Principles of Biomedical Sciences

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<tr>
<th>Instructor</th>
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<tbody>
<tr>
<td>Room</td>
<td>334 Haddix</td>
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<tr>
<td>After School</td>
<td>Thursday</td>
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<tr>
<td>Hours</td>
<td>3:05 – 4:00</td>
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<td>Plan Periods</td>
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PLTW:

Project Lead the Way is a non-profit organization that specializes in writing activity, project, and problem-based national curriculum for STEM education. Please visit [www.pltw.org](http://www.pltw.org) for more information.

Course Description:

This course provides an introduction to the biomedical sciences through exciting hands-on projects and problems. Students investigate concepts of biology and medicine as they explore health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. They will determine the factors that led to the death of a fictional woman as they piece together evidence found in her medical history and autopsy report. Students will investigate lifestyle choices and medical treatments that might have prolonged the woman's life and demonstrate how the development of disease is related to changes in human body systems. The activities and projects introduce students to human physiology, basic biology, medicine, and research processes that allow students to design experiments, and to solve problems. Key biological concepts covered include maintenance of homeostasis in the body, metabolism, inheritance of traits, and defense against disease.

Course Goals:

Students will:

- think critically and problem solve
- write scientifically and analyze scientific writing
- master technology skills including internet use, PowerPoint use, and many other computer programs
- master relevant lab skills using proper lab equipment
- use proper medical terminology
• gain a deeper understanding of the Biomedical Sciences field including content and career aspects.
• Be prepared for the Human Body Systems course

**Course Outline:**

• **Unit 1 – The Mystery**

  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 well as 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.

• **Unit 2 – Diabetes**

  Students 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 life style 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.

• **Unit 3 – Sickle Cell Disease**

  Students 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 create chromosomes spreads, examine the structure of chromosomes, and show how traits are passed through generations on these chromosomes in our cells. **Unit 4 - Heart Disease**

Students 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.

- **Unit 5 - Infectious Disease**

Students follow the spread of a simulated epidemic as engagement to 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 run 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.

- **Unit 6 - Post Mortem**

In the final unit of the course, students 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 course.

**Grading:**

Each assignment will be given points based on the amount of work and difficulty of the assignment and will be placed into a corresponding folder, the Formative (35%), Summative (65%) and Practice (0%) in the grade book. Classwork, lab participation and homework grades, will be placed in the Formative folder. Whereas, projects, lab results, tests and quizzes will be placed in the
Summative folder. Most assignments will receive a rubric so students will know what they will be graded on and the point value of the assignment. No assignments will be accepted for a grade from the prior unit once we have moved on to the next unit.

Class Expectations:

1. Be on time - this mean inside the room when the bell rings WITH ALL MATERIALS- we have MANY activities to do this year and we need EVERY minute we can spare to get them done!

2. Wear appropriate clothing - follow the school dress code - but ALSO our lab dress code - we do many labs and you will need to wear proper clothes and SHOES!!!

3. CLOSED TOED SHOES FOR ALL LABS! If you don't have closed toed shoes on a lab day you cannot participate in the lab! This means you lose your lab participation points.

4. Be RESPECTFUL of yourself, your classmates, and your teachers!

5. Take responsibility for your work - It is up to YOU to get your make-up work - most class activities and assignments are posted on Canvas in the PBS folder for the class. If you are having trouble, it is up to YOU to seek help!

6. NO CHEATING - this includes copying conclusion questions, tests, homework, etc. NO FORM OF CHEATING WILL BE TOLERATED! Both the copier and the one who allows the other to copy will receive a zero on the assignment!

7. Follow ALL lab procedures - no goofing off, everyone MUST participate in the lab activities; no standing back and just watching, wear your protective goggles, gloves, and aprons at all times during labs! Failure to follow dress code during labs and/or participate will cause you to lose lab participation points.

8. Work is turned in ON TIME and COMPLETED. Again, most outside work will be prepping for a lab by reading and completing conclusions questions for quizzes - other than that work is done in class with plenty of class time to complete! DON'T FALL BEHIND!! Work turned in late, from posted due date, will lose points!

9. No makeup work will be excepted for unexcused absences.

Tutoring/Extra Help:

As stated above, I am available after school on Thursdays from 3:05 - 4:00. If this does not work for you, please see me to schedule a time that does. Please note, I will not answer phone calls or emails after hours or on weekends.
PBS Syllabus Contract

Please sign and return to Mrs. Cooney as soon as possible.

I have read the syllabus and understand the way that I will be graded and the expectations that are set forth for me and all students in this class.

Student Name:

________________________________________________________________________

Student Signature:

________________________________________________________________________

Parent/Guardian Name:

________________________________________________________________________

Parent/Guardian Phone #:

________________________________________________________________________

Parent/Guardian Email:

________________________________________________________________________

Parent Signature:

________________________________________________________________________

Note to Teacher: (please feel free to write me a message below if you feel there is something extra I need to know! I look forward to working with you!)