

**HOWARD UNIVERSITY
COLLEGE OF ARTS AND SCIENCES
COMPREHENSIVE SCIENCES**

**LIFE SCIENCES LECTURE TIMELINE
Fall 2017**

UNIT IV: GENETICS

<u>WEEK(S)</u>	<u>LECTURE TOPIC(S)</u>	<u>TEXTBOOK CHAPTER(S)</u>
September 26th- October 5 th	<p>1. THE GENETIC BASIS (structural, molecular) of ALL LIFE FORMS</p> <p>2. GENETICS/PRINCIPLES of INHERITANCE</p> <p>definition: the study of the inheritance of traits from one generation to another in life forms</p> <ul style="list-style-type: none"> - historical information ▪ the work of Gregor Mendel <p>- trait: an inherited characteristic in life forms; types</p> <ul style="list-style-type: none"> ▪ (1) physical: i.e., eye color, skin color, leaf shape, cell morphology, presence/absence of blossoms, cones or spores, fur color ▪ (2) physiological: i.e., capacity to produce auxin, chlorophyll, hemoglobin, insulin, enzymes, transmission of electrical impulses; formation of free radicals ▪ (3) immunological: capacity to produce immune factors i.e., antibodies, histamines, interferon, etc. <p>- focus levels of genetic activities</p> <ol style="list-style-type: none"> a. the cell b. eukaryotic nucleus c. the chromosome structure – p. 180 <ul style="list-style-type: none"> ○ physical/structural basis of inheritance ○ chromatid ○ centromere ○ chromosome number/karyotype (humans – Appendix IV) <ul style="list-style-type: none"> • in somatic cells – DIPLOID (2N) • in reproductive cells (pollen, ova, sperm, some spores) <ul style="list-style-type: none"> – HAPLOID/MONOPLOID (N) <p>IMPORTANT TOPIC:</p> <ul style="list-style-type: none"> * ABNORMAL DIPLOID CHROMOSOME NUMBER IN HUMANS 	<p>Chapter 13</p> <p>Chapter 13.1</p> <p>Chapter 11</p>
September 26 th - October 5 th	<p>- two important biophysical processes that occur on the level of the cell:</p> <p>(1) MITOSIS and (2) MEIOSIS</p> <p>(1) MITOSIS – always occurs in a 2N cell; process produces two 2N cells from one 2N cell after five phases</p> <ul style="list-style-type: none"> • the cell cycle • karyokinesis • cytokinesis 	Chapter 11 (11.2-11.3)

WEEK(S)LECTURE TOPIC(S)TEXTBOOK CHAPTER(S)

(2) MEIOSIS – occurs only in 2N cells that are located in reproductive organs/structures (ovaries, testes, ovulatory, stamens, some spore cases); process produces four or more N cells (ova, sperm, pollen, spores) from one 2N cell after ten phases

Chapter 12
(12.2-12.5)

- Phase I
 - chromosome number doubles
 - crossing-over occurs
 - separation of homologous chromosomes
 - segregation and independent assortment
- Phase II
 - separation of sister chromatids
 - four or more N cells (sperm, pollen, ova) are produced
 - (chromosome number has been reduced)
- Summary of Mitosis and Meiosis

d. genes:

Chapter 10

- phenotype
- genotype
- homozygous
- heterozygous
- allele
- test crosses
- probability: P₁ through F₂ with the Punnett Square
 - F₂ phenotypic ratio – 3:1
 - F₂ genotypic ratio – 1:2:1
- probability: the Hardy-Weinberg principle probability problem

IMPORTANT TOPICS:

- * HUMAN GENE DISORDERS
- * SEX-LINKED TRAITS
- * PLEIOTROPY

**September 26th -
October 5th**

- e. Deoxyribonucleic Acid (DNA) – molecular basis of inheritance/molecular genetics – **p.134**
 - structure
 - components
 - genome(s)
 - Genetic Code
 - Triplet Code
 - (transcription and translation for the synthesis of proteins)
 - recombinant DNA

Chapter 8 - DNA

IMPORTANT TOPICS:

- * CANCER CELLS
- * EUGENICS
- * GENETIC ENGINEERING
- * GENOME SEQUENCING
- * MITOCHONDRIAL DNA
- * DNA "FINGERPRINTING"
- * GENOMICS
- * COPYING DNA – THE PCR PROCESS
- * THE HUMAN GENOME
- * KNOWN GENOMES OF LIFE FORMS
(bacteria, fungi, some plants, some invertebrates)
- * MUTATIONS
- * ACTION OF ENZYMES THAT CAN BREAK
DNA MOLECULES (topoisomerases, helicases, primases,
polymerases, exonucleases, ligases)
- * BIOINFORMATICS/DNA TECHNOLOGY THE HUMAN GENOME PROJECT AT
HOWARD UNIVERSITY
- * BLOOD TRANSFUSIONS (Antigens and Antibodies)

f. Bioinformatics

Bioinformatics is the application of computational methods to interpret the rapidly expanding amount of biological information such as sequence analysis, genome database organization. Students will be introduced to the basic concepts behind bioinformatics and computational biology tools which will include hands on sessions.

Reading assignments: Molecular Biology Review

<http://www.ncbi.nlm.nih.gov/Class/MLACourse/Modules/MolBioReview/>

Prerequisite Reading:

<http://www.ncbi.nlm.nih.gov/Class/MLACourse/Modules/MolBioReview/reading.html>

Laboratory Assignment

- 1. Hands on sequencing**
- 2. Web Assignment**