

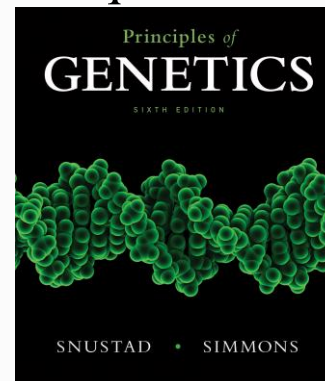
Course objectives

- Understanding the definition and branches of genetics.
- Understanding the key features of chromosome and gene.
- Describing the key steps in the cell cycle.
- Understanding cell division ;mitosis and meiosis in both haploid and diploid cells.
- Understanding Mendel's first law of equal segregation.
- Understanding Mendel's second law of independent assortment.
- Be able to apply the rules of probability to solve genetic questions.

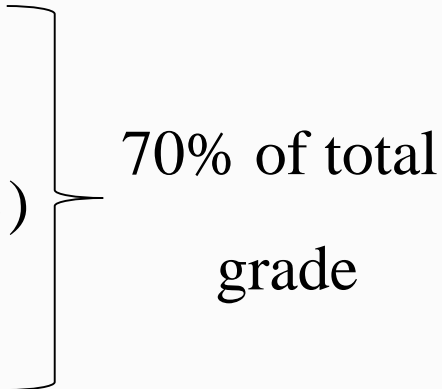
Main book

Principles of genetics / D. Peter Snustad,

Michael J. Simmons. 6th ed. SBN 978-0-470-90359-



Assessment

- Lecture
 - 2 lecture exams (20%)
 - Attendance, participation and homework (10%)
 - Final exam (40%)
 - Laboratory
 - 30% of total grade
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- 70% of total grade

Time table for weekly planning for principles of genetics

Lectures	Dates	Syllabus view
1	5/9/2019	Genetics overview
2	12/9/2019	Chromosomes
3	19/9/2019	The cell cycle and its checkpoint
4	26/9/2019	Mitosis
5	3/10/2019	Meiosis
6	10/10/2019	Errors in meiosis
7	17/10/2019	Exam 1
8	24/10/2019	Mendelian genetics
9	31/10/2019	The law of segregation
10	7/11/2019	Law of independent assortment
11	14/11/2019	Genetics of the human blood group,
12	21/11/2019	Exam 2
13	28/11/2019	Genetics engineering
14	5/12/2019	Epigenetics

Genetics

- **Genetics** is the study of **genes**, **heredity**, and **genetic variation** in living organisms.
 - **A gene** is the molecular unit of heredity of a living organism.
 - **A gene** is a portion (or sequence) of DNA that codes for a known cellular function (another definition).
 - **Heredity** is the passing of phenotypic traits from parents to their offspring, either through asexual reproduction or sexual reproduction.
 - **Genetic variation**, variation in alleles of genes, occurs between individuals or between populations.
-

Word Match Activity

Match the genetic terms to their corresponding parts of the illustration.

- **base pair**
- **cell**
- **chromosome**
- **DNA**
(Deoxyribonucleic Acid)
- **double helix***
- **genes**
- **nucleus**

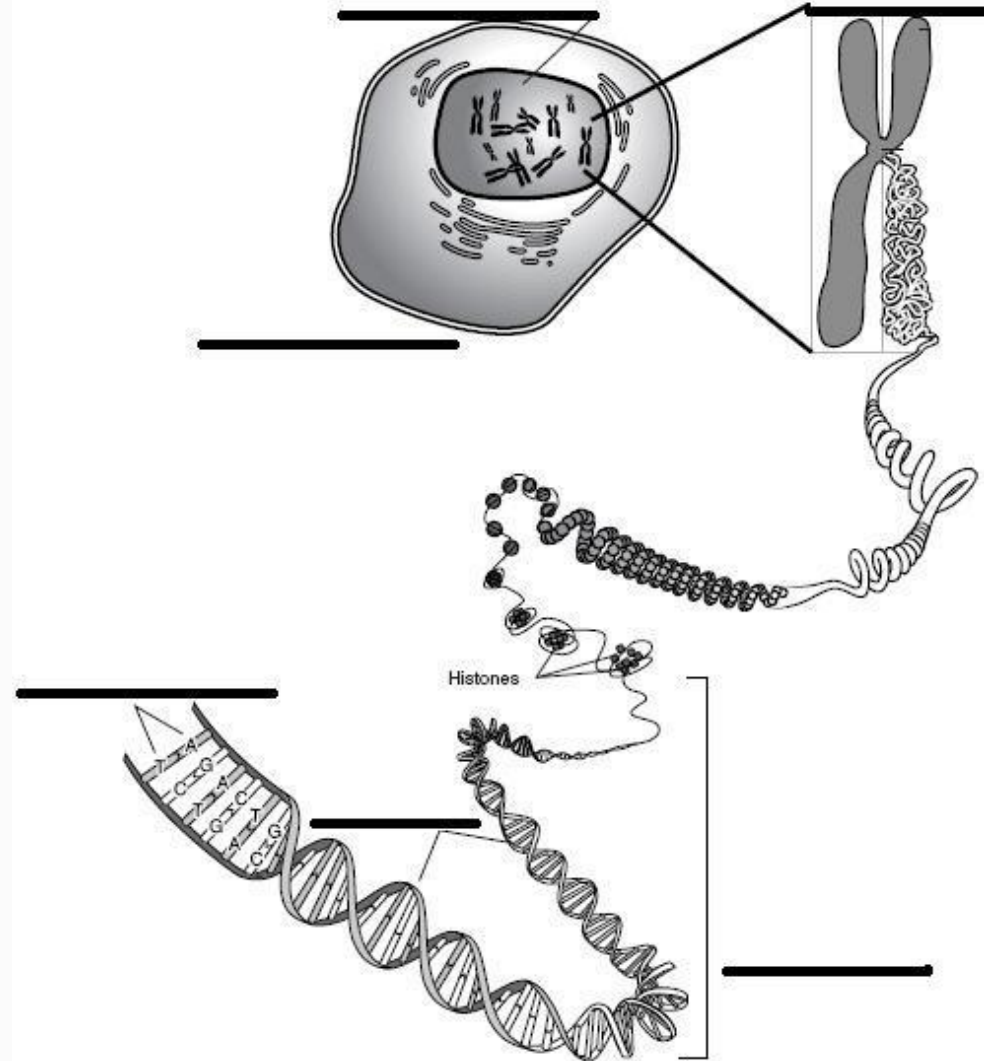


Illustration Source: Talking Glossary of Genetic Terms

<http://www.genome.gov/glossary.cfm?keyword=chromosome>

Word Match Activity

- base pair
- cell
- chromosome
- DNA
(Deoxyribonucleic Acid)
- double helix*
- genes
- nucleus

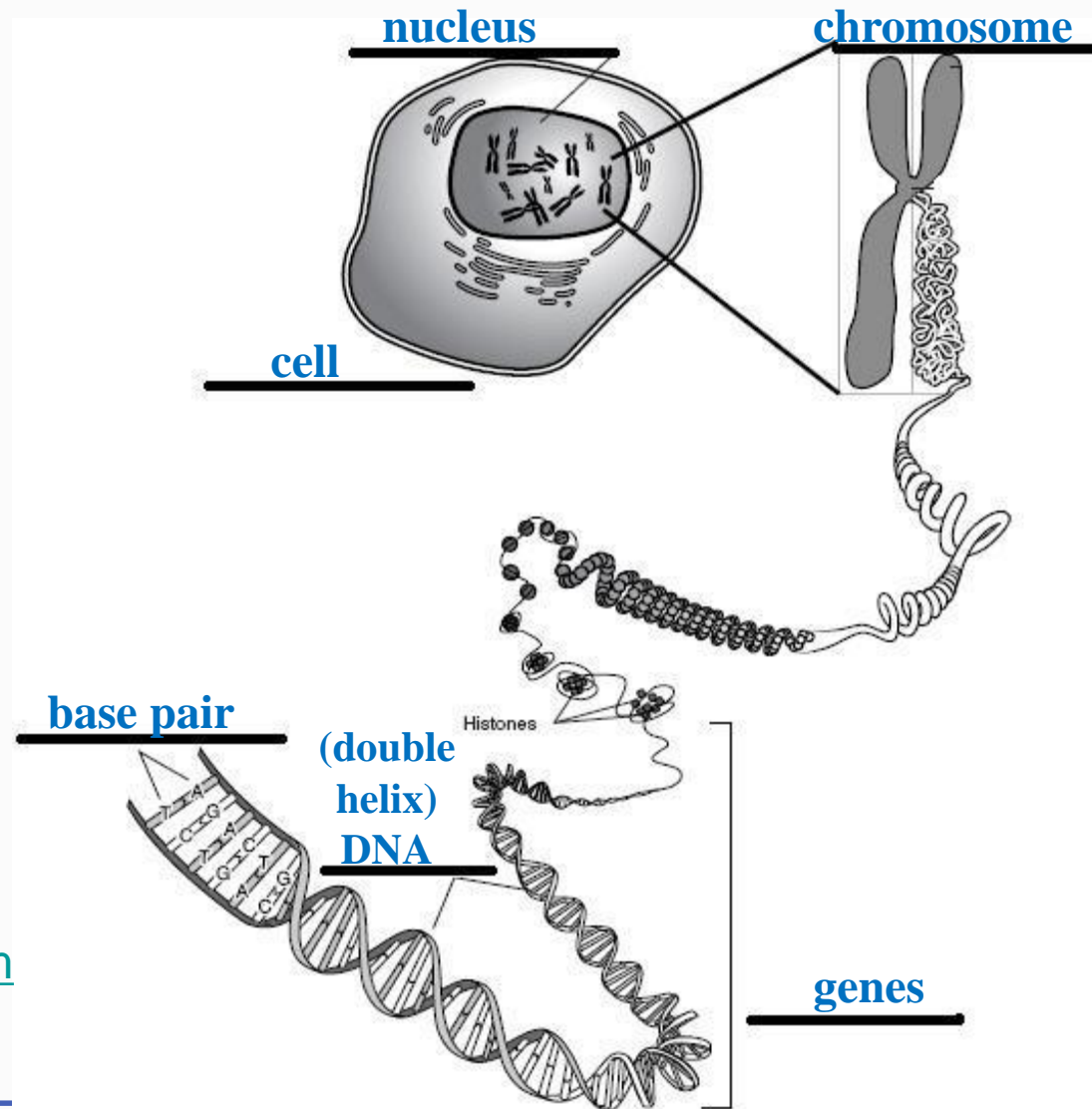


Illustration Source: Talking Glossary of Genetic Terms
<http://www.genome.gov/glossary.cfm?key=chromosome>

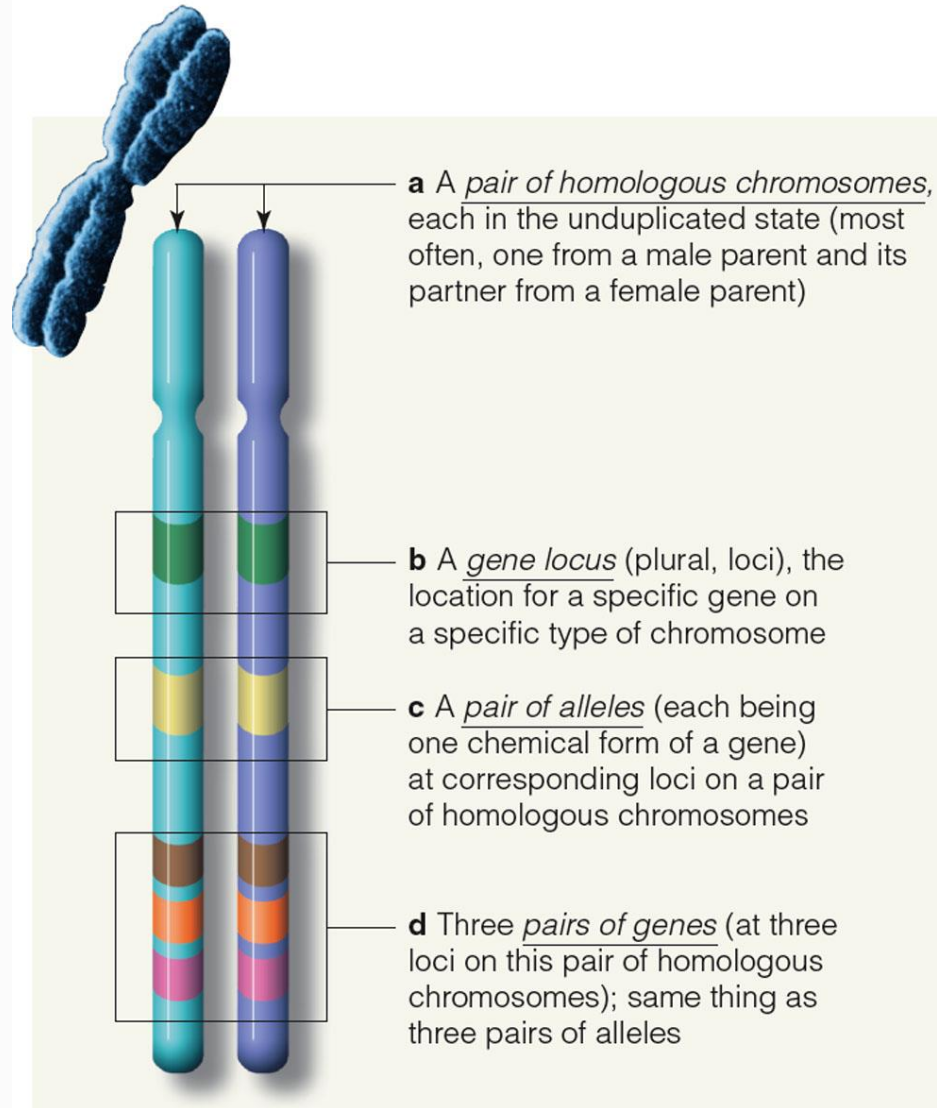
Basic Concepts of Heredity

- Genes provide the instructions for all human traits, including physical features and how body parts function
- Each person inherits a particular mix of maternal and paternal genes
- **Genes**
 - Humans have ~21,500
 - Chemical instructions for building proteins
 - **Locus:** specific location on a chromosome

Diploid cells contain two copies of each gene on pairs of homologous chromosomes

- **Allele:** each version of a gene
-

A Few Basic Genetic Terms



Branches of Genetics

- 1) Classical Genetics:** It is the **oldest discipline** in the field of genetics, going back to the experiments of **Gregor Mendel**. The study of the transmission of genotype from parent to offspring.
 - 2) Human genetics:** is the study of heredity and variation in the humans.
 - 3) Cytogenetics:** is the study of chromosomes and chromosome abnormalities
 - 4) Population genetics:** The genetics of the different populations of animal and plant species.
 - 5) Molecular genetics:** is the study of the structure and function of genes at the molecular level.
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Cell Theory

- Cells are the basic units of living organisms.
 - The cell theory states that:
 - All living things are made of one or more cells.
 - Cells are the basic unit of structure and function in living things.
 - All cells come from other cells.
-

Differences between Prokaryotic and Eukaryotic cells

	Prokaryotic cells	Eukaryotic cells
Taxonomic groups	Bacteria, Cyanobacteria	all protists, fungi, plants, animals
Size	Usually $<5 \mu\text{m}$ (less than)	Usually $>5 \mu\text{m}$ (greater than)
Nucleus	No true nucleus, no nuclear membrane	True nucleus, nuclear membrane
Genetic material	One circular molecule of DNA, little protein	Linear DNA molecules complexed with histones
Mitosis and Meiosis	Absent	present

- Eukaryotic cells contain many different organelles that perform specific functions. Such as, mitochondria, chloroplasts contain genomes.
 - The eukaryotic cell possesses some structures that are critical for mitosis and meiosis: **centrosomes** and **microtubules/spindle fibers**.
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Differences between Prokaryotic and Eukaryotic cells

Prokaryotic Cell Structure

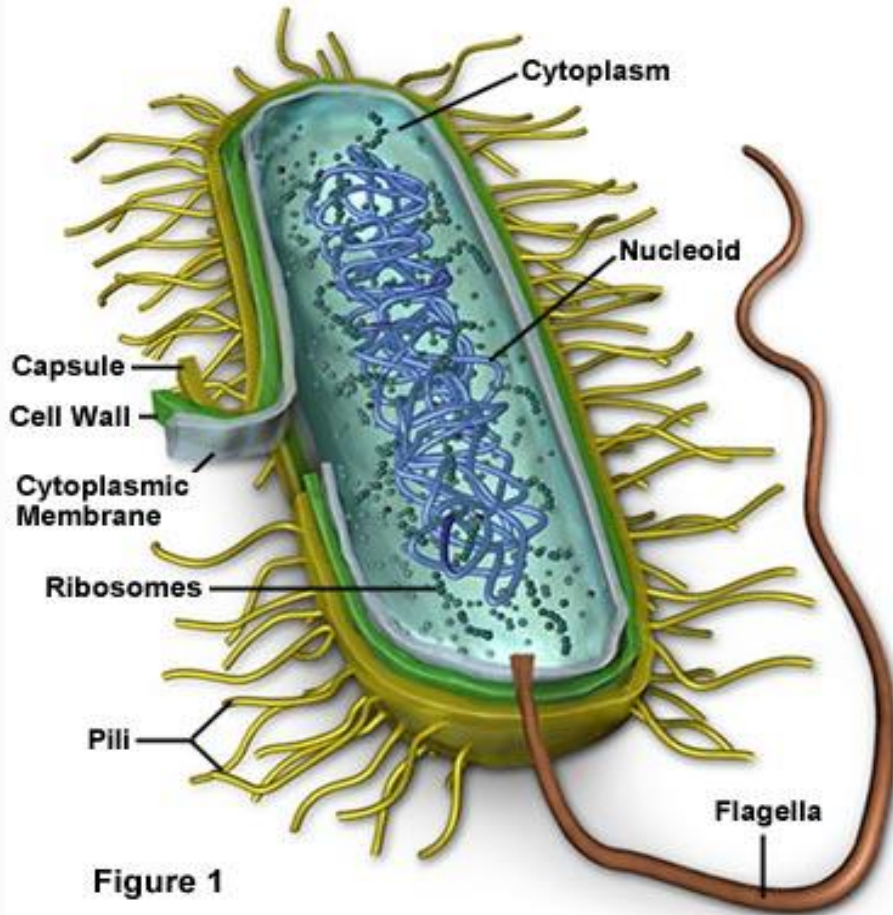


Figure 1

Cells that **do not** have membrane-bound organelles called **prokaryotic cells**

Unicellular organisms such as **bacteria** are examples of prokaryotes.

Differences between Prokaryotic and Eukaryotic cells

Cell that have membrane-bound organelles

Called **Eukaryotic Cells**

