



Human Body Systems

Mr. Martin

REAL Time: Tuesdays and Fridays Room 302

Welcome to Human Body Systems (HBS) Class! Wheaton High School is the only school in Montgomery County to be partnered with Project Lead the Way to offer this class. The equipment that you work with this year has been specially purchased so that we can experiment, research, and build scientific models together. This course builds upon the Principles of Biomedical course you all took last year. This course will engage students in the study of the processes, structures and interactions of human body systems. Important biomedical concepts in the course include: communication, transport of substances, locomotion, metabolic processes, identity, and protection. The central theme will focus on how body systems work together to maintain homeostasis and good health. The systems will be studied as “parts of a whole,” working together to keep the amazing human machine functioning at an optimal level. Students will design experiments, investigate the structures and functions of body systems, and use data acquisition software to monitor body functions such as muscle movement, muscle reflex, voluntary actions, and respiratory operation. Exploring science in action, students will work through interesting real world cases and often play the role of biomedical professionals to solve medical mysteries. The course is designed to provide an overview of all the courses in the Biomedical Sciences program and to lay the scientific foundation necessary for your success in subsequent courses. These are the policies that we have created to make the most of the time that we have together and ensure our SUCCESS.

Responsibilities – What are my responsibilities as a student in this class?

1. Always bring your binder, notebook and pencil to class. Upon occasion a calculator will be needed, so have one available.
2. Tardy by definition in this class is simply not being in your assigned seat when the tardy bell rings. You are to be seated before the tardy bell rings. This specifically means personal business should be tended to such as sharpening pencils prior to the tardy bell. Three tardies will result in one unexcused absence. Your tardy will be logged into the computer. If you have an excused pass, please bring it to my computer.
3. Always work until the bell; never stand by the door waiting for the bell.
4. **Share clean-up responsibilities:** Sinks are not to be used to dispose of trash, including glass cover slips, paper towels, or anything else. Broken glass should be brought to my attention for proper disposal. If you need something, ask.
5. If you missed notes, labs, or an exam due to an absence it is your responsibility to get the missing information and schedule a completion time. Excused absences will be allowed the same amount of time you missed to make-up work before it is considered to be late.
6. Hats, cell phones, and other electronic devices are to be out of sight. Cell phones are to be turned off all during class. Electronic devices are to be turned off during class time. Violation of this school wide policy could result in the confiscation of your property. If this should occur you will have to deal with an administrator to retrieve your property.

Rituals and Routines – What should I expect in my HBS class?

- A **warm-up** question/activity will start every class period to engage students in the content of class.
- **Homework check** occurs when students are working on the warm-up. Students are required to have the assignment and homework sheet on the desk when they come into class.
- **Read – Aloud** of text that will lead into the lesson.
- Review previous homework assignment. Explain new **homework assignment** and refer to weekly agenda.
- **Mini-lesson** on content.
- **Work period:** Project Work in small groups, laboratory Investigations, or oral presentations.
- **Closing: Summarizers** recap the content that was addressed during class & how it will relate to what is done the following day.

Materials – What should I bring to HBS class?

- Composition Notebook
- Scientific Science Notebook
- Jump Drive of 256MB or more (WHS computers do not read U3!)
- 2 inch binder with 2 packets of 5 dividers and notebook paper
- Ruler, calculator, pencils, pens, glue stick, and colored pencils

Assessment – How will I be graded in HBS?

- 1) Each assignment will have a **due date** and a **deadline date**. Any student, who turns in his /her work after the due date, will be penalized one letter grade. Assignments will not be accepted after the **deadline date**.
- 2) Cheating will not be tolerated. Plagiarism is cheating! Students will receive a score of zero for any assignment in which in the student has cheated.
- 3) Quizzes may be announced or unannounced. Some quizzes may be re-taken once a student has shown that he/she has mastered the indicator. Unit exams or final exams will never be retaken.
- 4) Grades are posted on the web. Progress reports will be issued at three week intervals. Students are expected to keep all returned papers. In case of a grade discrepancy, the burden of proof rests entirely on the student! Keep all papers!
- 5) Students who fulfill the requirements of an assignment or exam will not receive any grade lower than 50%. However, students who do not complete the assignment will receive a zero and may not have the opportunity for a re-take or re-assessment.
- 6) **Make-up Policy** If you are absent, it is up to **you** to get the work and the assignments you have missed. The agenda for each class and the distributed materials are located in the **catch-up center**. For excused absences, you will have as many days to make up this work as the days that you missed.

Summative Assessments 50%

- Projects and Laboratory Analyses
- Oral Presentations and some career journals

Formative Assessments 40%

- Career Journal
- Assignments
- Notebooks
- Quizzes

Homework 10%

Grading Scale

100 - 90 = A
89 - 80 = B
79 - 70 = C
69 - 60 = D
59-0 = E

Human Body Systems™ Course Overview

The Human Body Systems (HBS) course is divided into six units designed to introduce students to the way in which body systems work together to maintain homeostasis and good health. The following is a description of each unit in the HBS course.

Unit One – Identity

Unit one engages 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.

Unit Two – Communication

In unit two, students investigate modes of communication within the human body as well as the ways humans communicate with the outside world. Students create a model of the human brain and design a brain map that pinpoints specific areas of function. 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 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

In this unit, students 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 working model of the digestive system and design experiments to test the optimal conditions for chemical digestion. Students use probes and data acquisition software to monitor their own lung function and oxygen intake. Students investigate the anatomy and physiology of the urinary system and do a simulated urinalysis to identify health conditions and diagnosis disease.

Unit Four – Movement

In unit four, students investigate the movement of the human body as well as of substances within the body. Students dissect a joint to visualize the connection between skeletal muscle and bone. 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 smooth and cardiac muscles play in the transport of substances around the body. At the end of the unit, 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, the 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

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. Students analyze data from a fictional illness and relate antibody response to the action of specific white blood cells. Students design a game or a children's book that illustrates the many ways in which body structures function in protection.

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; the activities in this lesson are an engagement for the subsequent course, Medical Interventions.

Course Outline - Human Body Systems™

Unit One- Identity (26 Days)

Lesson 1: Identity: Human (4 Days)

Activity 1.1.1 - Amazing Facts

Activity 1.1.2 - Orientation to the Maniken® (Directional/Regional Terms)

Lesson 2: Identity: Tissues (12 Days)

Activity 1.2.1 - Identity of Your Maniken® (Histology Review/Build Face)

Activity 1.2.2 - Skeleton Scavenger Hunt

Project 1.2.3 - Bone Detectives: Forensic Anthropology

Activity 1.2.4 - Height Estimation from Bones

Lesson 3: Identity: Molecules and Cells (10 Days)

Activity 1.3.1 - DNA Detectives

Activity 1.3.2 - Careers in Identity

Project 1.3.3 - Biometrics: Who Are You?

Unit Two – Communication (38 Days)

Lesson 1: The Brain (9 Days)

Activity 2.1.1 - The Power of Communication

Activity 2.1.2 - Build-A-Brain

Project 2.1.3 - Map-A-Brain

Lesson 2: Electrical Communication (15 Days)

Activity 2.2.1 - The Neuron

Activity 2.2.2 - The Secret to Signals

Project 2.2.3 - Reaction Time (LoggerPro)

Activity 2.2.4 - It's All in the Reflexes (LoggerPro)

Activity 2.2.5 - Communication Breakdown

Lesson 3: Chemical Communication (6 Days)

Activity 2.3.1 - The Hormone Connection

Project 2.3.2 - Hormones Gone Wild

Lesson 4: Communication with the Outside World (8 Days)

Activity 2.4.1 - Exploring the Anatomy of the Eye

Activity 2.4.2 - Visual Perception

Project 2.4.3 - Put Yourself in Someone Else's Eyes (Optional, additional 3 Days)

Activity 2.4.4 - Eye Care Professionals

Unit Three - Power (33 Days)

Lesson 1: Introduction to Power (2 Days)

- Activity 3.1.1 - Resources for Life
- Activity 3.1.2 - The Rule of Threes

Lesson 2: Food (12 Days)

- Project 3.2.1 – Digestive System Design
- Project 3.2.2 – Living in a Material World (**Optional – alternative for Project 3.2.1**)
- Project 3.2.3 - The Amylase Experiment
- Activity 3.2.4 - Metabolism- A Balancing Act
- Activity 3.2.5 - In Search of Energy

Lesson 3: Oxygen (8 Days)

- Activity 3.3.1 - How Does Oxygen Get to Your Cells?
- Activity 3.3.2 - Measuring Lung Capacity (LoggerPro)
- Activity 3.3.3 - Oxygen Capture by the Lungs (LoggerPro)
- Activity 3.3.4 - Respiratory Therapy Resume

Lesson 4: Water (11 Days)

- Activity 3.4.1 - Hook up the Plumbing
- Activity 3.4.2 - Spotlight on the Kidney
- Project 3.4.3 - The Blood/Urine Connection
- Activity 3.4.4 - Water Balance
- Activity 3.4.5 - Urinalysis

Unit Four - Movement (42 Days)

Lesson 1: Joints and Motion (5 Days)

- Activity 4.1.1 - Bones, Joints, Action!
- Activity 4.1.2 - Range of Motion

Lesson 2: Muscles (15 Days)

- Activity 4.2.1 - Muscle Rules
- Activity 4.2.2 - Building a Better Body - Muscles of the Deep Chest
- Project 4.2.3 - Maniken® Mystery Muscles
- Activity 4.2.4 - Laws of Contraction
- Project 4.2.5 - Rigor Mortis Modeling
- Activity 4.2.6 - You've Got Nerve

Lesson 3: Blood Flow (11 Days)

- Activity 4.3.1 - The Heart of the Matter
- Project 4.3.2 - Varicose Veins
- Activity 4.3.3 - Go With the Flow
- Activity 4.3.4 - Cardiac Output
- Activity 4.3.5 - Smoking Can Cost You an Arm and a Leg!

Lesson 4: Energy and Motion: Exercise Physiology (10 Days)

Project 4.4.1 - The Body's Response to Exercise

Activity 4.4.2 - Mind Over Muscle (LoggerPro)

Activity 4.4.3 - Performance Enhancers (**Optional, additional 2 Days**)

Problem 4.4.4 - Training A Champion

Unit Five – Protection (22 Days)

Lesson 1: The Skin (6 Days)

Activity 5.1.1 - Under My Skin

Activity 5.1.2 - Burn Unit

Activity 5.1.3 - Hurts So Good: Pain as Protection

Lesson 2: Bones (8 Days)

Activity 5.2.1 - Looking Inside Bone

Activity 5.2.2 - X-ray Vision

Activity 5.2.3 - Bone Remodeling and Repair

Lesson 3: Lymph and Blood Cells (8 Days)

Activity 5.3.1 - To Drain and Protect

Activity 5.3.2 - Transfusion Confusion

Activity 5.3.3 - Fighting the Common Cold

Project 5.3.4 - Lines of Defense (**Optional, additional 3 Days**)

Unit Six – Homeostasis (14 Days)

Lesson 1: Health and Wellness (14 Days)

Problem 6.1.1 - Surviving the Extremes

Activity 6.1.2 – Putting it All Together

Problem 6.1.3 – Building a Case

Activity 6.1.4 - Finishing Touches