

Course Title:	Biology II: HEREDITY & PHYSIOLOGY
Head of Department:	Nadia Iskandarani
Cycle/Division:	High School
Grade Level:	Grade 12
Credit Unit:	1
Duration:	2 semesters / 5 periods per week

Department's Vision:	Create Innovators who can link to life, with scientific understanding and learning.
Department's Mission:	Provide students with the proper knowledge, skills and scientific principles through hands on activities, research and experimentations, and thus creating young innovators who are ready for real life challenges and problem solving.

COURSE DESCRIPTION:

This course provides a basic study of the structure and function of the endocrine, nervous, and reproductive system of the human body and plants. It covers principles of prokaryotic and eukaryotic cell genetics. Emphasis is placed on the molecular basis of heredity, chromosome structure, patterns of Mendelian and non-Mendelian inheritance, evolution, and biotechnological applications. Upon completion, students should be able to recognize and describe genetic phenomena and demonstrate knowledge of important genetic principles. Laboratory exercises include specific organ dissections and observations of physiology. Laboratory work includes dissection of preserved specimens, microscopic study, physiologic experiments, computer simulations, and multimedia presentations with a term lab theoretical and practical assessment.

General Academic Goals:

Study the nervous, endocrine, and reproductive systems (including plants as living organisms) and how they are related in reproduction process
 Understand meiosis , replication, transcription, and duplication and their effect .

Analyze different genetically problems and be able to draw Punnett squares and give ratios of phenotypes and genotypes (autosomal and sex chromosomal).

Understand mutation and its effect in natural selection and adaptation.

General Skills:

Evaluation skills: making judgment about knowledge by introducing new text to solve and tackle problems using the related knowledge taught.

Comprehension: given scientific text or diagrams to analyze and answer questions about, summarize, compare, relate, or experiment...

Communication and social skills: Making movies, ppt., projects, interviews, and presenting the work either individually or with a peer or as a group.

Investigative skills: lab work, research, journals, experimentation...

Mathematical skills: related to investigations in the lab and application in projects.

Technological skills used in science and computer labs.

Knowledge skills: list, define, show, demonstrate, invent, relate etc... using the taught concepts.

GENERAL COURSE LEARNING OBJECTIVES:

List the major organs of the digestive system.

Distinguish between chemical and mechanical digestion in the:

- Mouth.
- Esophagus.
- Stomach.

Distinguish between chemical and mechanical digestion in the Small intestine.

Explain the role of the small intestine in absorption.

Explain the role of the large intestine in digestion and excretion.

Identify the major parts of a kidney.

Refer the structure of a nephron to its function (filtration).

Refer the structure of a nephron to its function (reabsorption and secretion).

Summarize the path in which urine is eliminated from the body.

Describe some medical conditions related to the excretory system.

Describe how the communication between organ systems helps in maintaining homeostasis.

Explain ways of communication between nervous and endocrine systems.

Describe the structure of a neuron.

Summarize the electrical and the chemical conditions that characterize the resting potential.

Outline the electrical and the chemical changes that occur during action potential.

Explain the role of neurotransmitters in transmitting a signal across a synapse.

Describe the structure of the eye and relate it to vision.

Describe the two main parts of the central nervous system.

Explain the functions of the main parts of the brain.

Describe the roles of the motor and the sensory division of the peripheral nervous system.

Define hormone.

Distinguish between exocrine and endocrine glands.

List the major endocrine glands in the human body and describe their role.

Distinguish between mitosis and meiosis.

Summarize the events of meiosis I.

Explain crossing over and genetic linkage and how they contribute in the production of unique individuals.

Summarize the events of meiosis II.

Compare spermatogenesis and oogenesis.

Define sexual reproduction.

Identify the major structures of the female reproductive system.

Identify the major structures of the male reproductive system.

Describe the function of each structure of the male reproductive system.

Relate the structure of a human sperm cell to its function.

Explain the formation of the egg.

Summarize the stages of the ovarian cycle.

Describe the process of fertilization.

Explain some of the common STDs.

Describe how Mendel was able to control how his pea plants were pollinated.

Describe the steps in Mendel's experiments on true-breeding garden peas.

State the laws of heredity that were developed from Mendel's work.

Describe the relationship between gene and allele.

Distinguish between characteristic and trait.

Differentiate between genotype and phenotype of an organism.

Distinguish between dominant and recessive traits.

Explain how probability is used to predict the results of genetic crosses.

Use a Punnett square to predict the results of monohybrid crosses.

Use a Punnett square to predict the results of dihybrid crosses.

Describe the difference between autosomal and sex-linked traits.

Describe the inheritance of some of the common traits in living things.

Analyze pedigrees to determine how genetic traits and genetic disorders are inherited

Define chromosome map.

Analyze a karyotype.

Evaluate the contributions of Franklin and Wilkins in helping Watson and Crick discover DNA's double helix structure.

Describe the three parts of a nucleotide.

Summarize the role of hydrogen and covalent bonds in the structure of DNA.

Relate the role of the base-pairing rules to the structure of DNA.

Summarize the process of DNA replication.

Identify the role of enzymes in the replication of DNA.

Describe how complementary base pairing guides DNA replication.

Compare the number of replication forks in prokaryotic and eukaryotic cells during DNA replication.

Describe how errors are corrected during DNA replication.

Outline the flow of genetic information in cells from DNA to protein.

Compare the structure of RNA with that of DNA.
Compare the role of mRNA, rRNA and tRNA in translation.
Summarize the process of transcription.
Distinguish between replication and transcription.
Describe the importance of the genetic code.
Describe the process of translation a genetic code into a protein.
Distinguish between chromosome mutation and gene mutation.
Explain the different types of gene and chromosome mutations.
Explain the causes and effects of mutations on a living thing.

STANDARDS/BENCHMARKS:

Cell Cycle

HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Structure and Function

HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Inheritance and Variation of Traits

HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Natural Selection and Evolution

HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-5 Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Engineering Design

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

RESOURCES:

HMH SCIENCE DIMENSIONS Biology book and online resources
One Stop Planner, Linked Lesson presentations, Extended Visual Labs
You Tube movies
E-games and links
Teacher's Extended Handouts
Lab Handouts

COURSE OUTLINE:

Extended (Reinforcement Sheet)

- Section 2: Digestive System
- Section 3: Absorption and Nutrients
- Section 4: Excretory System

Extended (Reinforcement Sheet)

- Section 1: How Organ systems communicate
- Section 2: Neurons
- Section 3: The Senses
- Section 3: The Senses
- Section 4: Central and Peripheral Nervous Systems.

- Section 6: The Endocrine System and Hormones

Extended (Reinforcement Sheet)

- Section 1: Reproductive Anatomy
- Section 2: Reproductive Processes

Unit 5

- Lesson 1: The Cell Cycle
- Lesson 2: Mitosis and Differentiation

Unit 7

- Lesson 1: Meiosis
- Lesson 2: Mendel and Heredity
- Lesson 3: Traits and Probability
- Lesson 4: Mutation and Genetic Diversity

Extended (Reinforcement Sheet)

- Section 1: Chromosomes and Phenotype
- Section 2: Complex Patterns of Inheritance
- Section 4: Human Genetics and Pedigrees

Unit 6

- Lesson 1: DNA Structure and Replication.
- Lesson 2: Protein Synthesis
- Lesson 3: Gene Expression.

GRADING:

1. Quizzes /tests are given every other week as assigned by school. **Our tests and assessments** consist of multiple-choice, short answer, direct application problems, critical thinking situations, refer to figures, texts, graphs and/or open response items. They are aligned with Michigan benchmarks. A student failing any of his quizzes would have to sit for a **support class and retest** to achieve his 60% which is our passing mark. **A progress report is sent to the parent eventually after sitting for the make up exam.** 40 % is given to students that do not have a medical excuse for missing such an assessment.

2.Skill Based Assignments are done in class where a student has his resources all opened in front of him to answer a set of questions under verbal, nonverbal, quantitative, and spatial domains.

3. Research Sessions are done where students can debate as groups and check the internet for resources and answers to support their ideas. This kind of assessment is under **Research /Project/ Lab Sessions /Journals**. They are evaluated to info, creativity, presentation, discussion and relation to the subject.

4. Daily assessments and drop quizzes take place to check the understanding of students.

5. Laboratory work is checked for research, completeness, accuracy, understanding the experiment, group and individual reports and attendance with the lab coats. Every semester has one term practical assessment.

7. Projects are integrated across and assigned for every term. They are evaluated to accuracy, creativity, info and relation to the subject.

Grade Distribution:

SCIENCE DEPARTMENT GRADE DISTRIBUTION	
HIGH SCHOOL	
End of semester assessment	30%
Quizzes	30%
Skill based Assessment	5%
Project	10%
Research/Journal	5%
Labs	10%
MAP	5%
Drop Quizzes	5%

Cross-Curricular Project(s):

- Once per semester across disciplines.