



Biology – Part 2

Michigan State High School Science Content Expectations

Course Description

Biology Part II will allow you to describe Mendel's plant breeding experiments. You will then explore the many variations of inheritance patterns. You will summarize the chromosome theory of inheritance. You will identify the building blocks of DNA and describe the process of DNA replication.

Text Book

Prentice Hall, Biology, Exploring Life

Unit 1 Description

This unit will allow you to describe Mendel's plant breeding experiments. You will then explore the many variations of inheritance patterns. You will summarize the chromosome theory of inheritance. You will identify the building blocks of DNA and describe the process of DNA replication.

Essential Content and Skills

The learner will:

- Describe the methods Mendel used in his plant-breeding experiments.
- Explain Mendel's principle of segregation.
- Describe how alleles interact in intermediate inheritance.
- Identify the building blocks of DNA.
- Describe the process of DNA replication.
- Describe the process of DNA transcription.
- Describe the types of mutations that can affect genes.

Unit 1 Michigan State Curriculum Content Standards

[Click here to view the Michigan DOE Curriculum Content Standards.](#)

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 1 Lesson 1: Lesson Title Genetics From Inheritance

State Standard	Description
B 4.1 B	Explain that the information passed from parents to offspring is transmitted by means of genes that are coded in DNA molecules. These genes contain the information for the production of proteins. Explain the genetic basis for Mendel's laws of segregation and independent assortment.
B 4.1.d	

Unit 1 Lesson 2: Lesson Title Mendel Discovers Inheritance and Chance

State Standard	Description
B 4.1 A	Draw and label a homologous chromosome pair with heterozygous alleles highlighting a particular gene location. Differentiate between dominant, recessive, codominant, polygenic, and sex-linked traits. Explain the genetic basis for Mendel's laws of segregation and independent assortment. Determine the genotype and phenotype of monohybrid crosses using a Punnett Square.
B 4.1 c	
B 4.1.d	
B 4.1 e	

Unit 1 Lesson 3: Lesson Title Variations of Inheritance Patterns

State Standard	Description
B 4.1 A	Draw and label a homologous chromosome pair with heterozygous alleles highlighting a particular gene location. Show that when mutations occur in sex cells, they can be passed on to offspring (inherited mutations), but if they occur in other cells, they can be passed on to descendant cells only (noninherited mutations).
B 4.2 A	

Unit 1 Lesson 4: Lesson Title Meiosis Explains Mendel's Principles

State Standard	Description
B 4.1 B	Explain that the information passed from parents to offspring is transmitted by means of genes that are coded in DNA molecules. These genes contain the information for the production of proteins. Show that when mutations occur in sex cells, they can be passed on to offspring (inherited mutations), but if they occur in other cells, they can be passed on to descendant cells only (noninherited mutations).
B 4.2 A	

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 1 Lesson 5: Lesson Title Sex-Linked Trait Inheritance Patterns

State Standard	Description
B 4.2 A	Show that when mutations occur in sex cells, they can be passed on to offspring (inherited mutations), but if they occur in other cells, they can be passed on to descendant cells only (noninherited mutations). Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other). Explain that the sorting and recombination of genes in sexual reproduction result in a great variety of possible gene combinations from the offspring of two parents. Explain that gene mutation in a cell can result in uncontrolled cell division called cancer. Also know that exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.
B 4.2 D	
B 4.3 d	
B 4.4 B	

Unit 1 Lesson 6: Lesson Title Genes Are Made Of DNA

State Standard	Description
B 4.2 C	Describe the structure and function of DNA. Describe the processes of replication, transcription, and translation and how they relate to each other in molecular biology.
B 4.2 g	

Unit 1 Lesson 7: Lesson Title Nucleic Acids Store Information in Their Sequences of Chemical Units

State Standard	Description
B 4.2 C	Describe the structure and function of DNA.

Unit 1 Lesson 8: Lesson Title DNA Replication Is The Molecular Mechanism of Inheritance

State Standard	Description
B 4.2 B	Recognize that every species has its own characteristic DNA sequence. Compare and contrast the processes of cell division (mitosis and meiosis), particularly as those processes relate to production of new cells and to passing on genetic information between generations.
B 4.3 A	

Unit 1 Lesson 9: Lesson Title A Gene Provides The Information for Making a Specific Protein

State Standard	Description
B 4.2 B	Recognize that every species has its own characteristic DNA sequence. Describe the structure and function of DNA.
B 4.2 C	

Unit 1 Lesson 10: Lesson Title Two Main Steps From Gene to Protein

State Standard	Description
B 4.3 A	Compare and contrast the processes of cell division (mitosis and meiosis), particularly as those processes relate to production of new cells and to passing on genetic information between generations.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 2 Description

This unit will allow you to explain the significance of the Human Genome Project. You will then describe how disorders, whether inherited or from mutations, can arise in humans. You will also investigate how biologists have learned to manipulate DNA using bacteria. Finally, you will look at DNA technologies and further applications.

Essential Content and Skills

The learner will:

- Explain what can cause a mutation.
- Explain the significance of the Human Genome Project.
- Describe how chromosomes can be damaged.
- Summarize the information provided in a pedigree.
- Describe how inheriting certain mutations can increase a person's risk for cancer.
- Explain how the use of bacteria has contributed to the development of DNA technology.
- Summarize the GMO controversy.
- Describe a technique used to compare DNA samples.
- Explain how operons enable a prokaryote to respond to changes in its environment.

Unit 2 Michigan State Curriculum Content Standards

Unit 2 Lesson 1: Lesson Title Mutations Can Change the Meaning of Genes

State Standard	Description
B 4.2 A	Show that when mutations occur in sex cells, they can be passed on to offspring (inherited mutations), but if they occur in other cells, they can be passed on to descendant cells only (noninherited mutations).
B 4.2 D	Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other).
B 4.2 E	Propose possible effects (on the genes) of exposing an organism to radiation and toxic chemicals.
B 4.3 B	Explain why only mutations occurring in gametes (sex cells) can be passed on to offspring.
B 4.4 A	Describe how inserting, deleting, or substituting DNA segments can alter a gene. Recognize that an altered gene may be passed on to every cell that develops from it and that the resulting features may help, harm, or have little or no effect on the offspring's success in its environment.

Unit 2 Lesson 2: Lesson Title The Nucleus Contains Information-rich Genomes

State Standard	Description
B 4.2 C	Describe the structure and function of DNA.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 2 Lesson 3: Lesson Title Accidents Affecting Chromosomes Can Cause Disorders

State Standard	Description
B 4.2 A	Show that when mutations occur in sex cells, they can be passed on to offspring (inherited mutations), but if they occur in other cells, they can be passed on to descendant cells only (noninherited mutations). Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other). Explain how it might be possible to identify genetic defects from just a karyotype of a few cells. Recognize that genetic variation can occur from such processes as crossing over, jumping genes, and deletion and duplication of genes.
B 4.2 D	
B 4.3 C	
B 4.3 e	

Unit 2 Lesson 4: Lesson Title Mendel's Principles Applied To Humans

State Standard	Description
B 4.1.d	Explain the genetic basis for Mendel's laws of segregation and independent assortment. Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other). Explain why only mutations occurring in gametes (sex cells) can be passed on to offspring.
B 4.2 D	
B 4.3 B	

Unit 2 Lesson 5: Lesson Title Genetic Changes Contribute to Cancer

State Standard	Description
B 4.2 D	Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other). Propose possible effects (on the genes) of exposing an organism to radiation and toxic chemicals. Explain how it might be possible to identify genetic defects from just a karyotype of a few cells.
B 4.2 E	
B 4.3 C	

Unit 2 Lesson 6: Lesson Title Biologists Have Learned to Manipulate DNA

State Standard	Description
B 4.2 D	Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other). Explain how recombinant DNA technology allows scientists to analyze the structure and function of genes. (recommended)
B 4.r.2 I	

Unit 2 Lesson 7: Lesson Title Biologists Can Engineer Bacteria to Make Useful Products

State Standard	Description
B 4.2 h	Recognize that genetic engineering techniques provide great potential and responsibilities. Compare and contrast the processes of cell division (mitosis and meiosis), particularly as those processes relate to production of new cells and to passing on genetic information between generations.
B 4.3 A	

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 2 Lesson 8: Lesson Title Biologists Can Genetically Engineer Plants and Animals

State Standard	Description
B 4.2 f	Demonstrate how the genetic information in DNA molecules provides instructions for assembling protein molecules and that this is virtually the same mechanism for all life forms.
B 4.3. A	Compare and contrast the processes of cell division (mitosis and meiosis), particularly as those processes relate to production of new cells and to passing on genetic information between generations.

Unit 2 Lesson 9: Lesson Title DNA Technologies Have Many Applications

State Standard	Description
B 4.2 B	Recognize that every species has its own characteristic DNA sequence.
B 4.2 C	Describe the structure and function of DNA.

Unit 2 Lesson 10: Lesson Title Control Mechanisms Switch Genes On and Off

State Standard	Description
B 4.2 B	Recognize that every species has its own characteristic DNA sequence.
B 4.2 g	Describe the processes of replication, transcription, and translation and how they relate to each other in molecular biology.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Description

This unit will allow you to identify two domains of prokaryotes, describe the three physical features used to classify prokaryotes, and how prokaryotes reproduce. You will then describe two ways bacteria can cause illness and how humans can defend themselves against bacterial disease. You will describe the ways a virus can cause illness and how humans can defend themselves against a viral disease. Finally, you will investigate the characteristics of protists and fungi.

Essential Content and Skills

The learner will:

- Identify two domains of prokaryotes.
- Describe three physical features that are used to classify prokaryotes.
- Describe the four modes of nutrition and identify which one cyanobacteria use.
- Explain how prokaryotes reproduce.
- Explain how prokaryotes recycle chemicals between organic matter and the environment.
- Describe ways that prokaryotes are helpful to humans.
- Describe two ways bacteria can cause illness.
- Identify ways that humans can defend themselves against bacterial disease.
- Describe the structure and reproduction of a virus.
- Explain how viruses cause disease.
- Describe the life cycle of a retrovirus.
- Explain how humans defend themselves against viral disease.
- Describe the characteristics that all protists have in common.
- Explain why certain unicellular protists can be considered.
- Describe the characteristics of eugleneoids and dinoflagellates.
- Distinguish diatoms from other photosynthetic protists.
- Compare and contrast three types of seaweed.
- Describe the basic structure of fungi.

Unit 3 Michigan State Curriculum Content Standards

Unit 3 Lesson 1: Lesson Title Prokaryotes Life Began On a Young Earth

State Standard	Description
B 2.4 g	Explain that some structures in the modern eukaryotic cell developed from early prokaryotes, such as mitochondria, and in plants, chloroplasts.
B2.4 h	Describe the structures of viruses and bacteria.
B 2.5 f	Relate plant structures and functions to the process of photosynthesis and respiration.

Unit 3 Lesson 2: Lesson Title Prokaryotes Perform Essential Functions in Biosphere

State Standard	Description
B 2.4 i	Recognize that while viruses lack cellular structure, they have the genetic material to invade living cells.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Lesson 3: Lesson Title Viruses Infect Cells By Inserting Genes

State Standard	Description
B 2.4 h B 2.4 i	Describe the structures of viruses and bacteria. Recognize that while viruses lack cellular structure, they have the genetic material to invade living cells.

Unit 3 Lesson 4: Lesson Title Protists Are the Most Diverse of All Eukaryotes

State Standard	Description
B 2.4 d	Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes.

Unit 3 Lesson 5: Lesson Title Slime Molds Decompose Organic Matter

State Standard	Description
B 2.4 d	Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes.

Unit 3 Lesson 6: Lesson Title Algae Are Photosynthetic Protists

State Standard	Description
B 2.4 d	Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes.

Unit 3 Lesson 7: Lesson Title Plants, Fungi, and Animals Evolved From Protists

State Standard	Description
B 2.4 d	Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes.

Unit 3 Lesson 8: Lesson Title Fungi Are Adapted for Nutrition By Absorption

State Standard	Description
B 2.4 d	Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes.

Unit 3 Lesson 9: Lesson Title Fungi Consists of Diverse Forms

State Standard	Description
B 2.4 d	Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes.

Unit 3 Lesson 10: Lesson Title Fungi Have a Major Impact on Other Life

State Standard	Description
B 2.4 d	Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Description

This unit will allow you to describe how land plants (mosses, ferns) evolved from green algae. You will then differentiate gymnosperms from angiosperms. You will then examine the structure of a plant. Finally, you will identify how plants acquire nutrients from the air and soil.

Essential Content and Skills

The learner will:

- Describe the hypothesis that proposes how plants evolved from algae.
- Describe the three groups of bryophytes.
- Name the three groups of pteridophytes.
- List the four main groups of gymnosperms.
- Describe two unique features of angiosperms.
- Relate the structures of a flower to their reproductive functions.
- Describe root and shoot structures and functions.
- Identify the location of meristematic tissue in a plant.
- Describe how tree rings form.
- List the three sources of a plant's mass.
- Explain how water and minerals from the soil reach the xylem of a root.
- Identify adaptations of some plants to a carnivorous, parasitic, or epiphytic lifestyle.

Unit 4 Michigan State Curriculum Content Standards

Unit 4 Lesson 1: Lesson Title Land Plants Evolved From Green Algae

State Standard	Description
B 2.2 D	Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.

Unit 4 Lesson 2: Lesson Title Mosses and Other Bryophytes Were The First Land Plants

State Standard	Description
B 2.2 D	Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.

Unit 4 Lesson 3: Lesson Title Pollens and Seeds Evolved in Gymnosperms

State Standard	Description
B 2.2 D	Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Lesson 4: Lesson Title Flowers and Fruits Evolved in Angiosperms

State Standard	Description
B 2.5 f B 3.5 d	Relate plant structures and functions to the process of photosynthesis and respiration. Describe different reproductive strategies employed by various organisms and explain their advantages and disadvantages.

Unit 4 Lesson 5: Lesson Title Reproductive Adaptations Contribute to Angiosperm Success

State Standard	Description
B 2.5 f B 3.5 d	Relate plant structures and functions to the process of photosynthesis and respiration. Describe different reproductive strategies employed by various organisms and explain their advantages and disadvantages.

Unit 4 Lesson 6: Lesson Title Primary Growth Lengthens Roots and Shoots

State Standard	Description
B 2.1 C	Explain cell division, growth, and development as a consequence of an increase in cell number, cell size, and/or cell products.

Unit 4 Lesson 7: Lesson Title Secondary Growth Increases the Thickness of Woody Plants

State Standard	Description
B 2.1 C B 3.1 B	Explain cell division, growth, and development as a consequence of an increase in cell number, cell size, and/or cell products. Illustrate and describe the energy conversions that occur during photosynthesis and respiration.

Unit 4 Lesson 8: Lesson Title Plants Acquire Nutrients From the Air and Soil

State Standard	Description
B 2.1 A B 2.5 C B 3.1 C	Explain how cells transform energy (ultimately obtained from the sun) from one form to another through the processes of photosynthesis and respiration. Identify the reactants and products in the general reaction of photosynthesis. Describe how energy is transferred and transformed from the Sun to energy-rich molecules during photosynthesis. Recognize the equations for photosynthesis and respiration and identify the reactants and products for both.

Unit 4 Lesson 9: Lesson Title Vascular Water and Minerals from Soil Transported

State Standard	Description
B 2.2 D	Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Lesson 10: Lesson Title Some Plants Have Unique Adaptations for Nutrients

State Standard	Description
B 2.2 D	Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.