



Perris Union High School District Course of Study

A. COURSE INFORMATION

<p>Course Title: (limited to 34 characters with spaces in Infinite Campus)</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Principles of Biomedical Science</div> <p> <input type="checkbox"/> New <input checked="" type="checkbox"/> Revised </p> <p>If revised, the previous course name if there was a change</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">PLTW Principles of Biomedical Science</div> <p>Transcript Course Code/Number:</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">604301 / 604302</div> <p>(To be assigned by Educational Services if it's a new course)</p> <p>CREDIT TYPE EARNED: CALPADS CODE:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <tr> <td style="width: 70%;">Life Science</td> <td>9222-08</td> </tr> </table>	Life Science	9222-08	<p>Subject Area:</p> <p> <input type="checkbox"/> Social Science <input type="checkbox"/> English <input type="checkbox"/> Mathematics <input checked="" type="checkbox"/> Laboratory Science <input type="checkbox"/> World Languages <input type="checkbox"/> Visual or Performing Arts <input type="checkbox"/> College Prep Elective <input type="checkbox"/> Other </p> <p>Is this classified as a Career Technical Education course?</p> <p> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </p> <p>If yes, which pathway does this course align to? Pathway Name:</p> <div style="border: 1px solid black; height: 20px; margin-bottom: 5px;"></div> <p>CTE CDE Code:</p> <div style="border: 1px solid black; height: 20px; margin-bottom: 5px;"></div>	<p>Grade Level(s)</p> <p> <input type="checkbox"/> MS <input type="checkbox"/> HS <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input checked="" type="checkbox"/> 11 <input checked="" type="checkbox"/> 12 </p>		
Life Science	9222-08					
<p>Was this course <u>previously approved by UC for PUHSD?</u></p> <p> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Will be verified by Ed Services) </p> <p>Which A-G Requirement does/will this course meet?</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <tr> <td style="width: 70%;">D Lab Science</td> <td><input type="checkbox"/> Pending</td> </tr> </table>	D Lab Science	<input type="checkbox"/> Pending	<p style="background-color: yellow; text-align: center;">Credential Required to teach this course: To be completed by Human Resources only.</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Single Subject: Biological Sciences, Health Science </div> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <tr> <td style="width: 70%; text-align: center;"> Signature </td> <td style="width: 30%; text-align: center;"> 3/11/2024 Date </td> </tr> </table>		 Signature	3/11/2024 Date
D Lab Science	<input type="checkbox"/> Pending					
 Signature	3/11/2024 Date					
<p>Submitted by: Jennifer West Site: PVHS Science Date: 2/14/24 Email: jennifer.west@puhsd.org</p>	<p>Unit Value/Length of Course:</p> <p> <input type="checkbox"/> 0.5 (half-year or semester equivalent) <input checked="" type="checkbox"/> 1.0 (one-year equivalent) <input type="checkbox"/> 2.0 (two-year equivalent) <input type="checkbox"/> Other: </p>					
<p>Approvals</p>	<p>Name/Signature</p>	<p>Date</p>				
<p>Director of Curriculum & Instruction</p>		<p>03/13/24</p>				
<p>Asst. Superintendent of Educational Services</p>		<p>3/14/24</p>				
<p>Governing Board</p>						

Prerequisite(s) (REQUIRED):
N/A
Corequisite(s) (REQUIRED):
Biology
Brief Course Description (REQUIRED):
<p>Principles of Biomedical Science (PBS) is a full-year high school course, the first in the Biomedical Science Pathway. This course serves to provide foundational knowledge and skills in fields such as biology, anatomy & physiology, genetics, microbiology, and epidemiology as well as engage students in how this content can be applied to real-world situations, cases, and problems.</p> <p>Through both individual and collaborative team activities, projects, and problems, students will tackle real-world challenges faced by biomedical professionals in the field. They will work with the same tools and equipment used in hospitals and labs as they engage in relevant hands-on work. Students will develop skill in technical documentation to represent and communicate experimental findings and solutions to problems. In addition, students will explore how connections to other disciplines such as computer science and engineering shape the future of medicine and practice collaboration techniques that will help them connect with professionals across any field.</p>

B. COURSE CONTENT

Course Purpose (REQUIRED):

What is the purpose of this course? Please provide a brief description of the goals and expected outcomes. Note: More specificity than a simple recitation of the State Standards is needed.

Unit 1: Medical Investigation

In Unit 1 students engage in forensic science and medical examination investigations in order to: a.) explore biological and forensic science careers; b.) gain experience in experimental design and data analysis; c.) learn about biomolecules and their role in determining identity; d.) learn about human anatomy and physiology and causes of death; e.) practice synthesizing multiple forms of data to draw conclusions; and f.) work to develop professional communication skills.

Unit 1 Lessons

- Lesson 1.1 Investigating the Scene
- Lesson 1.2 Master the Morgue
- Lesson 1.3 Open Investigation

Unit 2: Clinical Care

Students assume the role of different medical professionals working through the schedule of patients in a family care clinic in order to: a.) explore medical careers; b.) practice professional communication; c.) gain experience collecting, recording, and interpreting physiological data; d.) learn how to perform routine medical tests and evaluate results; e.) learn about cutting edge technologies revolutionizing healthcare; f.) understand the interconnectedness between body systems; and g.) explore the various causations and inheritance of disease.

Unit 2 Lessons

- Lesson 2.1 Talk to Your Doc
- Lesson 2.2 Decoding a Diagnosis
- Lesson 2.3 New to the Practice

Unit 3: Outbreaks & Emergencies

Working as public health officials and then as emergency responders, students are presented with a series of events they must address while exploring: a.) careers in public health, epidemiology, microbiology and emergency medicine; b.) professional communication and presentation; c.) data analysis; d.) processes by which critical medical decisions are made and acted upon; e.) processes by which patients are diagnosed with a contagious disease and by which a causative agent is identified.

Unit 3 Lessons

- Lesson 3.1 Nosocomial Nightmare
- Lesson 3.2 Emergency Response
- Lesson 3.3 Information Sharing

Unit 4: Innovation, Inc.

Welcome to Innovation, Inc. – an incubator for innovation where some of the best minds in science and engineering endeavor to solve some of the world’s most pressing biomedical challenges. Students tour Innovation, Inc. labs and engage in experiences designed to: a.) build their engineering and experimental design process skills, b.) challenge them to design solutions to current and emerging issues both on and off this world, c.) tangibly highlight that solutions to biomedical science problems rely on collaboration between professions, d.) build their computer science skills by using computer aided design (CAD) and geographic information system (GIS) to innovate the future of medicine, and e.) explore career fields on the forefront of medicine.

Unit 4 Lessons

- Lesson 4.1 Designing the Future
- Lesson 4.2 New Frontier
- Lesson 4.3 Invitation to Innovation

Course Outline (REQUIRED):

Detailed description of topics covered. All historical knowledge is expected to be empirically based, give examples. Show examples of how the text is incorporated into the topics covered.

Unit 1: Medical Investigation

Lesson 1.1 - Investigating the Scene

In lesson 1.1, students begin their training as medical investigators. Shadowing members of the forensic investigation team, they will document and analyze the clues left at the scene of a woman's death. A video from the police commissioner emphasizes the severity of the situation, the need for more qualified professionals to help solve these types of cases, and the need for them to get to the bottom of the case ASAP. Students will sketch the crime scene and document evidence, analyze trace evidence in the lab, analyze biometric data of interviewed suspects, as well as record a video check-in for the police commissioner – chronicling what they have learned about the case in this lesson. Students will also be introduced to experimental design as well as proper scientific documentation.

1.1 Essential Questions:

- What are different forms of evidence, how infallible are they, and how are they useful in resolving potential criminal cases?
- How can varying forms of evidence be evaluated for meaning?
- How does technology help bring resolution to forensic cases? Or how does technology advance understanding in forensic science?

1.1 Labs: Anna Garcia Forensic Case Lab, DNA Analysis Lab Activity, Hair Lab, Fingerprint Lab

Lesson 1.2 - Master the Morgue

In lesson 1.2, students shadow the medical examiner to investigate what clues the body provides about the cause and manner of death. Students explore human body system structure and function as they investigate the

composition of an autopsy. They will explore the many pieces of evidence that go into determining time of death and complete toxicology testing to determine the presence of drugs or chemicals in the body of the decedent. Examining basic tissue types in the body, students will zoom in to the microscopic level for clues that can't be seen with the naked eye. Students will then explore gross anatomy as they complete an "autopsy" dissection of a preserved heart. Using what they have learned in this lesson and from the examination of evidence from the scene, students will determine the cause, mechanism, and manner of death of the decedent.

1.2 Essential Questions:

- How can the cause, mechanism, and manner of death be established?
- What information can be collected from an autopsy?
- How can information collected during an autopsy lead to an understanding of disease and/or cause of death?
- In what ways are the careful evaluation of evidence and accurate recording of data critical to establishing legitimate testimony?

1.2 Lab: Toxicology Lab

Lesson 1.3 - Open Investigation

Now that students have "graduated" from their training, they will be tasked to solve a new case. They will explore a virtual crime scene, gather evidence from the scene and persons of interest, complete laboratory testing, analyze evidence to deduce what happened, and complete an autopsy report using test and examination results. In preparation for court testimony, they must create an evidence board that illustrates the case to a judge or jury.

1.3 Essential Questions

- How can individual pieces of evidence, evaluated against the whole, be used to resolve questions?
- In what ways can scientific writings and presentations be utilized to present evidence and justify conclusions?
- To what extent can current understandings be reinforced through practice?

1.3 Lab: Open Investigation Forensic Case Lab

Unit 2: Clinical Care

Lesson 2.1 - Talk to Your Doc

Students begin their day at the Total Care Clinic. Each patient they see will highlight key clinical skills as well as allow students to explore biological and physiological content. Students will explore effective questioning techniques, learn about documentation of patient data and medical history in electronic medical records, and investigate issues related to patient privacy. They will collect and analyze vital signs from a patient, investigating how each vital sign relates to the overall health and homeostasis of the body as well as how these vital signs can be used as part of clinical care and disease diagnosis. Students will interpret the results of routine blood work and make recommendations on ways to improve overall health and limit disease risk. Students are also introduced to telehealth, wearable devices, and remote monitoring as they simulate a virtual visit with a diabetic patient. At the end of the lesson, students will apply what they have learned to design a plan for a routine visit of a patient with a chronic health condition.

2.1 Essential Questions:

- How can an individual's health status be assessed and evaluated?
- What factors make an individual more susceptible to disease?
- What are strategies for maintaining health?
- What are effective means of communicating with others in order to reach common goals?
- What qualities make for an effective medical professional?
- In what ways, and for what purpose, can patient confidentiality be maintained?

2.1 Labs: Vital Signs Stations Lab Activity, Phlebotomy Lab, Patient Charlie Medical Report Activity, Stethoscope & Sounds Lab Activity

Lesson 2.2 - Decoding a Diagnosis

In this lesson students explore the relationship between DNA, chromosomes, genes and proteins as they work through the diagnosis of various patients in the practice. Students investigate the process of protein synthesis as they piece together how mutations are related to various health conditions. Students will also explore how abnormalities with chromosomes can contribute to disease and overall health. At the end of the lesson, students will use what they have learned to help a family interested in learning more about their genetic risk.

2.2 Essential Questions

- How can changes in a genome lead to disease?
- Why is an understanding of heredity an important factor in human health?
- In what ways are genetic changes acquired?
- In what ways can altered biological processes lead to disease?
- How can the genetic health of an individual be evaluated?

2.2 Lab: Diabetes Dilemma Patient Lab Activity

Unit 3: Outbreaks & Emergencies

Lesson 3.1 - Nosocomial Nightmare

In this lesson students are part of the Disease Defense Team and they have been called to the local hospital. There have been a number of hospital acquired infections and the patients are not related or in the same ward. Students are challenged to investigate the case, determine why and how patients are getting sick and design a strategy for resolving the outbreak (and preventing another one). Through their investigation, students will investigate the chain of infection, agents of disease, as well as basic structure and function of the human immune system. In the lab, students will work to identify the infectious agent that plagues the fictional hospital.

3.1 Essential Questions

- In what ways, and for what purpose, can microorganisms be characterized?
- What factors affect the growth and death of microorganisms?
- What are effective strategies for preventing and treating disease?
- How does an immune system identify and eradicate infection?
- How can pieces of evidence be evaluated to form conclusions and inform decisions?

3.1 Labs: Microbes & Infectious Disease Lab Stations, Pandemic Project

Lesson 3.2 - Emergency Response

Students will now serve as part of an emergency medical response team, trained to respond when access to care is limited during accidents, natural disasters, and other mass casualty events. As they respond to an emergency in the field, students will investigate assessment and stabilization of a patient, drug delivery and metabolism, techniques to stop bleeding, and communication between medical care providers. Students will evaluate hospital protocol for medical surge during an event as well as design a mobile response facility to assist with patient triage and care.

3.2 Essential Questions

- How can an individual's health status be assessed and evaluated?
- How is patient case information summarized and communicated efficiently?
- What professions respond in emergency situations, what are their roles, and how do they work together?
- What are several career paths in the field of emergency medicine?
- How do patient vitals and presumptive diagnoses inform the prioritization for treatment options in emergency medical situations?
- What makes for effective emergency and disaster response protocols?
- How do medical professionals manage emergencies that involve multiple patients?
- To respond to emergency situations, what common medical resources and facilities need to be available?

3.2 Labs: Patient Zero Lab, Health Careers Project

Lesson 3.3 - Information Sharing

Students will apply what they have learned in the unit as they plan the design of an app to be used to trace outbreaks, respond to emergencies (local or global), increase response efficiency in emergencies, or provide another public health function. This app can be used by medical professionals or can be designed to be used by civilians in an emergency. Students will create mock-ups of their app, modeling the interactivity and peer review each other's designs.

3.3 Essential Questions

- What are features of a user-friendly app?
- In what ways can technology enable a faster response and quicker resolution during medical emergencies?

3.3 Labs: App Idea Generation and Design

Unit 4: Innovation, Inc.

Lesson 4.1 - Designing the Future

In lesson 4.1 students will tour labs in the company, each dedicated to a different area of research, innovation, and design. They will investigate innovation in medical device development as they design model vessels for testing of cardiac stents. They will explore how computer-aided design (CAD) can be used for modeling and prototyping in innovation. Students will explore innovation in drug delivery as they design and test the formulation for a new drug. Focusing on large scale efforts in disease prevention and health promotions, they will then design a

comprehensive initiative that could be implemented in communities around the country.

4.1 Essential Questions

- How do the engineering and experimental design processes enable innovation?
- Who innovates, and why?
- What is the process for innovation and what personal characteristics are required for success?
- How do innovations impact and advance human health?

4.1 Labs: Open for Innovation Lab Activity

Lesson 4.2 - New Frontier

In this lesson students expand their exploration of innovation to new frontiers. They will explore how the body reacts to travel to and life in space and design innovative improvements. They will then dive under the sea as they locate and test marine organisms for bioactive compounds useful as therapeutics. In the project students will be tasked with identifying the next frontier for scientific exploration using GIS and designing an innovation for use in exploring, existing in, or adapting materials from, this new frontier. Students will summarize their research and present their proposal in an interactive story map.

4.2 Essential Questions

- How does technology function as a vehicle for innovation?
- In what ways do different types of scientists and engineers collaborate in the biomedical sciences field?
- What are potential untapped resources that could work to advance the field of biomedical sciences?

4.2 Labs: Under the Sea Lab Activity

Writing Assignments (REQUIRED):

Give examples of the writing assignments and the use of critical analysis within the writing assignments.

- Students will maintain a formal laboratory notebook.
- Students will maintain a career journal.
- Technical writing will consist of formal lab reports and case reports. Reports will include background research with properly cited primary sources, analyzed experimental data, discussion, and a conclusion

INSTRUCTIONAL MATERIALS (REQUIRED)

Textbook #1: N/A

Title:

Edition:

Author:

ISBN:

Publisher:

Publication Date:

Usage: <input type="checkbox"/> Primary Text <input type="checkbox"/> Read in entirety or near	
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Textbook #2: N/A

Title:	Edition:
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Author:	ISBN:
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Publisher:	Publication Date:
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Usage: <input type="checkbox"/> Primary Text <input type="checkbox"/> Read in entirety or near	
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Supplemental Instructional Materials *Please include online, and open source resources if any.*

- Explore Health Careers: <https://explorehealthcareers.org/>
- ONet Online: <https://www.onetonline.org/>
- Career OneStop: <https://www.careeronestop.org/>
- Occupational Outlook Handbook: <https://www.bls.gov/ooh/>

Estimated costs for classroom materials and supplies (REQUIRED). *Please describe in detail.*
 If more space is needed than what is provided, please attach a backup as applicable.

Cost for a class set of textbooks: \$	Description of Additional Costs:
Additional costs: \$5000	Lab and activity supplies
Total cost per class set of instructional materials:	\$5000

Key Assignments (REQUIRED):

Please provide a detailed description of the Key Assignments including tests, and quizzes, which should incorporate not only short answers but essay questions also. How do assignments incorporate topics? Include all major assessments that students will be required to complete

- Group presentations
- Case study analysis
- Graphic organizers
- Lab notebooks
- Lab practicum
- Projects
- Lab or case reports
- Lesson quizzes
- Unit exams

Instructional Methods and/or Strategies (REQUIRED):

Please list specific instructional methods that will be used.

- Collaborative groups work
- Hands-on laboratory experiments
- Virtual simulations
- Experimental design
- Modeling
- Role playing
- Graphing
- Direct interactive instruction
- Note taking
- Issue-based inquiry
- Group discussions
- Debate
- Group presentations

Assessment Methods and/or Tools (REQUIRED):

Please list different methods of assessments that will be used.

- Group presentations
- Individual and group projects
- Lab notebooks
- Lab practicum
- Lab or case study reports
- Lesson quizzes
- Unit exams
- Cumulative final exam

COURSE PACING GUIDE AND OBJECTIVES (REQUIRED)				
Day(s)	Objective	Standard(s)	Chapter(s)	Reference
21	Lesson 1.1 - Investigating the Scene	N/A	N/A	N/A
16	Lesson 1.2 - Master the Morgue	N/A	N/A	N/A
4	Lesson 1.3 - Open Investigation	N/A	N/A	N/A
17	Lesson 2.1 - Talk to Your Doc	N/A	N/A	N/A
22	Lesson 2.2 - Decoding a Diagnosis	N/A	N/A	N/A
4	Lesson 2.3 - New to the Practice	N/A	N/A	N/A
18	Lesson 3.1 - Nosocomial Nightmare	N/A	N/A	N/A

18	Lesson 3.2 - Emergency Response	N/A	N/A	N/A
6	Lesson 3.3 - Information Sharing	N/A	N/A	N/A
17	Lesson 4.1 - Designing the Future	N/A	N/A	N/A
12	Lesson 4.2 - New Frontier	N/A	N/A	N/A
6	Lesson 4.3 - Invitation to Innovation	N/A	N/A	N/A

C. HONORS COURSES ONLY

Indicate how much this honors course is different from the standard course.

N/A

D. BACKGROUND INFORMATION

Context for course (optional)

The following outlines the skills and content knowledge students are expected to obtain in the Principles of Biomedical Science course. It includes computational and analytical skills as well as technical skills that come from experience with tools, software, lab work, and engineering design. This detailed list of skills and knowledge illustrates the immediate, applicable contributions that PBS students can make within a workplace.

Laboratory Skills

- Aseptic technique
- Bacterial culturing, plating, and identification (Gram staining)
- Blood testing and typing
- Dissection
- DNA extraction
- DNA gel electrophoresis
- Fingerprint and hair analysis
- Karyotyping
- Applied math
- Micropipetting
- Microscopy
- Standard curve creation and utilization

Clinical Skills

- Bloodwork analysis
- Blood drawing
- Blood pressure measurement and analysis
- Clinical empathy
- Heart rate measurement and analysis

- HIPAA legislation and implications understanding
- Scientific terminology and abbreviation usage
- Patient questioning, record keeping and documentation
- Pedigree construction and analysis
- Controlled bleeding techniques
- Triage

Equipment and Software Proficiencies

- ArcGIS
- TinkerCAD
- Productivity software (Google Docs, Sheets, Slides)
- Probes and sensors (temperature, respiration, heart rate)
- Data acquisition software (Graphical Analysis)
- Light microscope
- Gel electrophoresis
- Micropipettes
- Electronic balance

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

Design Process Experience

- Solve a problem using an iterative design process
- Work collaboratively on a design team to design a product or solve a problem
- Document in detail the design process used to solve a problem or design a product
- Develop a detailed and comprehensive design brief
- Brainstorm to generate creative ideas and potential solutions to a problem
- Carry out a plan to compare alternate solutions and select the best solution path
- Evaluate a design solution with respect to design criteria and constraints

Professional Skills

- Team collaboration
- Peer review and feedback
- Project management
- Problem-solving
- Oral communication and presentation
- Technical writing
- Ethical reasoning

Course Knowledge

- Bioethics
- Biomedical science careers
- Body systems (selected) anatomy and physiology
- Cancer biology
- Cell biology
- Crime scene investigation
- Disease treatment and prevention
- Drug design
- Emergency medicine and medical surge
- Forensic investigation, manner, mechanism and cause of death
- High throughput screening (HTS)
- Homeostasis and positive and negative feedback mechanisms
- Infectious disease transmission
- Inheritance
- Interrelationship between body systems, health, and disease
- Mitosis and meiosis
- Molecular biology
- Pathology of disease: infectious, hereditary, and physiological diseases
- Protein synthesis
- Punnett squares
- Relationship between DNA, mutations, protein structure, and disease or dysfunction
- Relationship between genes, chromosomes, and DNA
- Restriction fragment length polymorphisms (RFLP) analysis
- Structure of DNA

Engagement Experiences

- Laboratory investigations
- Case studies
- Instant challenges
- Simulations
- Role playing
- Digital design: podcasts, videos, etc.
- Thought experiments
- Design thinking

History of Course Development (optional)

This course was originally written in 2013 and then revised in 2021 to reflect a major curriculum update. The purpose of the current revision is to update the title and make the course more accessible to students throughout the district.