

**MT. DIABLO UNIFIED SCHOOL DISTRICT  
COURSE OF STUDY**

**COURSE TITLE:** Honors Human Body Systems  
**COURSE NUMBER:** 002258  
**CBEDS NUMBER:** 7921  
**DEPARTMENT:** CTE/Science  
**LENGTH OF COURSE:** One year  
**CREDITS PER SEMESTER:** 5  
**GRADE LEVEL(S):** 10-12  
**REQUIRED OR ELECTIVE:** Elective

**PREREQUISITES:**

**Required – Completion of a C or better in PBS**

**BOARD OF EDUCATION ADOPTION: (Date of Action Meeting)**

**COURSE DESCRIPTION:** This is the second of the 3 year series investigating the integration of the body systems, health conditions and related careers. Students examine the interactions of human body systems as they explore identity, power, movement, protection, and homeostasis. Students design experiments, investigate the structures and functions of the human body, and use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration. Exploring science in action, students build organs and tissues on a skeletal manikin, work through interesting real world cases and often play the roles of biomedical professionals to solve medical mysteries

**COURSE PURPOSE:** Students examine the interactions of human body systems as they explore identity, power, movement, protection, and homeostasis in the body. Exploring science in action, students build organs and tissues on a skeletal Maniken®; use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration; and take on the roles of biomedical professionals to solve real-world medical cases.

**COURSE OUTLINE:**

**Unit One - Identity**

The goal of Unit 1 is to engage students in a discussion of what it means to be human. Students investigate the body systems and functions that all humans have in common and then look at differences in tissues, such as bone and muscle, and in molecules, such as DNA, to pinpoint unique identity. Students play the role of forensic anthropologists as they unlock the clues of identity found in bone and use restriction analysis and gel electrophoresis to analyze differences in DNA. Students begin to study histology and build upon their knowledge of human tissue. In the HBS course, students will be working with an Anatomy in Clay™ two foot skeletal model. Students will work in pairs on an assigned Maniken® model and will use clay to build various organs, tissues, and vessels on the skeletal frame. Over the year each Maniken model will take on a unique identity. Even though students are technically building the same structures on their model, students will notice that the Manikens do not all look the same. Faces will look different. Muscles may be more defined. Blood vessel placement may vary slightly. The Maniken may manifest a disease or illness. The core remains the same, but the specific details will lead to the individual.

## **Unit Two – Communication**

The goal of Unit 2 is for students to investigate modes of communication within the human body as well as the ways the human body communicates with the outside world. Students map the function of key regions of the brain and explore how the body detects, processes, and responds to internal and external stimuli. Students investigate the roles of electrical and chemical signals in communication and response in the human body. They explore the ways in which hormones and the endocrine system control body function in order to solve a medical mystery. Students compare response time to reflex and voluntary actions using data acquisition software, and they design experiments to test factors that can impact this response. By investigating the anatomy and physiology of the human eye, students learn how the body receives and interprets stimuli from the outside world.

## **Unit Three – Power**

The goal of Unit 3 is for students to investigate the human body systems that work to obtain, distribute, or process the body's primary resources for energy and power—food, oxygen, and water. Students make a model of the digestive system and design experiments to test the optimal conditions for enzymatic digestion. They explore lung function by diagnosing and treating a patient with breathing problems and use probes and data acquisition software to monitor their own lung function. Students investigate the anatomy and physiology of the urinary system and run simulated urinalysis to identify health conditions and diagnose disease.

## **Unit Four - Movement**

In Unit 4 students investigate movement of the human body as well as the movement of substances within the body. By building muscle groups on a skeletal model, students learn how a muscle's structure is directly related to its function and to the actions it can produce. Students design experiments to test the requirements for muscle contraction and create models to show relaxation and contraction of the sarcomere. A study of blood flow illustrates the roles that smooth and cardiac muscles play in the transport of substances around the body.

## **Unit Five – Protection**

In this unit students explore ways in which the human body protects itself from injury and disease. Before students investigate specific defense mechanisms and the immune system, they explore the protective functions of skin, bone, and the feeling of pain. Antigen-antibody interactions are introduced as well as the structure of the lymphatic and immune system.

## **Unit Six – Homeostasis**

This final unit focuses on the connection between all of the human body systems and examines how these systems work together to maintain health and homeostasis. Students explore how the body deals with extreme external environments as well as how the body reacts to and defends against injury and illness. Students begin to discuss and design medical interventions for a fictional case study. The activities in this lesson are an engagement for the subsequent course, entitled Medical Interventions (MI).

## **KEY ASSIGNMENTS**

### **Unit One – Identity**

Students will research and conduct a forensic anthropology examination and issue a report.

### **Unit Two – Communication**

Students will research a number of serious eye disorders. Once the “viewpoint” of the patient is established, students will recreate what would be “experienced” by the patient. Goggles and other equipment will be utilized

to give our students an empathetic view of these conditions. Students will be required to play table tennis with these goggles and compare to normal vision.

### **Unit Three – Power**

Students will take on the role of doctor and therapist for a girl with asthma. Students will create a case file for the patient and include all special studies, such as spirometry and pulse oxidation. Students will perform the test as “patient” and then analyze the results as the “doctor”. A complete report on the patient’s condition will be submitted to the instructor and “peer-reviewed” by the class.

### **Unit Four – Movement**

Students combine information about power and movement to describe how the body fuels and responds to exercise. Playing the role of biomedical professionals in a combined medical practice that caters to athletes, students design a comprehensive training plan for an athlete. The plan includes all aspects of training, from diet and exercise to hydration and injury prevention.

### **Unit Five – Protection**

Students analyze patient data from a simulated illness and relate antibody response to the action of specific white blood cells. This will be presented in poster form, similar to that used in college presentations.

### **Unit Six – Homeostasis**

Students explore how the body deals with extreme external environments as well as how the body reacts to and defends against injury and illness. Students begin to discuss and design medical interventions for the fictional case study.

## **Culminating Assessments**

### *Final Project*

Students will explore a disease from beginning to end by creating a patient case study. Students will “give a patient some disease/disorder” and show how this illness or injury presents in the body and affects other body systems. As a prelude to the next course, *Medical Interventions*, students will also investigate and model medical interventions on this “patient”, including options for treating or curing this disease, illness or injury. Students will create a comprehensive case file for this patient and will present this case to fellow “biomedical professionals.”

### *PLTW End of Course Exam*

Students will be required to attain a score of “proficient” on the PLTW End of Course Exam, administered at the end of each semester, to earn the Honors credit.

**LABORATORY ACTIVITIES: Forensic Anthropology Human Remains Identification Activity, DNA testing with Gel Electrophoresis, sculpting organ systems with clay, Spirometer/Lung Function Testing, more details listed below.**

### **Laboratory Skills**

- Micropipetting
- DNA gel electrophoresis

### **Clinical Skills**

- EMG analysis
- Spirometry

- Visual perception testing
- Urinalysis
- Ankle Brachial Index
- Blood typing

### **Equipment and Software Proficiencies**

- Microsoft Office (Excel, Word, PowerPoint)
- Vernier probes and sensors
- Data Acquisition Software (Vernier Logger Pro)
- Microscope
- Goniometer

### **Scientific Experimentation Skills**

- Design and conduct reliable scientific experiments
- Analyze and interpret laboratory data
- Construct graphs (by hand and using graphing software)
- Interpolate and extrapolate data from a graph
- Draw conclusions based on experimental data
- Thoroughly and clearly communicate results and conclusions both orally and in writing

### **INSTRUCTIONS METHODS and/or STRATEGIES:**

- Project Based Learning
- Guided Inquiry projects
- Modeling
- Direct instruction (minimal)

### **ASSESSMENTS INCLUDING METHODS and/or TOOLS**

- Project-based learning (Graded by rubric)
  - Cumulative unit presentations
  - Medical Innovations for real life medical phenomenon
- Unit exams
- End of Course Exam

### **INSTRUCTIONAL MATERIALS:**

- Course laptops to allow for research and exploration of biomedical concepts
- Inspiration concept mapping tool
- Google Classroom
- PLTW Curriculum
- Equipment and Software Proficiencies
  - Microsoft Office (Excel, Word, PowerPoint)
  - Vernier probes and sensors
  - Data acquisition Software (Vernier Logger *Pro*)
  - Microscope

## **For Honors Distinction:**

### **CORRESPONDING NON-HONORS COURSE: Human Body Systems**

#### **DIFFERENCES in HONORS/NON-HONORS COURSES:**

*Unit 2:* All students understand the function of the nervous system and the effect that a compromised nervous system has on the body (e.g. eyesight). **HONORS** students will complete a unit research project about a number of serious eye disorders to show this effect. Students will recreate what would be “experienced” by the patient. Goggles and other equipment will be utilized to give our students an empathetic view of these conditions. Students will be required to play table tennis with these goggles and compare to normal vision.

*Unit 3:* All students understand the role of oxygen and the ability of the muscles to contract and relax, and understand the nutritional demands of the human body. All students explore the role of oxygen through spirometer testing. **HONORS** students will elaborate on this by taking the role of the doctor and therapist for a girl with asthma. Students will create a case file for this patient and include all special studies, such as spirometry and pulse oxidation. In order to fully appreciate the decreased vital lung capacity demonstrated by asthma sufferers, students will perform the test as “patient” and then analyze the results as the “doctor”. A complete report on the patient’s condition will be submitted to the instructor and “peer-reviewed” by the class.

*Unit 4:* All students will play the role of an exercise physiologist working with athletes to increase performance of muscular systems. **HONORS** students will create a team of exercise physiologists to combine information about power and movement to describe how the body fuels and responds to exercise. Playing the role of biomedical professionals in a combined medical practice that caters to athletes, students design a comprehensive training plan for an athlete. The plan includes all aspects of training, from diet and exercise to hydration and injury prevention.

*Unit 5:* All students will research the lines of defense of the immune system. **HONORS** students analyze patient data from a simulated illness and relate antibody response to the action of specific white blood cells. This will be presented in poster form and formally presented, similar to that used in college presentations.

#### *Final Assessments for Honor Students*

Final Culminating Project: Honors students will explore a disease from beginning to end by creating a patient study. Students will “give a patient some disease/disorder” and show how this illness or injury presents in the body and affects other body systems. As a prelude to the next course in the course sequence, *Medical Interventions*, students will also investigate and model medical interventions on this “patient”, including options for treating or curing this disease, illness or injury. Students will create a comprehensive case file for this patient and will present this case to fellow “biomedical professionals”.

PLTW End of Course Exam: Honors students will be administered at the end of each semester. Students who score “proficient” on the end of course exam will earn Honors credit.

## **For CTE Pathway:**

**This course is designed with an industry partner and to be scheduled in a course sequence as follows.**

**Industry Partner: PLTW**

**Sequence of Courses: Principles of Biomedical Science (Year One)**

**Human Body Systems (Year Two)**

**Medical Interventions (Year Three)**

**Committee Members:**

**1. Dylan Bland, PLTW Instructor**

**4. Heather Fontanilla, Administrator, Career Pathways & Linked Learning**

**2. Marcus Thomas, PLTW Instructor**

**5. David Saucedo**

**3. Al Douex, PLTW Instructor**

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