

**Principles of Biomedical Sciences Syllabus**

**Central Academy of Technology and Arts**

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Welcome to Project Lead the Way and the Biomedical Sciences Program! Project Lead the Way is a national, not-for-profit educational program that assists high-school students in developing strong backgrounds in science and engineering. The following is the link to Project Lead the Way online for more information: <http://www.pltw.org/Biomedical/biomedical.cfm>.

**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 researches processes and allow students to design experiments to solve problems. Key biological concepts covered include maintenance of homeostasis in the body, metabolism, inheritance of traits, and defense against disease.

**What does it mean to take a Project Lead the Way course?**

The teacher proposes essential questions for the students to think about before each activity. Each student reads a short introduction to the activity that presents important information and vocabulary words necessary for completion of the activity. Each activity is hands-on learning approach that emphasizes critical thinking, creativity, innovation and real-world problem solving. Students are exposed to methods of researching, processing, and organizing information. Most importantly students learn how to take an active role in learning that has been proven to prepare students for a post-secondary training and career success in STEM-related fields. Students conclude activities with questions that summarize key learning objectives and prepare them for future activities. There are no textbooks in the Biomedical Sciences program. Students learn by lab experiments, group activities, lab analysis, and research.

## **Principles of Biomedical Science Topic Summaries:**

The Principles of the Biomedical Sciences (PBS) course is divided into six units designed to introduce students to the study of human biology and medicine. The following is a description of each unit in the PBS course.

**Unit 1 – The Mystery**

Unit one provides the foundation and develops 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 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.

**Textbook: None – curriculum is online with strict copyright laws and password protected. Students will be given individual username and passwords.**

**Materials:** 3-ring binder (1.5-2 inch) with dividers (6), notebook paper, index cards, pencils, pens, and highlighters.

**Notebook:**

Students are required to keep and maintain a notebook for this class. The notebook should be a three-ring binder (1.5-2 inch). It is my advice to use only one binder for this class and not share it with any other classes. The notebook will be set up as part of the first activity for the class.

**Grades:**

The following scale will be used to determine grading.

40%- Tests

30%- Projects/ Presentations

20%- Quizzes, Classwork (Activities), and Lab Participation

10%- Lab Conduct, Safety and Homework

**Grading Scale**

|  |  |
| --- | --- |
| 100-90 | A |
| 89-80 | B |
| 79-70 | C |
| 69-60 | D |
| 59-0 | F |

**Tutoring**I am available for tutoring before school (8:00am-8:30am), during 3rd block planning (12:00pm-2:00pm), or after school by appointment only.

**Academic Integrity:**

Do not copy another student’s work even if you are assigned a partner or in groups. Copying, or copying and pasting material from online or elsewhere is absolutely not acceptable and constitutes academic dishonesty, or plagiarism. Assignments should not contain the same wording. Critical thinking is the main goal. A grade of a **0** will be given on any work a student submits if it is not completely his or her work and parents will be notified. The student whose name appears on the work must have completed the entire assignment.

**Dress Code Recommendation:**

Closed toe shoes, capri/long pants are **required** for your safety in lab activities. Hair will need to be up when working with bunson burner and chemicals. Each student will be provided personal protective equipment depending on the lab experiment such as goggles or gloves.

**Attendance/Tardiness**:

Students are expected to attend and be on time for each and every class. Students who are late to class must present a pass in order to enter.

**Assessments and Assignments**Students will be assessed through group projects, labs, quizzes, unit tests and classwork activities. PLTW curriculum is self-paced with multi-step daily activities. These activities require great attention to detail and encourage self-guided exploration of resource links. To be successful in a PLTW class, the student will be learn to take responsibility as an independent learner.

**Late Work**:

Homework, projects, lab assignments, and etc. are due at the beginning of class on the assigned due date. Late work will be docked 10 points each day with a “**0**” given on day 3.

**Make-up Work:**

**It is the student’s responsibility to find out what material and work that was missed on days they were absent**. If you are absent due to illness on the day that homework is due, you are expected to hand in the work as soon as you return. **If you are absent due to a field trip, all work is still due the assigned day.** It is up to students to arrange times for make-ups if they are absent for tests, quizzes, or labs. Students will be given advanced notice of upcoming tests, therefore students are expected to be prepared to make up missed test and quizzes.

**Classroom Procedures**

Students should ask permission to leave the room. If students are granted permission to leave the room they should take a hall pass. Students should practice time management and return as quickly as possible. Students who arrive late should have a tardy pass to enter class. Students will be held accountable to the UCPS Behavior Policies and UCPS Student Handbook.

**Classroom Expectations**

1. **Come to class!**
2. Bring all classroom materials and a **good attitude** to class with you each day.
3. **Be ready** to learn when the bell rings.
4. **Respect** yourself, your teacher, your classmates, and your school.
5. Wear your **safety equipment** at all required times.
6. Do not speak out of turn. **Raise your hand** if you would like to speak.
7. Remain in seat until the teacher dismisses you.
8. **No food, drink, candy, or gum in the lab!**
9. **Display personal integrity at all times –** Be honest and do not plagiarize.
10. Pull your own weight always being a good listener and following directions.
11. Never **talk** while **I’m** talking**!**

**Consequences of Non-compliance**

1. Verbal Warning
2. Parent notification
3. Administrative involvement

Immediate parent phone call or referral to Principal/Assistant Principal may be needed for extreme disrespect, cheating, fighting, profanity, disruptions and for alcohol/tobacco offenses

Remember, safety in the laboratory setting is number one. Students please read the Central Academy of Technology and Arts Laboratory Contract and sign below that you have read it. We will have a great semester!

**PBS Syllabus Contract**

Please sign and return to Ms. Turner by Friday, September 2, 2016

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:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Parent/Guardian Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Parent/Guardian Phone #\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Parent/Guardian Email: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Parent Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_