

MORENO VALLEY HIGH SCHOOL CURRICULUM

Course Title: Anatomy and Physiology Course Number: 1713

Department: Science ADS Number: 1713

Prerequisites: One year of high school science, preferably two years of high school science.

Length of Course: Year long Credit/PRI Area: .5 per semester Grade Level(s): 11-12

Important Notes: Although 10th grade students can enroll, first priority will be given to upper division students. Enrollment should be kept at 20 students or lower.

COURSE DESCRIPTION

An introductory human anatomy (structure) and physiology (function) course for upper classmen with some high school science background (life science or chemistry). Each organ system is investigated starting from the cellular level right through to the functioning body as a whole. This holistic approach encourages an integrated understanding of the human organism and makes clear the interrelations among the systems. Homeostasis is a recurrent theme and is contrasted regularly with pathology when appropriate. Throughout the year, students participate in a generous variety of labs, excersizes and hands-on investigations that serve to bring the subject to life.

SYLLABUS

- A. Organization and general plan of the body
- B. Biochemistry
- C. Cells
- D. Tissues and membranes
- E. Body systems
 - 1. Integumentary system
 - 2. Nervous system
 - 3. The senses
 - 4. Endocrine system
 - 5. Blood
 - 6. Heart and Vascular system (elk heart dissection)
 - 7. Respiratory system
 - 8. Digestive system
 - 9. Urinary system
 - 10. Reproductive system
 - 11. Many systems studied further during fetal pig dissection
- F. Human development and genetics
- G. Body temperature and metabolism

Skills emphasized

Reading and understanding theory and then applying knowledge to practical / clinical situations

Laboratory skills including dissection technique and equipment use (microscopes, scales, etc)

Gain familiarity and proficiency with diagnostic tools such as stethoscopes and a sphygmomanometer

Vocabulary and terminology

Ability to recognize and appreciate the interconnectedness of the human systems and own responsibility for their own health

STRATEGIES

Students work from the textbook and corresponding worksheets mostly on their own time. Class is dedicated to labs and/or hands-on investigations and excersizes that reinforce, extend and supplement theory. Most of the activities are cooperative (done in pairs or small groups) which satisfies the academic coaching of Paidea. Chapter (system) lectures and video are an integral part of the course and offer another perspective to the written text.

ASSESSMENTS

Weekly worksheets corresponding to chapter study

Lab and dissection technique

Projects and presentations

Unit tests

Cumulative exams

Seminar pieces (worked) and seminar participation

SUGGESTED TEXTBOOKS AND INSTRUCTIONAL MATERIALS:

1. *Essentials of Anatomy and Physiology* 4th edition By Valerie C. Scanlon/Tina Sanders
2. *Essentials of Anatomy and Physiology* 4th edition student workbook
3. *Human Anatomy & Physiology Laboratory Manual* by Elaine N. Marieb
4. *Fetal Pig Dissection: A Laboratory Guide* 2nd edition by Connie Allen and Valerie Harper
5. *Laboratory Anatomy of the Fetal Pig* 11th edition by Robert B. Chiasson, Theron O. Odlaug, William J. Radke

SUGGESTED TITLES/AUTHORS WEB SITES

<http://ublib.buffalo.edu/libraries/projects/cases> (case studies teaching in science) www.ornl.gov/sci/techresources/Human_Genome/home (Human Genome Project)

<http://academic.scranton.edu/departement/psych/sheep/newsheep/practice/framesheep.html> (sheep brain dissection guide) www.whitman.edu/biology/vpd/main.html (virtual pig dissection)

SEMINAR PIECES OR USE

Stephen Gould “Ever Since Darwin”

Nova online: *Does Race Exist? An antagonist’s perspective/a proponent’s perspective*

Ernst Mayr “One Long Argument: Charles Darwin and the Genesis of Modern Evolutionary Thought” (various chapters)

Roy Abraham Varghese “The Wonder of the World: A Journey from the Mind of Science to the Mind of God” (various chapters)

STRAND I: SCIENTIFIC THINKING AND PRACTICE

CONTENT STANDARD 1: UNDERSTAND THE PROCESSES OF SCIENTIFIC INVESTIGATIONS AND USE INQUIRY AND SCIENTIFIC WAYS OF OBSERVING, EXPERIMENTING, PREDICTING, AND VALIDATING TO THINK CRITICALLY.

A. BENCHMARK: *Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
11-12	<ol style="list-style-type: none">1. Describe the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions.2. Design and conduct scientific investigations that include:<ul style="list-style-type: none">• testable hypotheses• controls and variables• methods to collect, analyze, and interpret data• results that address hypotheses being investigated• predictions based on results• re-evaluation of hypotheses and additional experimentation as necessary• error analysis.3. Use appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, microscopes).4. Convey results of investigations using scientific concepts, methodologies, and expressions, including:<ul style="list-style-type: none">• scientific language and symbols• diagrams, charts, and other data displays• mathematical expressions and processes (e.g., mean, median, slope, proportionality)• clear, logical, and concise communication• reasoned arguments5. Understand how scientific theories are used to explain and predict natural phenomena (e.g., plate tectonics, ocean currents, structure of atom)	1-5) Case study exercises corresponding to chapter study. (Case study teaching in Science website). Class works to solve each 'case' in a step by step manner using textbook and internet information.

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B. BENCHMARK: *Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
11-12	<p>1. Understand how scientific processes produce valid, reliable results, including:</p> <ul style="list-style-type: none"> • consistency of explanations with data and observations • openness to peer review • full disclosure and examination of assumptions • testability of hypotheses • repeatability of experiments and reproducibility of results. <p>2. Use scientific reasoning and valid logic to recognize:</p> <ul style="list-style-type: none"> • faulty logic • cause and effect • the difference between observation and unsubstantiated inferences and conclusions • potential bias <p>3. Understand how new data and observations can result in new scientific knowledge.</p> <p>4. Critically analyze an accepted explanation by reviewing current scientific knowledge.</p> <p>5. Examine investigations of current interest in science (e.g., superconductivity, molecular machines, age of the universe).</p> <p>6. Examine the scientific processes and logic used in investigations of past events (e.g., using data from crime scenes, fossils), investigations that can be planned in advance but are only done once (e.g., expensive or time-consuming experiments such as medical clinical trials), and investigations of phenomena that can be repeated easily and frequently.</p>	1-6) Small group work using interactive lab – HHMI website- Gender Determination

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BENCHMARK: Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
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GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
11-12	<ol style="list-style-type: none"> 1. Create multiple displays of data to analyze and explain the relationships in scientific investigations. 2. Use mathematical models to describe, explain, and predict natural phenomena. 3. Use technologies to quantify relationships in scientific hypotheses (e.g., calculators, computer spreadsheets and databases, graphing software, simulations, modeling). 4. Identify and apply measurement techniques and consider possible effects of measurement errors. 5. Use mathematics to express and establish scientific relationships (e.g., scientific notation, vectors, dimensional analysis). 	1-5) Blood pressure and heart rate monitoring in various situations (cardiovascular study) and subsequent interpretation of data: Cardiovascular lab from AP Lab Manual (Marieb 4 th edition)

STRAND I: CONTENT OF SCIENCE
CONTENT STANDARD 2: LIFE SCIENCE: UNDERSTAND THE PROPERTIES, STRUCTURES, AND PROCESSES OF LIVING THINGS AND THE INTERDEPENDENCE OF LIVING THINGS AND THEIR ENVIRONMENTS.

B. BENCHMARK: Understand the genetic basis for inheritance and the basic concepts of biological evolution.

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
11-12	<p>Genetics</p> <ol style="list-style-type: none"> 1. Know how DNA carries all genetic information in the units of heredity called genes, including: <ul style="list-style-type: none"> • the structure of DNA (e.g., subunits A, G, C, T) • information-preserving replication of DNA • alteration of genes by inserting, deleting, or substituting parts of DNA. 2. Use appropriate vocabulary to describe inheritable traits (i.e., genotype, phenotype). 3. Explain the concepts of segregation, independent assortment, and dominant/recessive alleles. 4. Identify traits that can and cannot be inherited. 5. Know how genetic variability results from the recombination and mutation of genes, including: <ul style="list-style-type: none"> • sorting and recombination of genes in sexual reproduction result in a change in DNA that is passed on to offspring • radiation or chemical substances can cause mutations in cells, resulting in a permanent change in DNA. 6. Understand the principles of sexual and asexual reproduction, including meiosis and mitosis. 7. Know that most cells in the human body contain 23 pairs of chromosomes 	<ol style="list-style-type: none"> 1) DNA model making (jelly bean lab) <p>2 – 5) Human development and Genetic study (chapter 21 of current text)</p> <p>Student activity: practice with Punnett squares</p> <ol style="list-style-type: none"> 6) Meiosis and Mitosis comparison lab – bead model 7) Human Genome project web site and documentary

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	including one pair that determines sex, and that human females have two X chromosomes and human males have an X and a Y chromosome.	

STRAND I: CONTENT OF SCIENCE
CONTENT STANDARD 2: LIFE SCIENCE: UNDERSTAND THE PROPERTIES, STRUCTURES, AND PROCESSES OF LIVING THINGS AND THE INTERDEPENDENCE OF LIVING THINGS AND THEIR ENVIRONMENTS.

A. BENCHMARK: *Understand the characteristics, structures, and functions of cells.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
11-12	<p>Structure and Function</p> <ol style="list-style-type: none"> 1. Know that cells are made of proteins composed of combinations of amino acids. 2. Know that specialized structures inside cells in most organisms carry out different functions, including: <ul style="list-style-type: none"> • parts of a cell and their functions (e.g., nucleus, chromosomes, plasma, and mitochondria) • storage of genetic material in DNA • similarities and differences between plant and animal cells • prokaryotic and eukaryotic cells. 3. Describe the mechanisms for cellular processes (e.g., energy production and storage, transport of molecules, waste disposal, synthesis of new molecules). 4. Know how the cell membrane controls which ions and molecules enter and leave the cell based on membrane permeability and transport (i.e., osmosis, diffusion, active transport, passive transport). 5. Explain how cells differentiate and specialize during the growth of an organism, including: <ul style="list-style-type: none"> • differentiation, regulated through the selected expression of different genes • specialized cells, response to stimuli (e.g., nerve cells, sense organs). 6. Know that DNA directs protein building (e.g., role of RNA). <p>Biochemical Mechanisms</p> <ol style="list-style-type: none"> 7. Describe how most cell functions involve chemical reactions, including: <ul style="list-style-type: none"> • promotion or inhibition of biochemical reactions by enzymes • processes of respiration (e.g., energy production, ATP) • communication from cell to cell by secretion of a variety of chemicals (e.g., hormones). 	<p>1 – 5) Chapters 3 & 4 in student text (Cells, Tissues & Membranes) supplemented by Web site (www.cellsalive.com)</p> <p>6) DNA modeling (jelly bean lab)</p> <p>7) Covered in Chapter 3 of student text – student independent reading backed up with CD-ROM animation: Cell processes Biology Today and Tomorrow</p>

STRAND III: SCIENCE AND SOCIETY**CONTENT STANDARD: UNDERSTAND HOW SCIENTIFIC DISCOVERIES, INVENTIONS, PRACTICES, AND KNOWLEDGE INFLUENCE, AND ARE INFLUENCED BY, INDIVIDUALS AND SOCIETIES.**

A. BENCHMARK: *Examine and analyze how scientific discoveries and their applications affect the world, and explain how societies influence scientific investigations and applications.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
11-12	<p>Science and Technology</p> <ol style="list-style-type: none">1. Know how science enables technology but also constrains it, and recognize the difference between real technology and science fiction (e.g., rockets vs. antigravity machines; nuclear reactors vs. perpetual-motion machines; medical X-rays vs. Star-Trek tricorders).2. Understand how advances in technology enable further advances in science (e.g., microscopes and cellular structure; telescopes and understanding of the universe).3. Evaluate the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy, computers, medicine, genetic engineering) including both desired and undesired effects, and including some historical examples (e.g., the wheel, the plow, the printing press, the lightning rod).4. Understand the scientific foundations of common technologies (e.g., kitchen appliances, radio, television, aircraft, rockets, computers, medical X-rays, selective breeding, fertilizers and pesticides, agricultural equipment).5. Understand that applications of genetics can meet human needs and can create new problems (e.g., agriculture, medicine, cloning).6. Analyze the impact of digital technologies on the availability, creation, and dissemination of information. <p>Science and Society</p> <ol style="list-style-type: none">11. Know that societal factors can promote or constrain scientific discovery (e.g., government funding, laws and regulations about human cloning and genetically modified organisms, gender and ethnic bias, AIDS research, alternative-energy research). <p>Science and Individuals</p> <ol style="list-style-type: none">15. Identify how science has produced knowledge that is relevant to individual health and material prosperity.16. Understand that reasonable people may disagree about some issues that are of interest to both science and religion (e.g., the origin of life on Earth, the cause of the Big Bang, the future of Earth).	<p>1 – 4) Seminar, specifically “The Future of Evolution” Popular Science September, 05</p> <p>5 - 6) Human Genome Project documentary</p> <p>11 Seminar: “ Genetic discrimination paper” (Human Genome Project web-site)</p> <p>15) A constant theme emphasized during pathology study of each system</p> <p>16 – 17) Seminar: “ The Wonder of the World” Chapter 5 “The Wonder that is Life”</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>17. Identify important questions that science cannot answer (e.g., questions that are beyond today's science, decisions that science can only help to make, questions that are inherently outside of the realm of science).</p> <p>18. Understand that scientists have characteristics in common with other individuals (e.g., employment and career needs, curiosity, desire to perform public service, greed, preconceptions and biases, temptation to be unethical, core values including honesty and openness).</p> <p>19. Know that science plays a role in many different kinds of careers and activities (e.g., public service, volunteers, public office holders, researchers, teachers, doctors, nurses, technicians, farmers, ranchers).</p>	<p>19) Student involvement in community health fair – specifically taking blood pressure readings</p>