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## *Health Science Technology*

### **Principles of Biomedical Sciences (PBS)**

**HE150A/B    AVC**

Project Lead the Way (PLTW)

Course ID: 14299A001

PLTW Principles of the Biomedical Sciences provides an introduction to this field through “hands-on” projects and problems. Student work involves the study of human medicine, research processes and an introduction to bioinformatics. Students investigate the human body systems and various health conditions including heart disease, diabetes, hypercholesterolemia, infectious diseases, and medical Interventions. A theme through the course is to determine the factors that led to the death of a fictional person. After determining the factors responsible for the death, the students investigate lifestyle choices and medical treatments that might have prolonged the person’s life.

Key biological concepts included in the curriculum are: homeostasis, metabolism, inheritance of traits, feedback systems, and defense against disease. Engineering principles such as the design process, feedback loops, fluid dynamics, and the relationship of structure to function will be included where appropriate. The course is designed to provide an overview of all courses in the Biomedical Sciences program and to lay the scientific foundation necessary for student success in the subsequent courses.

Length of course:	1/2 Semester(s)
Credits per semester	1,5
Grade level:	11, 12 (Mt. Vernon Township H.S. Freshman and sophomores are permitted to take course)
Prerequisite:	A grade of B or above in Geometry or concurrent enrollment in Geometry or higher level math EXPLORE (Math/Science) Score: 17+ PLAN (Math/Science) Score: 19+
Application:	Yes
Class size:	25

### **General Goals/Purposes:**

Upon successful completion of this course, the student will:

- Identify various health conditions including:
  - Heart Disease
  - Diabetes
  - Sickle-Cell Disease
  - Hypercholesterolemia
  - Infectious Disease
- Investigate and determine the cause-of-death of a person.
- Analyze life-style choices and the impact that it has on an individual’s overall health.
- Explore medical interventions and treatments to prolong a person’s life.
- Develop an experimental design.

**Course Outline:**

Units of Instruction	Unit Objectives	Standard(s)	Duration Period(s)	Methods of Instruction	Methods of Assessment	Educational Resources
<p>Human Body Systems</p> <p>Lesson 1 The Mystery</p> <p>Activity 1.1.1 The Mystery Was it a Crime</p> <p>Activity 1.1.2 How is a Career Journal Entry Completed</p> <p>Activity 1.1.3 How do the Parts Make a Whole</p> <p>Activity 1.1.4 What is Our Skeletal System</p> <p>Activity 1.1.5 How do System Interconnect</p> <p>Activity 1.1.6 What Does the Evidence Say</p> <p>Activity 1.1.7 Why Confidentiality</p> <p>Activity 1.1.8 Careers that Determine the Cause of Death</p>	<ul style="list-style-type: none"> <li>• Research information about careers in biomedical science.</li> <li>• Write career journal entries following the described procedure.</li> <li>• Cite sources of information using the correct documentation protocol.</li> <li>• Use resource information without plagiarism.</li> <li>• Investigate a specific human body system to identify structures and functions of its component parts.</li> <li>• Design and produce models of the parts of the specific system and place them on a life size poster of the human body.</li> <li>• Summarize and present to the class your research on the specific body system.</li> <li>• Take notes on all six body systems as each group presents.</li> <li>• Continue to look for clues for the cause of death of the victim.</li> <li>• Begin to investigate medical issues that can affect human body system.</li> <li>• Produce a concept map of a human body system.</li> <li>• Make a concept map showing the interconnections between two body systems.</li> <li>• Utilize the internet to learn about autopsies.</li> <li>• Examine an autopsy.</li> <li>• Research clues to discover the cause-of-death of a patient.</li> <li>• Use a graphic organizer to sort evidence.</li> <li>• Produce a definition for confidentiality.</li> <li>• Write a summary of the Health Insurance Portability and Accountability Act (HIPAA).</li> <li>• Summarize information about specific careers.</li> <li>• Use correct documentation on citing sources used for career research.</li> </ul>		<p>3</p> <p>2</p> <p>7</p> <p>4</p> <p>4</p> <p>5</p> <p>2</p> <p>3</p>	<ul style="list-style-type: none"> <li>• Assessment inventory</li> <li>• Audio, videos, overhead transparencies, and electronic presentations for illustration</li> <li>• Computer lead instruction</li> <li>• Computer lead self-instruction</li> <li>• Demonstrate</li> <li>• Discuss</li> <li>• Guided practice</li> <li>• Hands-on experience</li> <li>• In-class assignments</li> <li>• Independent Study</li> <li>• Individual instruction</li> <li>• Laboratory</li> <li>• Lecture</li> <li>• Modeling</li> <li>• Project based</li> <li>• Reading Assignments</li> <li>• Research</li> <li>• Written exercises</li> </ul>	<ul style="list-style-type: none"> <li>• Article review</li> <li>• Case Study</li> <li>• Critical thinking activity</li> <li>• Daily work</li> <li>• Demonstrate</li> <li>• Evaluate student work</li> <li>• Homework</li> <li>• In-class assignments</li> <li>• Independent Reading</li> <li>• Journaling</li> <li>• Lab book evaluated</li> <li>• Laboratory</li> <li>• Lesson reviews</li> <li>• Multimedia and computer technology</li> <li>• Notebook assessment</li> <li>• Observation of student</li> <li>• Oral feedback</li> <li>• Participation</li> <li>• Peer to peer problem solving</li> <li>• Portfolios</li> <li>• Powerpoint presentation</li> <li>• Project activities</li> <li>• Quiz</li> <li>• Reading Assignments</li> <li>• Reading questions</li> <li>• Report on findings</li> <li>• Review questions</li> <li>• Rubric</li> <li>• Student Guided Practice</li> <li>• Student self-evaluations</li> <li>• Student work displays</li> <li>• Teacher Guided Practice</li> <li>• Teacher observation</li> <li>• Technology</li> <li>• Test</li> <li>• Verbal response</li> <li>• Visual evaluation</li> <li>• Writing assignment</li> </ul>	<ul style="list-style-type: none"> <li>• Computer Lab</li> <li>• Guest Speaker</li> <li>• Handouts</li> <li>• Internet</li> <li>• PLTW PBS Curriculum</li> <li>• Teacher handouts</li> <li>• Various web resources</li> <li>• Video</li> <li>• Wall charts</li> </ul>

<p>Heart Attack</p> <p>Lesson 2.1 What is a Pump?</p> <p>Activity 2.1.1 What is a Pump?</p> <p>Lesson 2.2 The Structure of the Heart</p> <p>Activity 2.2.1 How Many Chambers Does It Have</p> <p>Activity 2.2.2 What Does a Heart Really Look Like</p> <p>Lesson 2.3 The Heart at Work</p> <p>Activity 2.3.1 What Makes Your Heart Beat Faster</p> <p>Activity 2.3.2 What is Blood Pressure</p>	<ul style="list-style-type: none"> <li>• Construct a single pump.</li> <li>• Explain 2 ways that the human heart is like a mechanical pump.</li> </ul> <ul style="list-style-type: none"> <li>• Identify the major structures in the human heart.</li> <li>• Identify the location of the major structures of the human heart.</li> <li>• Diagram the pathway the blood takes as it travels through the heart.</li> <li>• Describe the advantages the four-chambered structure of the heart provides for blood flow and oxygen delivery.</li> </ul> <ul style="list-style-type: none"> <li>• Identify the major structures in a sheep's heart.</li> <li>• Explain the function of each of the structures identified in this activity.</li> <li>• Trace the pathway of blood flow through the sheep's heart.</li> <li>• Apply the information learned from the sheep's heart to the human heart.</li> <li>• Identify three tissue types found in the human heart.</li> <li>• Sketch simple drawings of the tissues as viewed through the microscope.</li> </ul> <ul style="list-style-type: none"> <li>• Students will explain why heart rate, EKG, and blood pressure are important indicators of cardiovascular health.</li> </ul> <ul style="list-style-type: none"> <li>• Students will apply the steps of experimental design to investigate factors that influence heart rate and blood pressure.</li> <li>• Students will analyze blood pressure and heart rate data to investigate cardiac activity under various environmental conditions.</li> </ul>	<p>4</p> <p>5</p> <p>5</p> <p>3</p> <p>3</p>	<ul style="list-style-type: none"> <li>• Assessment inventory</li> <li>• Audio, videos, overhead transparencies, and electronic presentations for illustration</li> <li>• Computer lead instruction</li> <li>• Computer lead self-instruction</li> <li>• Demonstrate</li> <li>• Discuss</li> <li>• Guided practice</li> <li>• Hands-on experience</li> <li>• In-class assignments</li> <li>• Independent Study</li> <li>• Individual instruction</li> <li>• Laboratory</li> <li>• Lecture</li> <li>• Modeling</li> <li>• Project based</li> <li>• Reading Assignments</li> <li>• Research</li> <li>• Written exercises</li> </ul>	<ul style="list-style-type: none"> <li>• Article review</li> <li>• Case Study</li> <li>• Critical thinking activity</li> <li>• Daily work</li> <li>• Demonstrate</li> <li>• Evaluate student work</li> <li>• Homework</li> <li>• In-class assignments</li> <li>• Independent Reading</li> <li>• Journaling</li> <li>• Lab book evaluated</li> <li>• Laboratory</li> <li>• Lesson reviews</li> <li>• Multimedia and computer technology</li> <li>• Notebook assessment</li> <li>• Observation of student</li> <li>• Oral feedback</li> <li>• Participation</li> <li>• Peer to peer problem solving</li> <li>• Portfolios</li> <li>• Powerpoint presentation</li> <li>• Project activities</li> <li>• Quiz</li> <li>• Reading Assignments</li> <li>• Reading questions</li> <li>• Report on findings</li> <li>• Review questions</li> <li>• Rubric</li> <li>• Student Guided Practice</li> <li>• Student self-evaluations</li> <li>• Student work displays</li> <li>• Teacher Guided Practice</li> <li>• Teacher observation</li> <li>• Technology</li> <li>• Test</li> <li>• Verbal response</li> <li>• Visual evaluation</li> <li>• Writing assignment</li> </ul>	<ul style="list-style-type: none"> <li>• Computer Lab</li> <li>• Handouts</li> <li>• Internet</li> <li>• PLTW PBS Curriculum</li> <li>• Teacher handouts</li> <li>• Various web resources</li> <li>• Video</li> </ul>
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<p>Activity 2.3.3 The EKG – What Can It Tell Us</p>	<ul style="list-style-type: none"> <li>• Students will explain what is happening to the heart muscle at specific times as evidenced by the graph of the EKG.</li> <li>• Students will analyze EKG graphs to determine the presence of various medical conditions that can affect the heart.</li> <li>• Students will interpret EKG results to determine heart rate and electrical activity.</li> </ul>	2				
<p>Activity 2.3.4 Careers that Involve Cardiac Testing</p>	<ul style="list-style-type: none"> <li>• Summarize information about specific careers</li> </ul>	1				
<p>Lesson 2.4 Blood – The River of Life</p>						
<p>Activity 2.4.1 How Do Blood Cells Differ</p>	<ul style="list-style-type: none"> <li>• Students will measure the size of a specimen using the microscope.</li> <li>• Identify red and white blood cells when observed with the microscope.</li> <li>• Mathematically compare the ratio of red blood cells to white blood cells.</li> <li>• Describe the functions of selected substances found in blood.</li> <li>• Explain how blood tests can be used to diagnose disease.</li> </ul>	3				
<p>Activity 2.4.2 Where Does All That Blood Go</p>	<ul style="list-style-type: none"> <li>• Students will name three different classifications of tissues in the human body.</li> <li>• Describe similarities and differences between the three classifications of tissues.</li> <li>• Name three specific examples of tissues found in human body systems, identify where they are found and explain one function each performs.</li> </ul>	2				
<p>Activity 2.4.3 Why Are Cells So Small</p>	<ul style="list-style-type: none"> <li>• Students will calculate the surface area and volume of a cube.</li> <li>• Define surface area-to-volume ration.</li> <li>• Explain how the surface area-to-volume ratio impacts the potential size of a cell.</li> <li>• Explain why metabolic processes require cells to be so small.</li> </ul>	3				
<p>Activity 2.4.4 Careers that Involve Cardiac Tissues</p>	<ul style="list-style-type: none"> <li>• Summarize information about specific careers</li> </ul>	1				

<p>Diabetes</p> <p>Lesson 1 What Is in Our Food</p> <p>Activity 3.1.1 What Is in that Stuff We Eat (Optional)</p> <p>Activity 3.1.2 How Much Energy Is in Food</p> <p>Activity 3.1.3 What Makes All Matter</p> <p>Activity 3.1.4 Where Is the Energy</p> <p>Activity 3.1.5 Careers in Food Science</p>	<ul style="list-style-type: none"> <li>Students should identify the major components on a food label.</li> <li>Explain the nutritional function of fats, carbohydrates and proteins.</li> <li>Explain the significance of the term serving size.</li> <li>Define RDA and DRI and explain the differences between the two terms.</li> <li>Students will explain how a healthy food is different from a junk food.</li> <li>Students will explain how food relates to energy for the human body.</li> <li>Students will organize and display information to demonstrate an understanding of dietary requirements.</li> <li>Students will use a model kit to build an example of a molecule and a compound.</li> <li>Explain the difference between a molecule and a compound.</li> <li>Describe how the structure of a molecule or a compound determines its physical characteristics.</li> <li>Explain what an ion is and how it can form. Describe, in simple terms, the role of electrons in forming molecules and compounds.</li> <li>Students will explain the significance of bonding in the formation of chemical compounds.</li> <li>Differentiate between hydrogen, covalent and ionic bonding.</li> <li>Explain how the forming and breaking of bonds allow for energy conversions in a chemical reaction.</li> <li>Explain why water is considered to be the universal solvent.</li> <li>Use the water molecule kit to demonstrate what it means for a solute to dissolve in a solvent.</li> <li>Differentiate between hydrophobic and hydrophilic substances and list examples of each.</li> <li>Summarize information about specific careers.</li> </ul>	<p>3</p> <p>2</p> <p>2</p> <p>2</p> <p>1</p>	<ul style="list-style-type: none"> <li>Activity</li> <li>Assessment inventory</li> <li>Audio, videos, overhead transparencies, and electronic presentations for illustration</li> <li>Computer lead instruction</li> <li>Computer lead self-instruction</li> <li>Demonstrate</li> <li>Discuss</li> <li>Guided practice</li> <li>Hands-on experience</li> <li>In-class assignments</li> <li>Independent Study</li> <li>Individual instruction</li> <li>Laboratory</li> <li>Lecture</li> <li>Modeling</li> <li>Project based</li> <li>Reading Assignments</li> <li>Research</li> <li>Written exercises</li> </ul>	<ul style="list-style-type: none"> <li>Article review</li> <li>Case Study</li> <li>Critical thinking activity</li> <li>Daily work</li> <li>Demonstrate</li> <li>Evaluate student work</li> <li>Homework</li> <li>In-class assignments</li> <li>Independent Reading</li> <li>Journaling</li> <li>Lab book evaluated</li> <li>Laboratory</li> <li>Lesson reviews</li> <li>Multimedia and computer technology</li> <li>Notebook assessment</li> <li>Observation of student</li> <li>Oral feedback</li> <li>Participation</li> <li>Peer to peer problem solving</li> <li>Portfolios</li> <li>Powerpoint presentation</li> <li>Project activities</li> <li>Quiz</li> <li>Reading Assignments</li> <li>Reading questions</li> <li>Report on findings</li> <li>Review questions</li> <li>Rubric</li> <li>Student Guided Practice</li> <li>Student self-evaluations</li> <li>Student work displays</li> <li>Teacher Guided Practice</li> <li>Teacher observation</li> <li>Technology</li> <li>Test</li> <li>Verbal response</li> <li>Visual evaluation</li> <li>Writing assignment</li> </ul>	<ul style="list-style-type: none"> <li>Computer Lab</li> <li>Handouts</li> <li>Internet</li> <li>PLTW PBS Curriculum</li> <li>Teacher handouts</li> <li>Various web resources</li> <li>Video</li> </ul>
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Lesson 3.2 Macromolecules						
Activity 3.2.1 What Are Macromolecules	<ul style="list-style-type: none"> <li>• Students will recognize and classify a diagram or model of a macromolecule as a protein, carbohydrate, or lipid.</li> <li>• Recognize and classify a diagram or model of the sub-units of each macromolecule.</li> <li>• Explain the functions of each of the macromolecules in the body.</li> <li>• Explain the processes of dehydration synthesis and hydrolysis.</li> </ul>		3			
Project 3.2.2 Which Molecule Am I	<ul style="list-style-type: none"> <li>• Students will name a specific indicator that can be used to test for each of the biomolecules studied including fats, proteins and carbohydrates.</li> <li>• Describe the protocol used and the results of a positive test for each of the indicators.</li> <li>• Explain what is meant by the statement: “Not all carbohydrates are the same.”</li> </ul>		3			
Lesson 3.3 Molecules Working Together						
Activity 3.3.1 What Are Action Molecules	<ul style="list-style-type: none"> <li>• Students will explain the lock and key and induced fit models of enzyme function.</li> <li>• Define the term substrate.</li> <li>• Explain the specificity and significance of the active site of an enzyme.</li> </ul>		3			
Lesson 3.4 The Diabetes Connection						
Activity 3.4.1 Can Negative Feedback Be a Positive Thing	<ul style="list-style-type: none"> <li>• Explain what a feedback loop is, and distinguish a positive from a negative feedback loop.</li> <li>• Explain the significance of feedback systems to maintaining homeostasis of the body.</li> </ul>		3			
Activity 3.4.2 Why is Too Much Sugar in Blood Bad	<ul style="list-style-type: none"> <li>• Describe the nutritional requirements of a diabetic compared to non-diabetics.</li> </ul>		2			
Project 3.4.3 How Does Insulin Work	<ul style="list-style-type: none"> <li>• Develop a 3D model to explain the mechanism insulin uses to facilitate the movement of glucose into cells.</li> <li>• Explain the concept of specificity as it relates to receptor sites and transport molecules.</li> </ul>		3			

<p>Activity 3.4.4 What Is Diabetes</p>	<ul style="list-style-type: none"> <li>• Predict why a deficiency of insulin could have a major impact on homeostasis.</li> <li>• Explain the importance of using a design process to create a working model of a complex process.</li> <li>• Explain the physiological causes of Type 1 and Type 2 diabetes.</li> <li>• Describe the symptoms and strategies for diagnosis of Type 1 and Type 2 diabetes.</li> <li>• Describe the short and long-term effects of Type 1 and Type 2 diabetes.</li> <li>• Describe the treatment options currently available for Type 1 and Type 2 diabetes.</li> <li>• Discuss any preventative measures to protect someone from becoming a Type 2 diabetic.</li> <li>• Compare and contrast Type 1 and Type 2 Diabetes including cause, effects, and treatments.</li> </ul>		3			
<p>Activity 3.4.5 Careers Involved in Treating Diabetes</p>	<ul style="list-style-type: none"> <li>• Summarize information about specific careers.</li> </ul>		1			
<p>Lesson 3.5 Life with Diabetes</p>			3			
<p>Activity 3.5.1 So What Can I Eat</p>	<ul style="list-style-type: none"> <li>• Develop a menu that is nutritionally complete and appropriate for a diabetic teenager.</li> <li>• Rationalize the food choices made when planning the menu for a teenager with diabetes.</li> </ul>		2			
<p>Activity 3.5.2 What Is a Day in the Life of a Diabetic Really Like</p>	<ul style="list-style-type: none"> <li>• Describe how diabetes may impact an individual's life, including the impact on the family as well.</li> <li>• Suggest strategies that help diabetics and their families address the challenges the disorder causes.</li> </ul>		1			
<p>Activity 3.5.3 Careers that Aid Diabetics</p>	<ul style="list-style-type: none"> <li>• Summarize information about specific careers.</li> </ul>					

<p>Sickle Cell Disease</p> <p>Lesson 4.1 What Is Sickle-Cell Disease</p> <p>Activity 4.1.1 What Are Sickle Cells</p> <p>Activity 4.1.2 Clinical Symptoms and Complications of Sickle-Cell Disease</p> <p>Activity 4.1.3 World Distribution of Sickle Cell Disease</p> <p>Activity 4.1.4 Careers that Involve the Study of Disease</p> <p>Lesson 4.2 What Causes Sickle Cell Disease</p> <p>Activity 4.2.1 What Are Chromosomes</p> <p>Activity 4.2.2 The Story of HeLa Cells</p> <p>Activity 4.2.3 The Doctor's Point of View</p> <p>Activity 4.2.4 How Does Sickle Cell Disease Pass through Families</p> <p>Project 4.2.5 What Is a Family's Pedigree</p> <p>Activity 4.2.6 What Is the Probability</p> <p>Activity 4.2.7 Careers that Involve the Study of Family Traits</p>	<ul style="list-style-type: none"> <li>• Describe the differences in the appearance of normal and sickle red blood cells.</li> <li>• List the symptoms and complications of sickle cell disease.</li> <li>• Interpret maps and charts to determine the global prevalence of diseases.</li> <li>• Summarize information about specific careers.</li> <li>• Observe human chromosomes by using a human tumor cell line grown in a laboratory to prepare a chromosome spread.</li> <li>• Analyze how medical research and health care be different, if Dr. Gey had not cultured cells from Henrietta Lacks.</li> <li>• Examine and interpret three pedigrees of families affected by sickle cell disease.</li> <li>• Create a pedigree that tracks a trait through at least three generations.</li> <li>• Calculate the probability of offspring inheriting a trait and explain how they made the calculation.</li> <li>• Summarize information about specific careers.</li> </ul>		<p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>2</p> <p>1</p>	<ul style="list-style-type: none"> <li>• Activity</li> <li>• Assessment inventory</li> <li>• Audio, videos, overhead transparencies, and electronic presentations for illustration</li> <li>• Computer lead instruction</li> <li>• Computer lead self-instruction</li> <li>• Demonstrate</li> <li>• Discuss</li> <li>• Guided practice</li> <li>• Hands-on experience</li> <li>• In-class assignments</li> <li>• Independent Study</li> <li>• Individual instruction</li> <li>• Laboratory</li> <li>• Lecture</li> <li>• Modeling</li> <li>• Project based</li> <li>• Reading Assignments</li> <li>• Research</li> <li>• Written exercises</li> </ul>	<ul style="list-style-type: none"> <li>• Article review</li> <li>• Case Study</li> <li>• Critical thinking activity</li> <li>• Daily work</li> <li>• Demonstrate</li> <li>• Evaluate student work</li> <li>• Homework</li> <li>• In-class assignments</li> <li>• Independent Reading</li> <li>• Journaling</li> <li>• Lab book evaluated</li> <li>• Laboratory</li> <li>• Lesson reviews</li> <li>• Multimedia and computer technology</li> <li>• Notebook assessment</li> <li>• Observation of student</li> <li>• Oral feedback</li> <li>• Participation</li> <li>• Peer to peer problem solving</li> <li>• Portfolios</li> <li>• Powerpoint presentation</li> <li>• Project activities</li> <li>• Quiz</li> <li>• Reading Assignments</li> <li>• Reading questions</li> <li>• Report on findings</li> <li>• Review questions</li> <li>• Rubric</li> <li>• Student Guided Practice</li> <li>• Student self-evaluations</li> <li>• Student work displays</li> <li>• Teacher Guided Practice</li> <li>• Teacher observation</li> <li>• Technology</li> <li>• Test</li> <li>• Verbal response</li> <li>• Visual evaluation</li> <li>• Writing assignment</li> </ul>	<ul style="list-style-type: none"> <li>• Computer Lab</li> <li>• Handouts</li> <li>• Internet</li> <li>• PLTW PBS Curriculum</li> <li>• Teacher handouts</li> <li>• Various web resources</li> <li>• Video</li> </ul>
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<p>Lesson 4.3 How Do Chromosomes Carry Information</p>			2			
<p>Activity 4.3.1 How Do Chromosomes Carry Information</p>	<ul style="list-style-type: none"> <li>• Visualize the structure of chromosomes and explore the features of chromosome 11 including the beta-globin gene, and investigate genes located on other chromosomes.</li> <li>• Describe the structure of a chromosome.</li> </ul>		2			
<p>Activity 4.3.2 What Is the Structure of DNA</p>	<ul style="list-style-type: none"> <li>• Describe the structure of DNA, especially the specific relationships between adenine and guanine nucleotides and between cytosine and thymine nucleotides.</li> </ul>		1			
<p>Activity 4.3.3 How Is DNA Isolated from Cells</p>	<ul style="list-style-type: none"> <li>• Isolate DNA from plant and animal cells.</li> </ul>		3			
<p>Activity 4.3.4 How Much DNA Is in a Human Cell</p>	<ul style="list-style-type: none"> <li>• Describe the size of a human cell compared to the length of the DNA molecules in the cell.</li> <li>• Analyze why a chromosome does not look like a long DNA helix.</li> </ul>		1			
<p>Activity 4.3.5 Careers that Involve the Study of DNA</p>	<ul style="list-style-type: none"> <li>• Summarize information about specific careers.</li> </ul>		3			
<p>Lesson 4.4 What Is the DNA Code</p>	<ul style="list-style-type: none"> <li>• Explain how the sequence of nucleotides in a gene acts as a code that determines the amino acid sequence of a protein.</li> </ul>		2			
<p>Activity 4.4.1 What Is the DNA Code</p>						
<p>Activity 4.4.2 What Determines the Shape of a Protein</p>	<ul style="list-style-type: none"> <li>• Describe how hydrophobic and hydrophilic amino acids respond to water and oil.</li> <li>• Predict the general structure of a protein based on the position of specific amino acids.</li> <li>• Explain how amino acids react with each other and the environment.</li> </ul>		3			
<p>Activity 4.4.3 What Is the Shape of Beta-Globin (Optional)</p>	<ul style="list-style-type: none"> <li>• Describe how changing the amino acids in a protein can change its 3-dimensional shape.</li> <li>• Describe the types of interactions individual amino acids have with each other and with their surrounding environment, and how these interactions determine a protein's shape.</li> </ul>		2			
<p>Project 4.4.4 How Are Designer Proteins Made</p>	<ul style="list-style-type: none"> <li>• Apply knowledge of the genetic code and amino acid interactions in order to design a protein with a specific function.</li> </ul>					



<p>Hypercholesterolemia</p> <p>Lesson 5.1 Cholesterol</p> <p>Activity 5.1.1 Aren't All Fats the Same</p> <p>Activity 5.1.2 What Are LDL and HDL</p> <p>Activity 5.1.3 Careers that Involve Diet and Lifestyle Changes</p> <p>Lesson 5.2 Molecular Biological Techniques for Diagnosing Disease</p> <p>Activity 5.2.1 How Does PCR Amplify DNA</p> <p>Activity 5.2.2 What Is Familial Hypercholesterolemia and How Is It Diagnosed</p> <p>Activity 5.2.3 Careers that Involve Molecular Biology</p>	<ul style="list-style-type: none"> <li>• Describe the differences between saturated and unsaturated fats.</li> <li>• Recognize and identify models of saturated and unsaturated fatty acids and cholesterol.</li> <li>• Explain why cholesterol is essential for proper functioning of the cells and the body.</li> </ul> <ul style="list-style-type: none"> <li>• Apply knowledge of cholesterol, lipid binding proteins, and heart disease to produce an informative brochure or poster.</li> </ul> <ul style="list-style-type: none"> <li>• Summarize information about specific careers.</li> </ul> <ul style="list-style-type: none"> <li>• Calculate how many copies of a section of DNA can be obtained from a single DNA molecule after 30 cycles of the PCR.</li> <li>• Demonstrate proper laboratory techniques to separate DNA fragments by gel electrophoresis.</li> <li>• Analyze how PCR amplifies DNA.</li> </ul> <ul style="list-style-type: none"> <li>• Using DNA electrophoresis, separate and analyze DNA fragments in order to determine if patients have familial hypercholesterolemia.</li> </ul> <ul style="list-style-type: none"> <li>• Summarize information about specific careers.</li> </ul>	<p>2</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p>	<ul style="list-style-type: none"> <li>• Activity</li> <li>• Assessment inventory</li> <li>• Audio, videos, overhead transparencies, and electronic presentations for illustration</li> <li>• Computer lead instruction</li> <li>• Computer lead self-instruction</li> <li>• Demonstrate</li> <li>• Discuss</li> <li>• Guided practice</li> <li>• Hands-on experience</li> <li>• In-class assignments</li> <li>• Independent Study</li> <li>• Individual instruction</li> <li>• Laboratory</li> <li>• Lecture</li> <li>• Modeling</li> <li>• Project based</li> <li>• Reading Assignments</li> <li>• Research</li> <li>• Written exercises</li> </ul>	<ul style="list-style-type: none"> <li>• Article review</li> <li>• Case Study</li> <li>• Critical thinking activity</li> <li>• Daily work</li> <li>• Demonstrate</li> <li>• Evaluate student work</li> <li>• Homework</li> <li>• In-class assignments</li> <li>• Independent Reading</li> <li>• Journaling</li> <li>• Lab book evaluated</li> <li>• Laboratory</li> <li>• Lesson reviews</li> <li>• Multimedia and computer technology</li> <li>• Notebook assessment</li> <li>• Observation of student</li> <li>• Oral feedback</li> <li>• Participation</li> <li>• Peer to peer problem solving</li> <li>• Portfolios</li> <li>• Powerpoint presentation</li> <li>• Project activities</li> <li>• Quiz</li> <li>• Reading Assignments</li> <li>• Reading questions</li> <li>• Report on findings</li> <li>• Review questions</li> <li>• Rubric</li> <li>• Student Guided Practice</li> <li>• Student self-evaluations</li> <li>• Student work displays</li> <li>• Teacher Guided Practice</li> <li>• Teacher observation</li> <li>• Technology</li> <li>• Test</li> <li>• Verbal response</li> <li>• Visual evaluation</li> <li>• Writing assignment</li> </ul>	<ul style="list-style-type: none"> <li>• Computer Lab</li> <li>• Handouts</li> <li>• Internet</li> <li>• PLTW PBS Curriculum</li> <li>• Teacher handouts</li> <li>• Various web resources</li> <li>• Video</li> </ul>
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<p>Infectious Disease</p> <p>Lesson 6.1 Bacteria</p> <p>Activity 6.1.1 What Are Bacteria</p> <p>Activity 6.1.2 How Do Bacteria in the Mouth Affect the Heart</p> <p>Activity 6.1.3 Which Antibiotic Is the Best Choice</p> <p>Lesson 6.2 Viruses</p> <p>Activity 6.2.1 What Are Viruses</p> <p>Activity 6.2.2 Careers that Deal with Infectious Diseases.</p> <p>Lesson 6.3 Public Health Campaign</p> <p>Project 6.3.1 How Do We Tell Others</p>	<ul style="list-style-type: none"> <li>• Describe the shapes of bacteria.</li> <li>• Make a bacteria smear on a microscope slide.</li> <li>• Stain bacteria using the Gram stain protocol.</li> <li>• View and classify bacteria based on their morphology and Gram stain.</li> </ul> <ul style="list-style-type: none"> <li>• Research the relationship between oral bacteria and increased risk of heart attack.</li> <li>• Summarize research in a concept map.</li> <li>• Design an educational poster for a dentist's office informing patients of the relationship between oral health and heart health.</li> </ul> <ul style="list-style-type: none"> <li>• Perform and analyze a test of antibiotic efficiency using pour plates and antibiotic discs.</li> </ul> <ul style="list-style-type: none"> <li>• Define viruses.</li> <li>• Explain the differences between bacteria and viruses.</li> <li>• Explain the structure of a virus.</li> </ul> <ul style="list-style-type: none"> <li>• Summarize information about specific careers.</li> </ul> <ul style="list-style-type: none"> <li>• Explain how the disease your group chose is passed from person-to-person.</li> <li>• Discuss how the disease your group chose could be prevented.</li> <li>• Discuss how public health campaigns are used to educate people in order to prevent the spread of diseases.</li> </ul>	<p>3</p> <p>3</p> <p>2</p> <p>3</p> <p>1</p> <p>5</p>	<ul style="list-style-type: none"> <li>• Activity</li> <li>• Assessment inventory</li> <li>• Audio, videos, overhead transparencies, and electronic presentations for illustration</li> <li>• Computer lead instruction</li> <li>• Computer lead self-instruction</li> <li>• Demonstrate</li> <li>• Discuss</li> <li>• Guided practice</li> <li>• Hands-on experience</li> <li>• In-class assignments</li> <li>• Independent Study</li> <li>• Individual instruction</li> <li>• Laboratory</li> <li>• Lecture</li> <li>• Modeling</li> <li>• Project based</li> <li>• Reading Assignments</li> <li>• Research</li> <li>• Written exercises</li> </ul>	<ul style="list-style-type: none"> <li>• Article review</li> <li>• Case Study</li> <li>• Critical thinking activity</li> <li>• Daily work</li> <li>• Demonstrate</li> <li>• Evaluate student work</li> <li>• Homework</li> <li>• In-class assignments</li> <li>• Independent Reading</li> <li>• Journaling</li> <li>• Lab book evaluated</li> <li>• Laboratory</li> <li>• Lesson reviews</li> <li>• Multimedia and computer technology</li> <li>• Notebook assessment</li> <li>• Observation of student</li> <li>• Oral feedback</li> <li>• Participation</li> <li>• Peer to peer problem solving</li> <li>• Portfolios</li> <li>• Powerpoint presentation</li> <li>• Project activities</li> <li>• Quiz</li> <li>• Reading Assignments</li> <li>• Reading questions</li> <li>• Report on findings</li> <li>• Review questions</li> <li>• Rubric</li> <li>• Student Guided Practice</li> <li>• Student self-evaluations</li> <li>• Student work displays</li> <li>• Teacher Guided Practice</li> <li>• Teacher observation</li> <li>• Technology</li> <li>• Test</li> <li>• Verbal response</li> <li>• Visual evaluation</li> <li>• Writing assignment</li> </ul>	<ul style="list-style-type: none"> <li>• Computer Lab</li> <li>• Handouts</li> <li>• Internet</li> <li>• PLTW PBS Curriculum</li> <li>• Teacher handouts</li> <li>• Various web resources</li> <li>• Video</li> </ul>
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<p>Medical Interventions</p> <p>Lesson 7.1 Medical Interventions</p> <p>Activity 7.1.1 What Are Medical Interventions</p> <p>Project 7.1.2 How Are Medicines Developed and Tested</p> <p>Activity 7.1.3 How Can Pharmaceuticals Help</p> <p>Problem 7.1.4 What Medical Interventions Might Have Helped</p> <p>Activity 7.1.5 What Is Biomedical Engineering</p> <p>Activity 7.1.6 Careers that Deal with Medical Interventions</p>	<ul style="list-style-type: none"> <li>Describe the different types or categories of medical intervention.</li> <li>Design and produce a product (e.g. game, comic book, or cartoon) that demonstrates the steps or stages in the development, trial, and approval of medical interventions.</li> <li>Present and explain the mode of actions of the researched medical interventions to the class.</li> <li>Describe how the application of engineering principles to a biological system allowed the design and production of a medical device to improve human health or quality of life.</li> <li>Explain how various medical interventions work and how they prevent or treat disease.</li> <li>Explain the societal and economic differences between disease prevention and treatment.</li> <li>Interpret information in order to determine the most appropriate medical intervention for a specific patient.</li> <li>Explain how biomedical engineers apply engineering principles to design and produce medical devices.</li> <li>Summarize information about specific careers.</li> </ul>	<p>2</p> <p>3</p> <p>2</p> <p>3</p> <p>1</p> <p>1</p>	<ul style="list-style-type: none"> <li>Activity</li> <li>Assessment inventory</li> <li>Audio, videos, overhead transparencies, and electronic presentations for illustration</li> <li>Computer lead instruction</li> <li>Computer lead self-instruction</li> <li>Demonstrate</li> <li>Discuss</li> <li>Guided practice</li> <li>Hands-on experience</li> <li>In-class assignments</li> <li>Independent Study</li> <li>Individual instruction</li> <li>Laboratory</li> <li>Lecture</li> <li>Modeling</li> <li>Project based</li> <li>Reading Assignments</li> <li>Research</li> <li>Written exercises</li> </ul>	<ul style="list-style-type: none"> <li>Article review</li> <li>Case Study</li> <li>Critical thinking activity</li> <li>Daily work</li> <li>Demonstrate</li> <li>Evaluate student work</li> <li>Homework</li> <li>In-class assignments</li> <li>Independent Reading</li> <li>Journaling</li> <li>Lab book evaluated</li> <li>Laboratory</li> <li>Lesson reviews</li> <li>Multimedia and computer technology</li> <li>Notebook assessment</li> <li>Observation of student</li> <li>Oral feedback</li> <li>Participation</li> <li>Peer to peer problem solving</li> <li>Portfolios</li> <li>Powerpoint presentation</li> <li>Project activities</li> <li>Quiz</li> <li>Reading Assignments</li> <li>Reading questions</li> <li>Report on findings</li> <li>Review questions</li> <li>Rubric</li> <li>Student Guided Practice</li> <li>Student self-evaluations</li> <li>Student work displays</li> <li>Teacher Guided Practice</li> <li>Teacher observation</li> <li>Technology</li> <li>Test</li> <li>Verbal response</li> <li>Visual evaluation</li> <li>Writing assignment</li> </ul>	<ul style="list-style-type: none"> <li>Computer Lab</li> <li>Handouts</li> <li>Internet</li> <li>PLTW PBS Curriculum</li> <li>Teacher handouts</li> <li>Various web resources</li> <li>Video</li> </ul>
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<p>Grant Proposal</p> <p>Lesson 8.1 The Grant Proposal</p> <p>Problem 8.1.1 A Call for Grant Proposals – What Can We Do</p>	<ul style="list-style-type: none"> <li>• Complete in-depth research on a disease or medical condition.</li> <li>• Present the research in the form of a written grant proposal following the Grant Proposal Guidelines.</li> <li>• Make an oral presentation of the grant proposal.</li> <li>• Evaluate each team presentation using the evaluation rubric.</li> <li>• Evaluate your own team presentation using the evaluation rubric.</li> </ul>		10	<ul style="list-style-type: none"> <li>• Activity</li> <li>• Assessment inventory</li> <li>• Audio, videos, overhead transparencies, and electronic presentations for illustration</li> <li>• Computer lead instruction</li> <li>• Computer lead self-instruction</li> <li>• Demonstrate</li> <li>• Discuss</li> <li>• Guided practice</li> <li>• Hands-on experience</li> <li>• In-class assignments</li> <li>• Independent Study</li> <li>• Individual instruction</li> <li>• Laboratory</li> <li>• Lecture</li> <li>• Modeling</li> <li>• Project based</li> <li>• Reading Assignments</li> <li>• Research</li> <li>• Written exercises</li> </ul>	<ul style="list-style-type: none"> <li>• Article review</li> <li>• Case Study</li> <li>• Critical thinking activity</li> <li>• Daily work</li> <li>• Demonstrate</li> <li>• Evaluate student work</li> <li>• Homework</li> <li>• In-class assignments</li> <li>• Independent Reading</li> <li>• Journaling</li> <li>• Lab book evaluated</li> <li>• Laboratory</li> <li>• Lesson reviews</li> <li>• Multimedia and computer technology</li> <li>• Notebook assessment</li> <li>• Observation of student</li> <li>• Oral feedback</li> <li>• Participation</li> <li>• Peer to peer problem solving</li> <li>• Portfolios</li> <li>• Powerpoint presentation</li> <li>• Project activities</li> <li>• Quiz</li> <li>• Reading Assignments</li> <li>• Reading questions</li> <li>• Report on findings</li> <li>• Review questions</li> <li>• Rubric</li> <li>• Student Guided Practice</li> <li>• Student self-evaluations</li> <li>• Student work displays</li> <li>• Teacher Guided Practice</li> <li>• Teacher observation</li> <li>• Technology</li> <li>• Test</li> <li>• Verbal response</li> <li>• Visual evaluation</li> <li>• Writing assignment</li> </ul>	<ul style="list-style-type: none"> <li>• Computer Lab</li> <li>• Handouts</li> <li>• Internet</li> <li>• PLTW PBS Curriculum</li> <li>• Teacher handouts</li> <li>• Various web resources</li> <li>• Video</li> </ul>
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## **Materials to be used in the Classroom**

### ***Materials to be Used in the Classroom***

#### **Textbook:**

#### **Software:**

- Inspiration 9
- Logger Pro

#### ***Additional References:***

- *PLTW PBS Curriculum*

#### ***Last updated:***

Friday, December 16<sup>th</sup>, 2011

#### ***Date Posted:***

Monday, December 19<sup>th</sup>, 2011

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