

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Biology 141L – Laboratory in Human Physiology

3 hours laboratory, 1 unit

Catalog Description

Laboratory course designed to illustrate the physiological principles studied in BIO 141. Emphasis is on lab-based investigations of human physiological processes.

Prerequisite

“C” grade or higher or “Pass” in BIOL C1000 or equivalent AND BIO 141 or concurrent enrollment in BIO 141 or equivalent

Entrance Skills

Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed.

- 1) Understand the principles and applications of the methods of scientific inquiry.
- 2) Perform the basic activities used by scientists in answering biological questions including design of experiments, collection of data, presentation of data in the form of tables, charts and graphs, and critical analysis and interpretation of data.
- 3) Recognize cellular structures and functions and its variations among different cell types.
- 4) Explain the basic chemical principles governing cellular metabolism.
- 5) Identify the chemical properties and functions of carbohydrates, lipids, proteins and nucleic acids.
- 6) Compare and contrast anaerobic to aerobic respiration.
- 7) Recognize the relationship between genes and chromosomes and how the genetic material is transmitted from parents to offspring.
- 8) Describe the relationship between the inheritance of genes and the expression of traits.
- 9) Identify physiological parameters regulated by homeostatic mechanisms.
- 10) Demonstrate the mechanisms by which a neuron transmits information electrically down its axon and chemically across a synaptic cleft.
- 11) Explain how the excitation of muscle fibers produces muscular contractions.
- 12) Explain how kidney function integrates with other systems to regulate osmolarity, gas exchange, excretion of wastes and acid/base balance.
- 13) Predict changes in cardiovascular function due to exercise or disease.
- 14) Identify the major organs of the human body and relate each to function.

Course Content

- 1) Fundamental principles of physiology: diffusion and osmosis
- 2) Extracellular fluid composition and pH balance
- 3) Enzyme function and transport
- 4) Nervous stimulation, integration and response
- 5) Skeletal muscle activity
- 6) Skeletal muscle mechanics
- 7) Electrocardiogram including heart structure & cardiac cycle
- 8) Blood composition
- 9) Regulation of blood pressure
- 10) Kidney simulation
- 11) Digestion and nutrition

Course Objectives

Students will be able to:

- 1) Utilize the methods of scientific inquiry and the philosophy of science to design scientific experiments in physiology, collect data, and discuss, interpret, analyze and draw conclusions from data presented in graphs, tables and diagrams related to lab exercises.
- 2) Determine the different concentrations of biomolecules in intracellular and extracellular fluid.
- 3) Demonstrate the different types of physiological transport including diffusion and osmosis, and predict the tonicity between compared solutions.
- 4) Carry out enzymatically catalyzed experiments and determine optimal conditions for the function of these enzymes.
- 5) Classify the different types of sensory receptors in the human body and know the stimulus to which each receptor responds.
- 6) Explore reflex pathways of the nervous system and distinguish experimentally between reflexes and voluntary responses.
- 7) Correlate EMG recordings with variations in force and anatomically defined movements generated by skeletal muscles.
- 8) Demonstrate the mechanical principles of skeletal muscle contraction.
- 9) Measure heart rate and determine the effects of exercise on heart rate.
- 10) Relate fitness level of individuals and the effects factors such as smoking, amount of exercise, etc., have on long term heart fitness.
- 11) Calculate heart rate on an EKG and recognize arrhythmias and other pathologies from the EKG; relate output to specific electrical and mechanical events of the cardiac cycle.
- 12) Demonstrate the proper use of a sphygmomanometer and a stethoscope to measure blood pressure and examine the homeostatic regulation of blood pressure in response to challenges such as exercise.
- 13) Test for blood glucose and cholesterol levels and determine blood type.
- 14) Measure lung volumes under different physiological conditions and relate to respiratory pathologies.
- 15) Test urine for various solutes and metabolites and classify abnormal samples by pathology.
- 16) Determine optimal conditions for the function of digestive enzymes and compare these to physiological conditions.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Written laboratory reports that demonstrate research, writing and critical thinking skills.
- 2) Quizzes and exams that measure students' ability to recognize, explain and provide examples of the concepts, principles and techniques associated with human physiology.
- 3) Practical exams consisting of essays and demonstration of techniques or equipment used to gather physiological data.
- 4) Presentations of journal articles or original experimentation designed by students singly or in groups to demonstrate oral and written communication skills and critical thinking skills.

Minimum Instructional Facilities

- 1) Smart classroom
- 2) Laboratory with microscopes, glassware, reagents, group workstations that include bench-tops, receptacles, sinks
- 3) Computer stations equipped with physiological sensors and printers
- 4) Animals for dissection and demonstration
- 5) Charts, models and microscopic slides of physiological systems, organs, tissues, cells

Special Materials Required by Student

- 1) Dissecting kit
- 2) Gloves
- 3) Lab coat or protective apron
- 4) Safety glasses

Methods of Instruction

- 1) Laboratory exercises and demonstration
- 2) Experiments
- 3) Lecture and discussion
- 4) Group team work and study
- 5) Supervised tutoring and office hours

Out-of-Class Assignments

- 1) **Reading:** Students will be assigned chapters from the Human Physiology Laboratory Manual in preparation for laboratory assignments. Students will pre-read laboratory exercises, prepare for quizzes, and review background information to ensure active participation during lab sessions.
- 2) **Writing/Problem Solving:** Students will complete prelab activities. Students will conduct research projects to identify a physiological problem of interest, locate relevant source material in the physiological literature, analyze the topic in a written or oral presentation, and specify directions for future research.
- 3) **Other:** Students will work collaboratively to interpret experimental results, compare findings, and synthesize observations into group presentations. Collaborative problem solving and peer discussions are encouraged to enhance comprehension and deepen understanding of physiological processes.

Texts and References

- 1) Required: (representative example): Human Physiology Laboratory Manual Bio 141L. 4th Edition. Cuyamaca College 2023.
- 2) Supplemental: None

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- 1) Use scientific laboratory equipment to observe organ system functions; record and analyze data to describe principles of homeostasis.
- 2) Given a set of data, use critical thinking to determine pathological states and/or deviations from typical physiology.
- 3) Effectively read, evaluate and communicate scientific information relating to current topics in physiology.