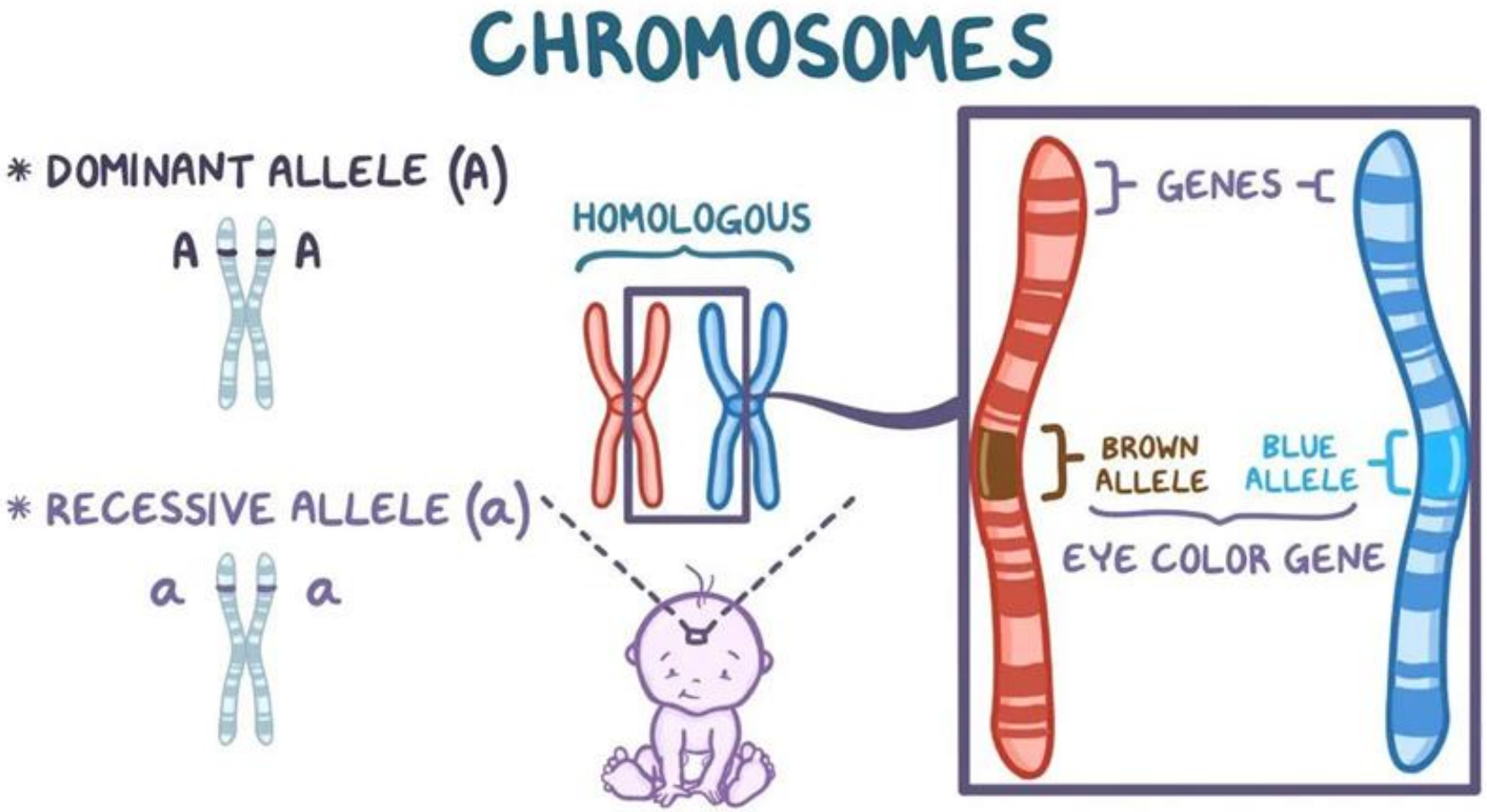
TRAIT AND CHARACTERISTICS

- Trait: characteristics that manifest themselves based on the expression of a particular gene. Traits can be: morphological, physiological and psychological.
- According to their "measurability" we divide the traits into: qualitative - not measurable and quantitative - they can be expressed in quantity.

ALELLE

- Specific form (quality) of a certain gene.
- It carries information for the relevant form of the trait.
- We divide alleles: dominant - indicated by a capital letter and recessive - phenotypic expression has been suppressed - indicated by a lower case letter

ALELLE


CHROMOSOMES
* DOMINANT ALLELE (A)
A A
* RECESSIVE ALLELE (a)
a a
HOMOLOGOUS
GENES
BROWN ALLELE
BLUE ALLELE
EYE COLOR GENE

HOMOZYGOUS AND HETEROZYGOUS ORGANISMS

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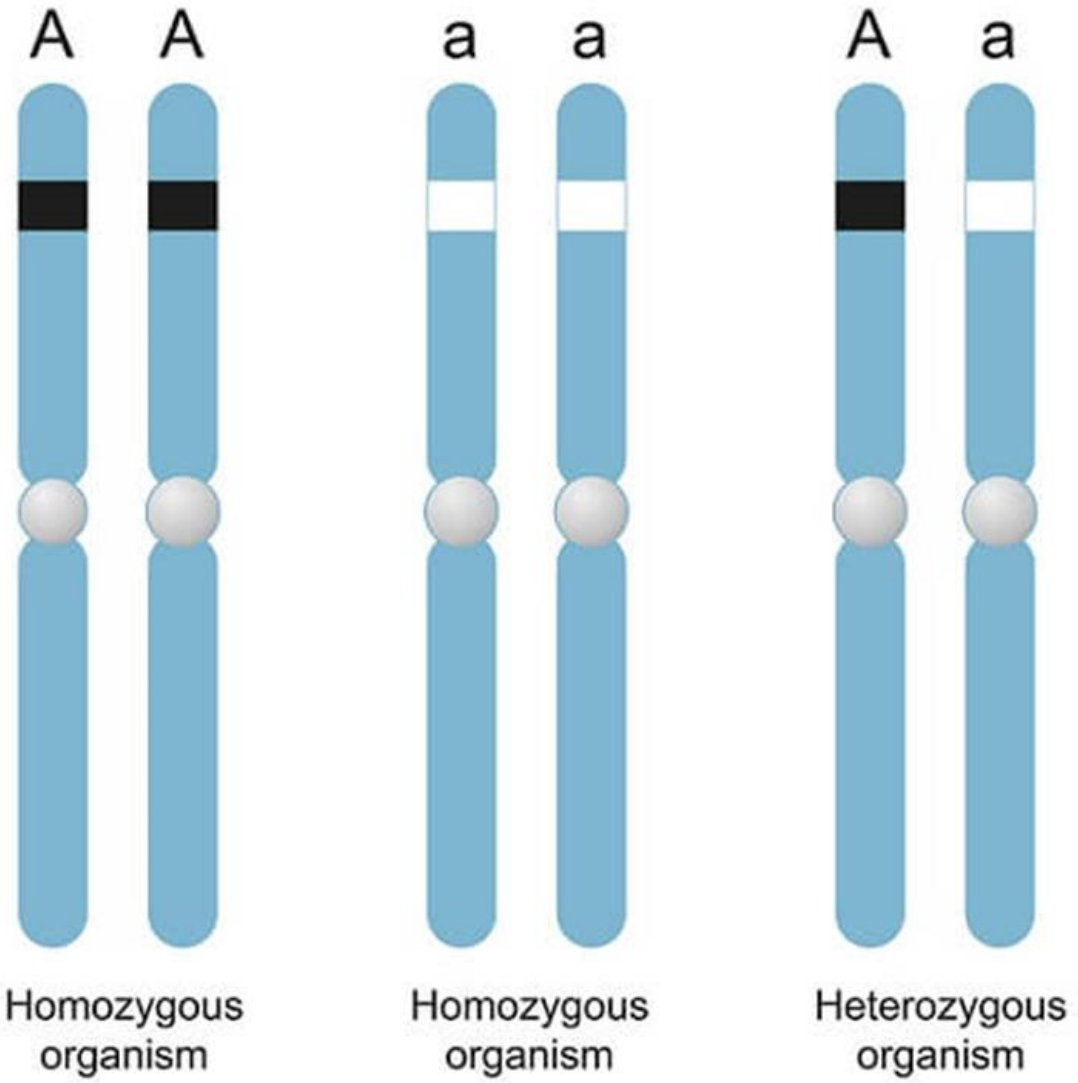
Homozygote:

- An individual who has two identical alleles in a gene. Types of homozygotes: dominant – both alleles are dominant and recessive – both alleles are recessive.

Heterozygote:

- An individual who has two different alleles in a gene.

HOMOZYGOUS AND HETEROZYGOUS ORGANISMS



CHROMOSOME

- Chromosomes carry genetic information encoded in a DNA molecule.
- Their shape - the letter X.

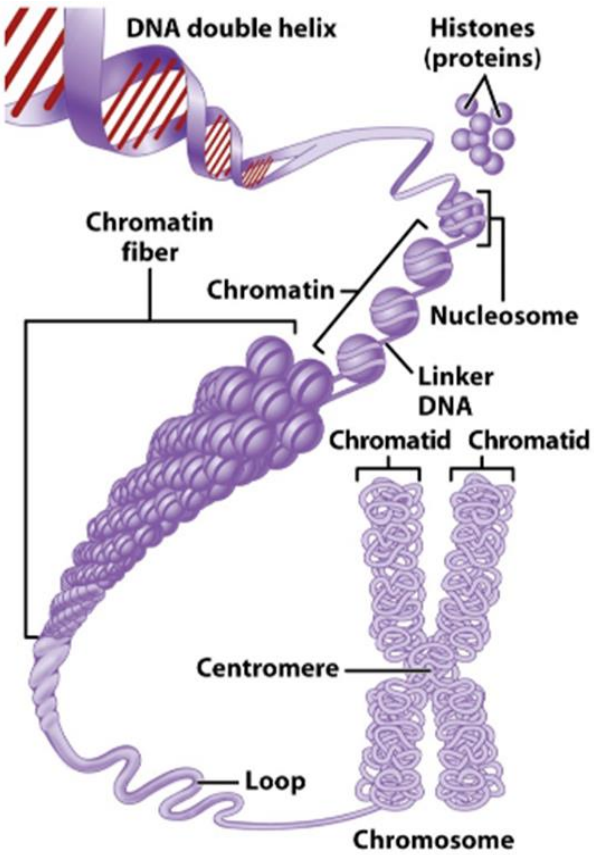


Figure 3-23 Principles of Anatomy and Physiology, 11/e
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CHROMOSOME

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Homologous chromosome:

- Humans have 46 chromosomes in body cells (diploid numbers, 2n).
- Body cell = 23 pairs of homologous chromosomes (a total of 46 chromosomes)
- Sex cell = only 23 chromosomes (not pairs).

Sex chromosomes:

- One pair of completely different chromosomes in the nucleus -sex chromosomes X and Y.

NUCLEIC ACIDS

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- Substances responsible for the organization and reproduction of living matter.
- Their building units are nucleotides - contain the nitrogenous bases adenine A, guanine G, cytosine C, thymine T and uracil U.
- Two types are known: DNA (deoxyribonucleic acid) and RNA (ribonucleic acid).

NUCLEIC ACIDS

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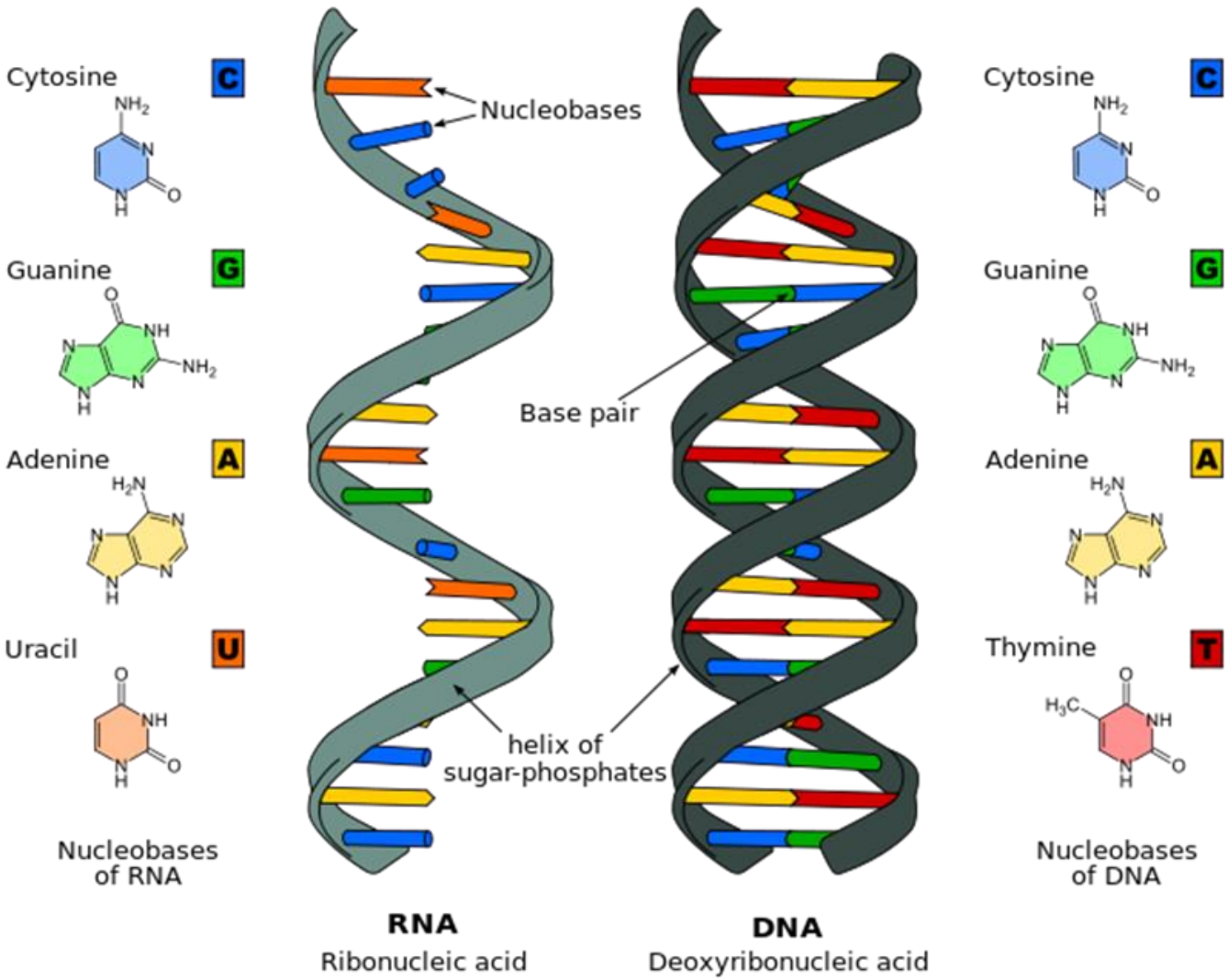

MENDEL´S LAWS AND CROSSBREEDING

- Crossbreeding – hybridization.
- Hybrid - a hybrid is a descendant created by crossing.
- Total dominance - one allele predominates over another. Allele A is completely dominant over allele a, if phenotypically heterozygous Aa and dominant homozygous AA are not different (e.g., the red color of the pea flower is completely dominant over white; heterozygous Aa has a red flower).

MENDEL´S LAWS AND CROSSBREEDING

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- Incomplete dominance - both alleles A and a participate in the formation of a heterozygous trait with the same intensity; heterozygous Aa is phenotypically different from homozygous AA, aa. (eg nightingale flowers - dominant homozygous AA has red flowers, recessive homozygote aa has white and heterozygous Aa has pink flowers).

MENDEL´S LAWS

1. Law of uniformity and reciprocity:

- When crossing two homozygous parents, all offspring of the F1 generation are genotypically and phenotypically the same - they are uniform. It does not matter which of the parents is dominant and which is recessive - reciprocity.

MENDEL´S LAWS

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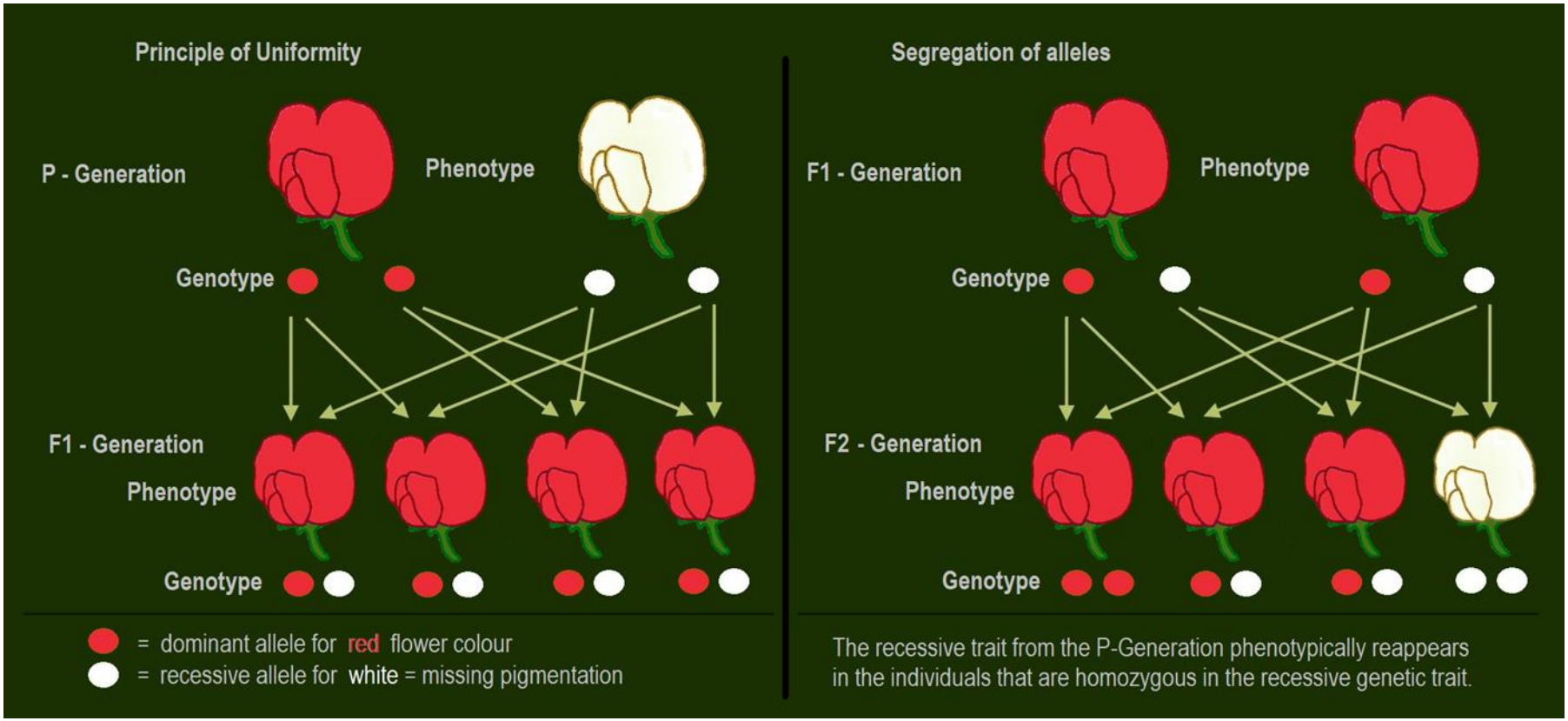
2. The law of segregation:

- When two heterozygous individuals cross with each other, a generation of offspring differ genotypically and phenotypically.

3. The law of independent assortment:

- When creating gametes, individual alleles pass into gametes randomly, on the principle of free combinability, regardless of the dominance or recessivity of these alleles.

MENDEL´S LAWS



BREEDING OF PLANTS AND ANIMALS

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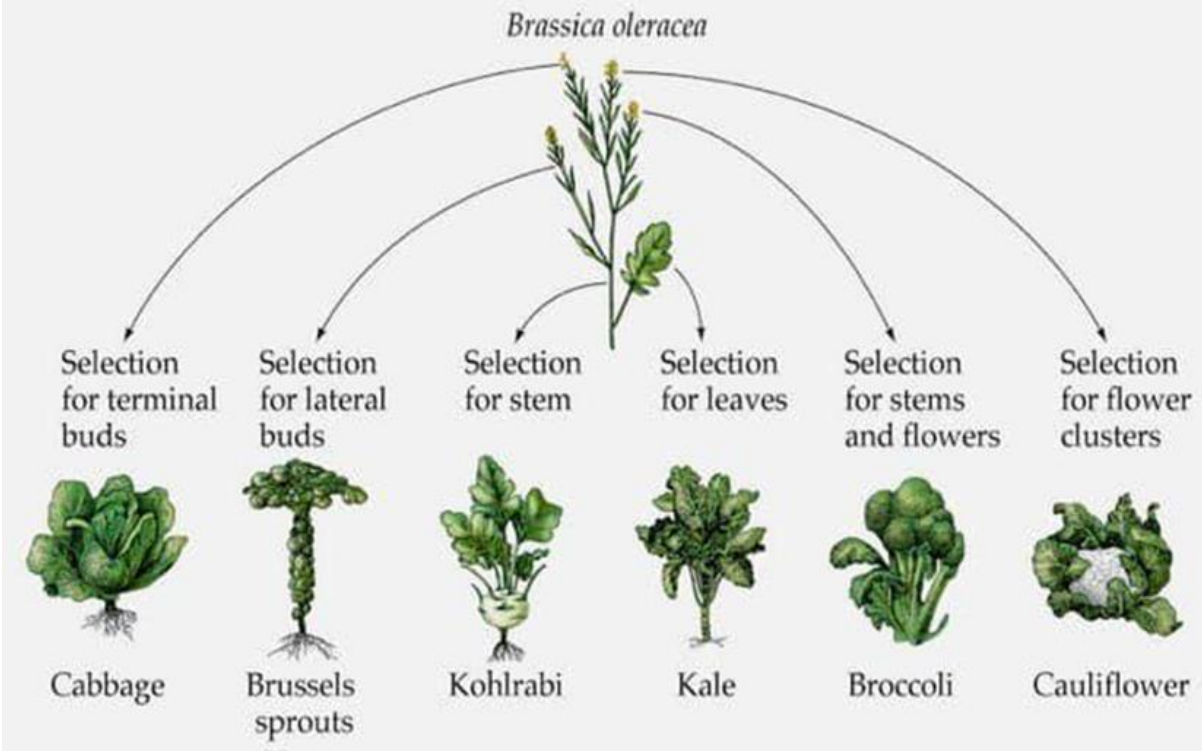
- Its purpose is to change the phenotypic characteristics of organisms to better suit human needs. New species with improved properties are obtained by crossing.



GENETIC DISORDERS

- Genetic mutations in specific genes are the cause of genetic disorders. Examples of hereditary diseases are: cystic fibrosis, phenylketonuria, hemophilia A, daltonism.

Genetic counseling:

- The common role of genetics and medicine is to identify and treat hereditary diseases. In addition, their role is to correctly predict the possibility of further outbreaks of these diseases in families and genera where they have already occurred.

PICTURES - USED SOURSES:

ALIVE

https://biopedia.sk/images/johann-gregor-mendel.jpg?id=00dd88a7d3bdc842ae057fca52d7b3ae

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