



Park Hill School District

Building Successful Futures • Each Student • Every Day

High School PLTW Principles of Biomedical Science Curriculum

Course Description: Students investigate various health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. They determine the factors that led to the death of a fictional person, and investigate lifestyle choices and medical treatments that might have prolonged the person's life. The activities and projects introduce students to human physiology, medicine, and research processes. This course provides an overview of all the courses in the Biomedical Sciences program and lays the scientific foundation for subsequent courses. © 2014 Project Lead The Way

Scope and Sequence:

Timeframe	Unit
3 Weeks	The Mystery
5 Weeks	Diabetes
2 Weeks	Sickle Cell Disease
5 Weeks	Heart Disease
2 Weeks	Infectious Disease
1 Week	Post Mortem

Unit 1: The Mystery

Subject: PLTW Principles of Biomedical Science

Grade: 10 - 12

Name of Unit: The Mystery

Length of Unit: 3 Weeks

Overview of Unit: The goal of Unit 1 is to provide the foundation and develop the theme for the course. Students are engaged by reading about a woman, Anna Garcia, who is found dead in her home. Students investigate the scene, gather evidence, and then move to the lab to analyze their findings. Through their examination of key evidence, students learn notebook organization, observation and documentation skills, and the fundamentals of experimental design. Students are introduced to the structure of DNA and investigate how basic molecular biology techniques can be used to connect suspects with a crime scene. Students also discuss the bioethics of scientific research and explore the bounds of HIPAA legislation. In each unit of the course, students obtain additional medical history information for Anna as well as details from her autopsy report as they explore the various illnesses she encountered throughout her life. Students will maintain a medical file for Anna Garcia, compile their ideas and findings over the duration of the course, and ultimately determine her cause of death in the final unit.

Topic 1: The Mystery

Activity	Title
Lesson 1.1	Investigating the Scene
Lesson 1.2	DNA Analysis
Lesson 1.3	The Findings

Unit 2: Diabetes

Subject: PLTW Principles of Biomedical Science

Grade: 10 - 12

Name of Unit: Diabetes

Length of Unit: 5 Weeks

Overview of Unit: The goal of Unit 2 is for students to walk through Anna Garcia's diagnosis of diabetes by completing simulated laboratory tests. Given results of the tests, students can deduce the basic biology of both Type 1 and Type 2 diabetes. Students investigate the connection between insulin and glucose and discuss how feedback systems in the body regulate the function of key hormones. Students investigate the biochemical makeup of food and complete experiments to demonstrate the relationship between energy and food. As students explore diabetes, they are introduced to basic chemistry, the structure and function of macromolecules, and the relationship of these molecules to metabolic function. The causes, symptoms, treatments, and side effects of diabetes are studied as well as the lifestyle implications associated with this disease. Students examine complications related to diabetes and finally brainstorm and develop an innovation to help with the management or treatment of the disease.

Topic 1: Diabetes

Activity	Title
Lesson 2.1	What is Diabetes?
Lesson 2.2	The Science of Food
Lesson 2.3	Life with Diabetes

Unit 3: Sickle Cell Disease

Subject: PLTW Principles of Biomedical Science

Grade: 10 - 12

Name of Unit: Sickle Cell Disease

Length of Unit: 2 Weeks

Overview of Unit: The goal of Unit 3 is for students to learn basic concepts of genetics and inheritance as they explore Anna Garcia's struggle with sickle cell disease. Students examine sickled red blood cells under a microscope and learn what life is like with the disease by reading and writing patient diary entries. They simulate the process of protein synthesis, examine the assembly of the protein hemoglobin, and demonstrate how sickle cell disease results from a mutation that alters a protein product. Students examine the structure of chromosomes and show how traits are passed through generations on the chromosomes in our cells.

Topic 1: Sickle Cell Disease

Activity	Title
Lesson 3.1	The Disease
Lesson 3.2	It's in the Genes
Lesson 3.3	Chromosomes
Lesson 3.4	Inheritance

Unit 4: Heart Disease

Subject: PLTW Principles of Biomedical Science

Grade: 10 - 12

Name of Unit: Heart Disease

Length of Unit: 5 Weeks

Overview of Unit: The goal of Unit 4 is for students to examine the normal function of the human heart and investigate malfunctions in the cardiovascular system that can lead to heart disease. Students complete a dissection to tour heart anatomy and study heart function using probes and data acquisition software. They collect and analyze heart data, including heart rate, blood pressure, and EKG readings and analyze cardiac test results of Anna Garcia. Students explore the role cholesterol plays in the body. Students further their knowledge of molecular biology as they run gel electrophoresis and complete RFLP analysis to diagnose familial hypercholesterolemia. Students design models to simulate the function of a pump and design visuals to show interventions for blocked coronary vessels.

Topic 1: Heart Disease

Activity	Title
Lesson 4.1	Heart Structure
Lesson 4.2	The Heart at Work
Lesson 4.3	Heart Dysfunction
Lesson 4.4	Heart Intervention

Unit 5: Infectious Disease

Subject: PLTW Principles of Biomedical Science

Grade: 10 - 12

Name of Unit: Infectious Disease

Length of Unit: 2 Weeks

Overview of Unit: The goal of Unit 5 is to introduce students to microbiology and infection. Students follow the spread of a simulated epidemic in order to conduct a thorough examination of the agents of disease. Students use clues from their investigation of Anna Garcia's medical history to deduce that she was suffering from a bacterial infection. Through a series of laboratory investigations, students learn the fundamentals of aseptic technique, complete visual identification of bacterial morphology, use the Gram stain to examine bacterial cell structure, and analyze the results of metabolic tests to pinpoint the particular bacterium at the heart of the illness. Students explain the functioning of the human immune system in a visual project and explore how this system is designed to protect against invaders.

Topic 1: Infectious Disease

Activity	Title
Lesson 5.1	Infection

Unit 6: Post Mortem

Subject: PLTW Principles of Biomedical Science

Grade: 10 - 12

Name of Unit: Post Mortem

Length of Unit: 1 Week

Overview of Unit: The goal of Unit 6 is for students to put together all they have learned throughout the course to determine Anna Garcia's cause of death. Students will investigate the structure and function of key human body systems and relate the illnesses in the course to a breakdown in these systems. Students will begin to recognize the coordination and interconnections of the body systems required to maintain homeostasis, a precursor to the theme of the Human Body Systems (HBS) course.

Topic 1: Post Mortem

Activity	Title
Lesson 6.1	Analyzing Anna