

## Genetics

### Mendelian Principles

On a separate quiz fill in the blanks from the text below:

[Quote / paraphrased from page 241 and 243: 2017. Vodopich, D.D., and Moore, R. BIOL 1406, Biology Laboratory Manual: Biological Investigations, South Texas College. McGraw-Hill Education LLC.



- Published papers are the primary means of communicating scientific discoveries. One of the most famous of these papers, entitled ‘Experiments in Plant Hybridization,’ was written in 1866 by Gregor Mendel, an Austrian Monk. Although Mendel’s paper later became the basis for genetics and inheritance, it went largely unnoticed until it was rediscovered independently by several European scientists in 1900. The experiments and conclusions in Mendel’s paper now form the foundation of Mendelian Genetics...
- Mendel’s greatest contribution was to replace the blending theory of inheritance, which stated that all traits blend with each other, with the particulate theory:
  1. Inherited characters are determined by particular factors (today called genes, which are located on DNA).
  2. The particulate factors (genes) occur in pairs (on maternal and paternal homologous chromosomes).
  3. When gametes form (sex cells; sperms or eggs) these genes segregate (separate) so that only one of the pairs remain in the gamete.
- The 3rd part of the particulate theory -- genes segregate -- is known as Mendel’s First Law (or Law of Segregation).
- Mendel’s Second Law (or Law of Independent Assortment), states that genes on non-homologous chromosomes (different chromosomes) will distribute randomly into gametes.
- Not all traits are inherited following Mendel’s Laws -- for example, some traits are inherited from traits in the mitochondria, instead of from DNA contained in the nucleus.
- A gene is a unit of heredity on a chromosome. A chromosome is DNA wrapped around a protein molecules called histones. A gene has alternate states called alleles, contributed to an organism by the organisms parents. Alleles for a particular gene occur in pairs. Alleles that mask expression of other alleles, but are themselves expressed are dominant (designated by a capital letter, e.g., P). Alleles whose expression is masked by dominant alleles are recessive (designated by a lowercase letter, e.g., p).
- The genotype of an organism includes all the alleles present in the cell, whether they are dominant or recessive. The physical appearance of the trait (the expressed trait) is the phenotype. When the paired (homologous) are identical (e.g., PP or pp), the genotype is homozygous. Heterozygous refer to a pair of different (e.g., Pp).

## Human Traits

- The traits listed below (and in the table) are determined by a single gene. List your phenotype for each trait in the table, and -- if possible -- list your genotype.

*Example: If you have **recessive trait for gene G**, your genotype must be homozygous **gg**. If you have the **dominant trait for gene G**, your genotype **COULD** be homozygous dominant **GG**, or heterozygous **Gg** -- then enter **G\_** in the table (because you cannot safely say whether the second allele is G or g). If you have the dominant trait, and one of your parents show the recessive trait, then you must be heterozygous Gg for the trait (you inherited G from one parent, and g from the other parent).*

- **Class activity:** In the table on next page, record your phenotype, your genotype, and the phenotypes of the class for the 11 human traits below. (See your lab manual for a description of each trait)

- **List of traits:**

1. Widow's peak
2. Bent little finger
3. Albinism
4. Pigmented iris
5. Earlobes
6. Hitchhikers thumb
7. Interlacing fingers
8. PTC tasting
9. Middigital hair
10. Dimpled chin
11. Six fingers

## Fill-in-the-blanks-quiz: Genetics: Mendelian Principles

Student Name: \_\_\_\_\_ Date: \_\_\_\_\_

• Published papers are the primary means of communicating \_\_\_\_\_ discoveries. One of the most famous of these papers, entitled 'Experiments in Plant Hybridization,' was written in 1866 by Gregor \_\_\_\_\_, an Austrian \_\_\_\_\_. Although Mendel's paper later became the basis for genetics and inheritance, it went largely unnoticed until it was rediscovered independently by several European scientists in \_\_\_\_\_. The experiments and conclusions in Mendel's paper now form the foundation of Mendelian Genetics...

• Mendel's greatest contribution was to replace the \_\_\_\_\_ theory of inheritance, which stated that all traits blend with each other, with the \_\_\_\_\_ theory:

1. Inherited characters are determined by particular factors (today called \_\_\_\_\_, which are located on DNA).
2. The particulate factors (genes) occur in \_\_\_\_\_ (on maternal and paternal homologous chromosomes).
3. When gametes form (sex cells; sperms or eggs) these genes \_\_\_\_\_ (separate) so that only one of the pairs remain in the gamete.

• The 3rd part of the particulate theory -- genes segregate -- is known as Mendel's First Law (or Law of \_\_\_\_\_).

• Mendel's Second Law (or Law of \_\_\_\_\_), states that genes on non-homologous chromosomes (different chromosomes) will distribute randomly into gametes.

• Not all traits are inherited following Mendel's Laws -- for example, some traits are inherited from traits in the mitochondria, instead of from DNA contained in the nucleus.

• A gene is a unit of heredity on a \_\_\_\_\_. A chromosome is \_\_\_\_\_ wrapped around a protein molecules called histones. A gene has alternate states called \_\_\_\_\_, contributed to an organism by the organisms parents. Alleles for a particular gene occur in \_\_\_\_\_. Alleles that mask expression of other alleles, but are themselves expressed are \_\_\_\_\_ (designated by a capital letter, e.g., P). Alleles whose expression is masked by dominant alleles are \_\_\_\_\_ (designated by a lowercase letter, e.g., p).

• The \_\_\_\_\_ of an organism includes all the alleles present in the cell, whether they are dominant or recessive. The physical appearance of the trait (the expressed trait) is the \_\_\_\_\_. When the paired (homologous) are identical (e.g., PP or pp), the genotype is \_\_\_\_\_. \_\_\_\_\_ refer to a pair of different (e.g., Pp) alleles.

## Table: Phenotypes and Genotypes of human traits

Student Name: \_\_\_\_\_ Date: \_\_\_\_\_