

## PRINCIPLES OF BIOMEDICAL SCIENCE Course Syllabus

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<b>Course Number:</b>	SCMA-0003	<b>OHLAP Credit:</b>	No
<b>OCAS Code:</b>	8706		
<b>Course Length:</b>	120 Hours		
<b>Career Cluster:</b>	Science, Technology, Engineering & Mathematics		
<b>Career Pathway:</b>	Science & Mathematics		
<b>Career Major(s):</b>	PLTW Biomedical Science and Medicine		

**Pre-requisite(s):**

**Course Description:** This course provides an introduction to the biomedical sciences through exciting "hands-on" projects and problems. Student work involves the study of human medicine, research processes and an introduction to bio-informatics. Students investigate the human body systems and various health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. 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 including: homeostasis, metabolism, inheritance of traits, feedback systems, and defense against disease are embedded in the curriculum. Engineering principles including: the design process, feedback loops, fluid dynamics, and the relationship of structure to function are incorporated in the curriculum where appropriate. 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 student success in the subsequent courses.

**Textbooks:** **Project Lead the Way curriculum.**

**Course Units:** **Unit One: Human Body Systems**

Lesson 1.1: The Mystery

- Activity 1.1.1: The Mystery—Was It a Crime?
- Activity 1.1.2: How Is a Career Journal Entry Completed?
- Activity 1.1.3: How Do the Parts Make a Whole?
- Activity 1.1.4: What Is Our Skeletal System?
- Activity 1.1.5: How Do Systems Interconnect?
- Activity 1.1.6: What Does the Evidence Say?
- Activity 1.1.7: Why Confidentiality?
- Activity 1.1.8: Careers that Determine the Cause of Death

**Unit Two: Heart Attack**

Lesson 2.1: What Is a Pump?

- Activity 2.1.1: What Is a Pump?

Lesson 2.2: The Structure of the Human Heart

# PRINCIPLES OF BIOMEDICAL SCIENCE

- Activity 2.2.1: How Many Chambers Does It Have?
- Activity 2.2.2: What Does a Heart Really Look Like?

## Lesson 2.3: The Heart at Work

- Activity 2.3.1: How Can Heart Function Be Monitored Using LabVIEW?
- Activity 2.3.2: What Makes Your Heart Beat Faster?
- Activity 2.3.3: What Is Blood Pressure?
- Activity 2.3.4: The EKG - What Can It Tell Us?
- Activity 2.3.5: Careers that Involve Cardiac Testing

## Lesson 2.4: Blood – The River of Life

- Activity 2.4.1: How Do Blood Cells Differ?
- Activity 2.4.2: Where Does All that Blood Go?
- Activity 2.4.3: Why Are Cells So Small?
- Activity 2.4.4: Careers that Involve Cardiac Tissues

## Unit Three: Diabetes

### Lesson 3.1: What Is in Our Food?

- Activity 3.1.1: What Is in that Stuff We Eat?
- Activity 3.1.2: How Much Energy Is in Food?
- Activity 3.1.3: What Makes All Matter?
- Activity 3.1.4: Where Is the Energy?
- Activity 3.1.5: Careers in Food Science

### Lesson 3.2: Macromolecules

- Activity 3.2.1: What Are Macromolecules?
- Project 3.2.2: Which Molecule Am I?

### Lesson 3.3: Molecules Working Together

- Activity 3.3.1: What Are Action Molecules?

### Lesson 3.4: The Diabetes Connection

- Activity 3.4.1: Can Negative Feedback Be a Positive Thing?
- Activity 3.4.2: Why Is Too Much Sugar in Blood Bad?
- Project 3.4.3: How Does Insulin Work?
- Activity 3.4.4: What Is Diabetes?
- Activity 3.4.5: Careers Involved in Treating Diabetes

### Lesson 3.5: Life with Diabetes

- Activity 3.5.1: So What Can I Eat?
- Activity 3.5.2: What Is a Day in the Life of a Diabetic Really Like?
- Activity 3.5.3: Careers that Aid Diabetics

## Unit 4: Sickle Cell Disease

### Lesson 4.1: What Is Sickle Cell Disease?

- Activity 4.1.1: What Are Sickle Cells?
- Activity 4.1.2: What Are the Clinical Symptoms and Complications?
- Activity 4.1.3: What Is the World Distribution of Sickle Cell Disease?
- Activity 4.1.4: Careers that Involve the Study of Disease

### Lesson 4.2: What Causes Sickle Cell Disease?

- Activity 4.2.1: What Are Chromosomes?
- Activity 4.2.2: The Story of HeLa Cells
- Activity 4.2.3: The Doctor's Point of View

# PRINCIPLES OF BIOMEDICAL SCIENCE

Activity 4.2.4: How Does Sickle Cell Pass through Families?

Activity 4.2.5: What Is a Family's Pedigree?

Activity 4.2.6: What Is the Probability?

Activity 4.2.7: Careers that Study Family Traits

Lesson 4.3: How Do Chromosomes Carry Information?

Activity 4.3.1: How Do Chromosomes Carry Information?

Activity 4.3.2: What Is the Structure of DNA?

Activity 4.3.3: How Is DNA Isolated from Cells?

Activity 4.3.4: How Much DNA Is in a Human Cell?

Activity 4.3.5: Careers that Study DNA

Lesson 4.4: What Is the DNA Code?

Activity 4.4.1: What Is the DNA Code?

Activity 4.4.2: What Determines the Shape of a Protein?

Activity 4.4.3: What Is the Shape of Beta-Globin?

Project 4.4.4: How Are Designer Proteins Made?

Lesson 4.5: Mistakes Happen

Activity 4.5.1: What Is Karyotyping?

Activity 4.5.2: Does Changing Just One Nucleotide Make a Big Difference?

## Unit 5: Hypercholesterolemia

Lesson 5.1: Cholesterol

Activity 5.1.1: Aren't All Fats the Same?

Activity 5.1.2: What Are LDL and HDL?

Activity 5.1.3: Careers the Involve Diet and Lifestyle Changes

Lesson 5.2: Molecular Biological Techniques for Diagnosing Disease

Activity 5.2.1: How Does PCR Amplify DNA?

Activity 5.2.2: What Is Familial Hypercholesterolemia and How Is It Diagnosed?

Activity 5.2.3: Careers that Involve Molecular Biology

## Unit 6: Infectious Diseases

Lesson 6.1: Bacteria

Activity 6.1.1: What Are Bacteria?

Activity 6.1.2: How Do Bacteria in the Mouth Affect the Heart?

Activity 6.1.3: Which Antibiotic Is the Best Choice?

Lesson 6.2: Viruses

Activity 6.2.1: What Are Viruses?

Activity 6.2.2: Careers that Deal with Infectious Diseases

Lesson 6.3: Public Health Campaign

Project 6.3.1: How Do We Tell Others?

## Unit 7: Medical Interventions

Lesson 7.1: Medical Interventions

Activity 7.1.1: What Are Medical Interventions?

Project 7.1.2: How Are Medicines Developed and Tested?

Activity 7.1.3: How Can Pharmaceuticals Help?

Problem 7.1.4: What Medical Interventions Might Have Helped?

Activity 7.1.5: What Is Biomedical Engineering?

Activity 7.1.6: Careers that Deal with Medical Interventions

# PRINCIPLES OF BIOMEDICAL SCIENCE

## Unit 8: Grant Proposal

### Lesson 8.1: Grant Proposal

#### Problem 8.1.1: A Call for Grant Proposals—What Can We Do?

<sup>1</sup> PLTW Objectives

<b>Teaching Methods:</b>	The class will primarily be taught by student-led research activities and projects along with the demonstration method and supported by various media materials to address various learning styles. There will be question and answer sessions over material covered in lecture and media presentations. Supervised lab time is provided for students to complete required projects.
<b>Grading Procedures:</b>	<ol style="list-style-type: none"><li>1. Students are graded on theory and lab practice and performance.</li><li>2. Each course must be passed with seventy (70%) percent or better. Grading scale: A=90-100%, B=80-89%, C=70-79%, D=60-69%, F=50-59%.</li></ol>
<b>Description of Classroom, Laboratories, and Equipment:</b>	Tulsa Technology Center campuses are owned and operated by Tulsa Technology Center School District No. 18. All programs provide students the opportunity to work with professionally certified instructors in modern, well-equipped facilities.
<b>Available Certifications/ College Credit</b>	There are no certification exams for this program, for it is a college-preparatory program. College credit can be earned by successfully completing an AP level course and passing the AP exam with a score of 3 or higher. See program counselor for additional information.
<b>College Credit Eligibility:</b>	The student must maintain a grade point average of 2.0 or better. The following career major(s) may require a 3.0 GPA or better due to the Articulation Agreements and/or accreditation/certification requirements: Certified Dental Assistant, Emergency Medical Technician (EMT), Licensed Practical Nurse (LPN), Surgical First Assistant (SFA), Surgical Technologist, Surgical Nurse Assistant, Central Sterile Processing Technician.