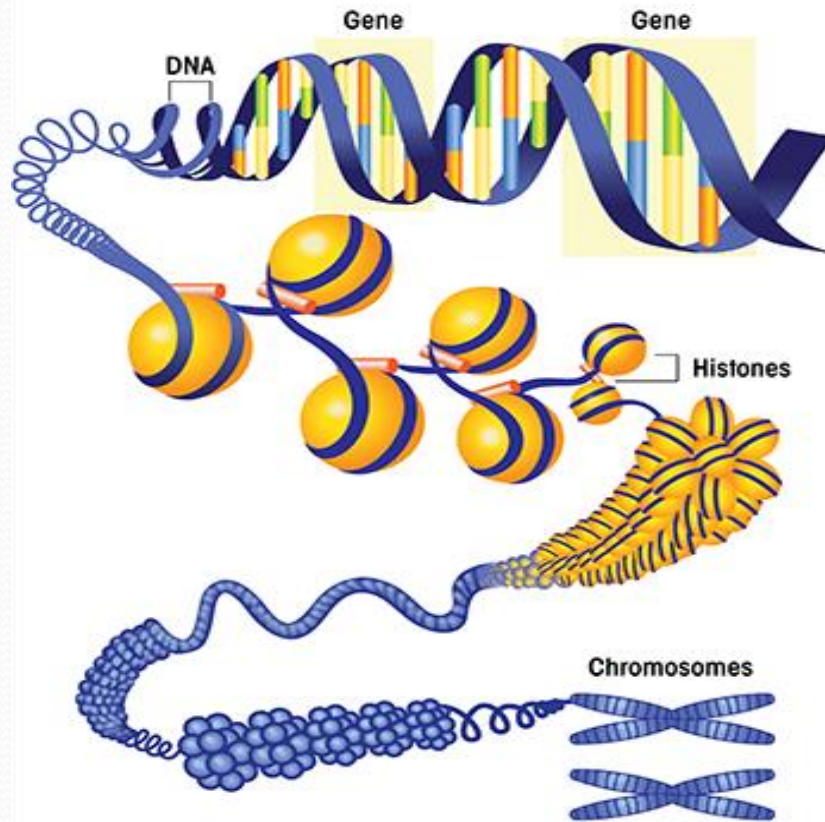


Principals of Genetics (Zoo-352)



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Aims of genetics course

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

Time table for weekly planning for principles of genetics

Lectures	Dates	Syllabus view
1	9/9/1437	Genetics overview
2	9/9/1437	Chromosomes
3	16/9/1437	The cell cycle and its checkpoint
4	16/9/1437	Mitosis
5	23/9/1437	Meiosis
6	23/9/1437	Errors in meiosis
7	7/10/1437	Exam 1
8	14/10/1437	Mendelian genetics
9	14/10/1437	The law of segregation
10	21/10/1437	Testing the law of segregation
11	21/10/1437	Law of independent assortment
12	28/10/1437	Testing the law of independent assortment
13	28/10/1437	Genetics of the human blood group,
14	6/11/1437	Exam 2

Assessment

- Lecture
 - 2 lecture exams (30%)
 - Attendance, participation and homework (5%)
 - Final exam (40%)
 - 70% of total grade
- Laboratory
 - 30% of total grade

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.

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.

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**.