COM GE SLO Mapping 2016: Area A

Natural Science GE AREA A SLOs:	**Apply the scientific method to explore physical and biological phenomena, including observation, hypothesis development, measurement, data collection, experimentation and analysis.**	**Articulate core concepts in a biological or physical science discipline.**
ANTH 101	1. Define scientific method and describe the scientific process. 2. Apply the concepts of evolution and natural selection to evaluate and describe biological change over time.	3. Apply and utilize the appropriate anthropological vocabulary when discussing the primary areas of physical anthropology (genetics, primatology, the fossil record, and modern human variation). 4. Explain and describe ancient and modern human variation in biocultural terms.
ANTH 101L	2. Describe and explain genetic processes that enhance our understudying of evolution such as DNA replication, Mitosis, Meiosis (crossing over/recombination), independent assortment, gene flow.	3. Identify and explain primate and hominid evolutionary patterns over time. 4. Recognize and taxonomically organize human, primate and fossil specimens and/or models used in physical anthropology
ASTR 101	4. Demonstrate use of the scientific method.	1. Describe methods used to interpret observable astronomical phenomena.
ASTR 117L	3. Employ critical thinking to evaluate observable data.	2. Use astronomical tools to make accurate observations.
BIOL 100	B. Identify the nutrients that provide energy for metabolism D. Contrast the structure and function of major nutrients E. Illustrate how vitamins and mineral contribute to a healthy diet F. Analyze the role of various nutrients in human metabolism	A. Enumerate the types of nutrients necessary for health and fitness C. Describe the digestive system of a person
BIOL 101	2) investigate the diversity of local taxa and differentiate the fundamental abiotic and biotic variables of which these species must endure to survive 3) evaluate concepts and debate in local natural history along with the differences and similarities in human and natural life systems	1) analyze, compare, contrast and distinguish various survival strategies of the most common organisms living within Central California
BIOL 107/KIN 107	4. Analyze and appreciate the strengths and limitations of the scientific method to explore and find solutions to specific questions. 2. Apply this knowledge as a context to gain deeper understandings into disease processes and treatments, as well as current medical and ethical debates relating to human biology. 3. Apply their knowledge of human biology to make informed decisions regarding the maintenance/improvement of their own health, as well as community health issues.	1. Discuss the important structures and functions of the body's major systems, as well as the interactions between these systems.
BIOL 108A	D. Analyze the role of mass media in recent evolution of human sexuality expression.	A. Describe human reproductive anatomy and functions B. Contrast sexual behavior in various cultures C. Explain how sexual practices affect human health;
BIOL 109	2. Analyze problems using the rules of genetics. 3. Compare the potential benefits and risks associated with new genetic technologies. 4. Evaluate the risks in ignoring natural selection and evolution when determining medical and environmental policy.	1. Discuss historically, our approach to the understanding of genetics and evolution.

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BIOL 110	SEE LAB SECTION	B. Explain,evolutionary connections between organisms, describe major groups of organisms, identify their unique structures and functions. C. Describe basic cell biology concepts such as the chemical origin, cellular structures and functions D. Describe basic molecular biology concepts including nucleic acids structure and function and protein synthesis F. Compare and contrast major systems in organisms E. Explain the concept of energy flow in life and ecosystems
BIOL 110L	1. Perform observations, construct hypotheses, perform experiments and interpret them in the context of important biological theories. 2. Use correctly the international system (SI or metric system) of measurement. 3. Select correct kind of microscope for viewing small specimens, prepare specimens for viewing and bring them into good focus with optimum illumination. 4. Use laboratory equipment appropriately, safely, and effectively.	
BIOL 112A	1. Demonstrate the ability to engage in clear and careful scientific inquiry and show that they can ask pertinent questions about zoological phenomena and formulate hypotheses based on those questions, drawing on scientific concepts and principles. 2. Conduct an experiment and collecting data and be able to test hypotheses, and show that they can organize and summarize data and render them in a way that is accurate and comprehensible in both verbal and graphical modes. 3. Draw conclusions from data that allow the students to support or refute hypothesis and make a case for alternative hypotheses	4. Demonstrate knowledge of the characteristics of all the major animal phyla as well as a thorough evolutionary understanding of the circumstances under which these phyla evolved.
BIOL 112B	2. Describe the major levels of ecological structure and function and their essential and emergent properties 3. Discuss evolution, structure and functions of prokaryotes and connections to algae, plants and fungi. 5. Name the major groups of algae, plants and fungi and place correctly in the modern biological classification system	1. Describe the scope and goals of ecology in relation to other biological and non-biological areas of inquiry 4. Describe the structure and function of vascular plants at the organismal, organ, organ system, tissue and cell levels of organization
BIOL 112C	4. Execute particular experimental procedures, collect data, interpret results by graphing and analyzing the data, and draw appropriate conclusions based on the results.	1. Describe the structures of representative biological molecules and relate structures to functions. 2. Identify and describe cell structures and explain their functions. 3. Explain the organization, regulation, and transmission of genetic information at the molecular level.

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BIOL 120	4. Differentiate under the microscope the four major tissue types, identify the subtypes of each of the major tissue types, and locate them in body structures.	1. Describe the basic anatomical design of the human body, including its bilateral symmetry, tube within a tube design, cavities, and fluid compartments. 2. Recall the organs and organ systems of the body and describe their basic structural design and function. 3. Recognize and describe the major organs of each system, including their location in the body, gross anatomy, histological features, and function.
BIOL 138/ENVS 138	5. Assess and apply environmental, ecology and sustainability principles to modern life and a technologically based society in a lab setting. 6. Assess the methodology utilized by environmental professionals to apply environmental indicators to assess current trends in our environment. 7. Examine the application of a systems approach to environmental and ecological principles used by government agencies, industry and other organizations to minimize environmental impact on natural resources	1. describe how ecosystems provide the necessary services for all life on earth. 2. Discuss alternative perspectives concerning various world views that can lead to valuing the earth system. 3. Explain how science will provide us with the foundations and processes needed to understand human systems and how our activities affect the planet. 4. Explain how an understanding of science will assist us in finding and implementing scientific, technological, economic, and political solutions to environmental problems.
BIOL 159	4) apply the scientific method and research techniques to understand local aquatic ecosystems	1) analyze, compare, contrast and distinguish various survival strategies of the most common organisms living in fresh water ecosystems of Western North America. 2) investigate the diversity of aquatic taxa and differentiate the fundamental abiotic and biotic variables of which these species must endure to survive 3) evaluate concepts and debate in local natural history along with the differences and similarities in human and natural fresh water ecosystems.
BIOL 162	F. Interpret the results of a soil analysis and contrast fertilizers. G. Conduct research to find information about soil properties.	A. Describe soil development and effect of soil use on human evolution. B. Recognize various physical and biological soil constituents. C. Describe how soils form and evolve. D. Explain interactions between soil properties and water and nutrient cycles.
BIOL 169A	3. Identify California birds as well as be able to efficiently use equipment associated with the study of birds in the field, including binoculars, spotting scopes, mist nets and recorders.	1. Explain how bird form, function, anatomy, physiology, flight mechanics and migration enable birds to have become adapted to a wide variety of habitats. 2. Explain how birds are integral to the sustainable functioning of ecosystems.

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BIOL 169B	2. Identify birds in the field and understand their behavior as well as complete a scientific study of involving nesting, courting, feeding, and migrating behavior. 3. Efficiently use equipment associated with the study of birds in the field, including binoculars, spotting scopes, mist nets and recorders.	1. Explain the principles of ornithology and how bird behavior, vocal behavior, bird reproductive biology, and avian ecology enable birds to have become adapted to a wide variety of habitats.
BIOL 224	6. Practice several basic clinical and research techniques for studying and measuring various physiological parameters, including blood pressure, hematocrit, urine parameters, electrocardiograms, and respiratory volumes and flows. 7. Identify the processes of scientific investigation and be able to design and carry out an independent study in physiology. 8. Interpret and evaluate data with respect to the hypotheses, as well as previously published research.	1. List the general functions of the body systems. 2. Explain physical and chemical principles related to cellular activity. 3. Explain relationships between structure and function at the molecular, cellular, and systems level of biological organization. 4. Recognize the complex interrelationships between various systems and processes in the body. 5. Summarize the homeostatic mechanisms by which body functions are known to be regulated. Distinguish between basic physiological changes and pathological changes in the body
BIOL 235	4) relate to the scientific method and research techniques to understand marine ecosystems 5) examine a fish or shark and inspect anatomical functional morphology 6) appraise and differentiate local holoplankton as well as meroplankton using a microscope 7) interpret, recognize and discuss the foundation knowledge and skills to commence to upper division studies in marine sciences 8) demonstrate they are safe while conducting marine-related field work or teaching in a variety of marine habitats.	1) analyze, compare, contrast and distinguish various survival strategies of the most common species of marine invertebrate and vertebrates living in the rocky, sand flat, and mud flat intertidal regions of Central California 2) inventory the diversity of marine taxa and differentiate the fundamental oceanagraphic processes of which these species must endure to survive 3)discuss concepts and debate in marine biology along with the differences and similarities in terrestrial and other life systems 9) explain the extent of and how human actions are interfering with the functioning of and contributing to the collapse of marine ecosystems
BIOL 240	4. Isolate and identify common disease producing organisms. 5. Demonstrate proper handling of microorganisms in a laboratory.	1. Recognize the importance of microorganisms to the ecology of the planet. 2. Describe the role that microorganisms play in health and disease. 3. Evaluate the major issues surrounding biotechnology research and development.
CHEM 105	3) Demonstrate a basic understanding of how the properties of a material relate to its atomic-level structure, including concepts of energy, bonding, and chemical reactivity.	1) Analyze everyday phenomena and current issues in modern society as they relate to the scientific method in general, and to chemical concepts in particular. 2) Provide a basic description of the organizational structure of matter from the subatomic to the macroscopic levels. 4) Recognize and apply several major classifications of chemical structure and patterns of reactivity.

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CHEM 105L	1) Demonstrate the appropriate and safe use of basic Chemistry laboratory skills and equipment. 2) Use the Scientific Method to draw conclusions from laboratory observations and collected data.	3) Apply chemical theories and principles to the interpretation of experimental observations and data. 4) Demonstrate an understanding of the connection of chemical substances and concepts to common consumer, health and environmental applications.
CHEM 110	3. Calculate concentrations of solutions. 4. Apply Stoichiometric calculations including mole to mole, mole to mass and mass to mass calculation	1. Demonstrate knowledge of selected inorganic and organic biochemicals necessary to sustain life; their names, structures and formulas, their function in biochemical processes. 2. Demonstrate knowledge of basic cellular metabolism at the molecular level.
CHEM 114	2) Solve different types of chemistry problems using quantitative and qualitative techniques, and articulate your answers. 3)Assess and record careful laboratory measurements and observations, and carry out qualitative and quantitative analyses of these data.	1) Develop explanations of everyday situations at the level of individual atoms and molecules.
CHEM 131	2) Develop solutions to complex chemistry problems using quantitative and qualitative techniques, and articulate your answers. 3) Obtain and record careful laboratory measurements and observations, carry out qualitative and quantitative analyses of these data, and present the results in a formal laboratory report.	1) Explain the macroscopic physical and chemical properties of a substance in terms of its atomic-level structure.
ENVS 138/BIO 138	5. Assess and apply environmental, ecology and sustainability principles to modern life and a technologically based society in a lab setting. 6. Assess the methodology utilized by environmental professionals to apply environmental indicators to assess current trends in our environment.	1. describe how ecosystems provide the necessary services for all life on earth. 2. Discuss alternative perspectives concerning various world views that can lead to valuing the earth system. 3. Explain how science will provide us with the foundations and processes needed to understand human systems and how our activities affect the planet. 4. Explain how an understanding of science will assist us in finding and implementing scientific, technological, economic, and political solutions to environmental problems. 7. Examine the application of a systems approach to environmental and ecological principles used by government agencies, industry and other organizations to minimize environmental impact on natural resources.
GEOG 101	SEE lab section	1. analyze the controls, distribution, and classification of world climates. 2. Describe seasonal Earth-Sun relations and explain resulting physical phenomena on Earth's surface. 3. Describe the Theory of Plate Tectonics, provide scientific evidence in its support, and explain its correlation to the creation of landforms.

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GEOG 101L	A) Analyze and interpret various types of maps, graphs, and tables depicting topographic, geologic, meteorologic, climatic and cartographic data. B) Collect, interpret, and present data obtained during field trips, from aerial photographs, and from the Internet. C) Analyze the relationship between the atmosphere, biosphere, hydrosphere, and lithosphere.	
GEOG 109	3. Examine the role of factors that contribute to California's weather (latitude, elevation, continental or marine air mass, and site and situation), and identify the dominant climates and precipitation patterns in the various regions of California.	1. Locate and briefly describe the diverse physiographic regions of California, including their dominant human and physical characteristics. 2. Recognize the various exogenic processes and mobile agents that serve to carve and shape today's California landscape. 4. Analyze the use of natural resources in the state, particularly the role of water in the development of both the economic and cultural landscapes of California, and it's impact on the natural environment. 5. Analyze the influence of California's ethnic and cultural groups, where they are concentrated, and how they have had an impact on the state and its landscapes. 6. Compare patterns of urban development in the state and recognize the process and effects of conurbation and suburbanization on California's landscapes.
GEOG 112	3. Apply basic knowledge of atmospheric processes to dissect and explain weather phenomenon or climate systems. 4. Use the scientific method to assess atmospheric processes. 5. Analyze and interpret data presented in graphs, weather maps, and statistical analysis.	1. Explain how energy is transferred throughout the Earth system. 2. Identify forcing mechanisms for upward vertical motions and explain how they can lead to cloud and precipitation formation.
GEOL 103	1. Evaluate geologic hazards, including potential earthquake damage, flooding, and volcanic eruptions. 3. Appraise the risks in particular areas from landslides	2. Judge the most probably effects of anthropogenic climate change. 4. Compare the effects on coastal erosion from human activities
GEOL 109	1. Evaluate how the physical chemistry of water correlates to natural phenomena, such as pollution due to water's high solvency and climatic heat transfer due to water's high heat capacity. 2. Assess how human interactions with the shorelines--building too close to shores, extending jetties into the longshore current--affects shorelines.	3. Compare how various types of marine pollution affect the oceans and environment 4. Analyze how evolution and common ancestry explain the diversity of marine life.

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GEOL 110	3. recognize specific types of landforms and define the geo-tectonic process that formed that land form	1. define the chemical and physical properties of the internal Earth 2. discuss and illustrate Earth-Sun relationships and define the various regions of the atmosphere of Earth 4. illustrate the various types of plate tectonic boundaries and discuss in specific detail the formation of California
GEOL 114	3. Judge the factors involved in California earthquake hazards, distinguish how these factors affect different areas of the state in different ways, and evaluate what efforts may be taken to reduce risk 2. Assess the role water has played, geologically and politically, in California's development 4. Estimate the effects of long-term climate change on California's future	1. Evaluate the role plate tectonics has had in shaping the geology of California 5. Compare how tectonics has produced different features in different area--volcanism in some regions, faulting in others, mountain building in others still.
GEOL 120	1. Appraise geologic hazards and the risks associated with earthquakes, landslides, pollution, and climate change 3. Select techniques for identifying rocks and minerals. 4. Differentiate between scientific and non-scientific methods of exploring questions and evaluating evidence.	2. Distinguish and examine different techniques geologists use to measure geologic time.
GEOL 120L	1. Apply principles of scientific methodology to evaluate and judge the best procedures to use in in-class investigations. 2. Communicate scientific observations in writing, utilizing charts and diagrams to interpret and analyze lab data. 3. Develop flow-charts using observable basic properties of minerals and rocks for use in identifying unknown samples 4. Evaluate and identify unknown rock and mineral samples, using basic properties and scientific methodology and geologic terminology 7. Examine data and perform calculations using proxy measurements from ice cores to evaluate long-term and short-term climate change	5. Apply the concepts of plate tectonics to understand the locations and features of earthquakes and volcanoes 6. Understand how geologic processes have shaped Earth over geologic time.
GEOL 121	5. Read at the highest level topographic and geologic maps 6. generate a geologic map of a basic area 7. measure stratigraphic sections of rock and collect in a representative fashion samples that reflect the lithology and paleontology of that stratigraphic section 8. Read and analyze the geology of an area from aerial photographs 9. Use Index fossils to appropriately place a stratigraphic section into the proper time period or epoch 10. Exhibit a high level of skill with a transit or compass	1. describe and discuss the principles of historical geology 2. describe the origin of the earth 3. describe and discuss the geology and fossils of each geologic period, and 4. identify fossils representative of each geologic period.

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KIN 107	4. Analyze and appreciate the strengths and limitations of the scientific method to explore and find solutions to specific questions.	1. Discuss the important structures and functions of the body's major systems, as well as 2. Apply this knowledge as a context to gain deeper understandings into disease processes and treatments, as well as current medical and ethical debates relating to human biology. 3. Apply their knowledge of human biology to make informed decisions regarding the maintenance/improvement of their own health, as well as community health issues. the interactions between these systems.
PHYS 108A	2. Apply the physical laws of kinematics and thermodynamics to word problems in order to obtain clear solutions by mathematical analysis. 3.Conduct an experiment, collect and analyze data, including such tools as graphs, regressions and statistical analysis, and interpret results within the framework of the physical laws of kinematics and thermodynamics 4. Write a lab report explaining, both qualitatively and quantitatively, the scientific results of an experiment and the certainty of those results. 5.Use modern scientific practices relevant to the field of physics: including the formulation of a scientific theory based on and consistent with quantified observations. 6 Demonstrate critical thinking skills	1. Communicate and utilize the physical laws of kinematics and thermodynamics via problem solving
PHYS 110	1. apply the scientific method to investigating and evaluating physical phenomena.	2. use fundamental physics concepts and principles to explain observations of physical phenomena. 3. research, analyze, and summarize scientific findings related to contemporary issues so as to support informed decision-making.
PHYS 110L	1.Demonstrate a basic understanding of how the fundamental principles of physics dictate physical processes. 2.Apply rational methods to construct and execute an experiment, minimizing error and uncertainty in measurements. 3.Record, characterize and interpret measured observations accurately. 4.Compose a lab report describing procedural methods, observed results, and discussing the results of an experiment.	
PHYS 207A	2. Develop logical, causal and quantitative reasoning skills to obtain numerical or algebraic solutions to applied problems in Newtonian mechanics that are consistent with predictions and results 3. Carry out laboratory work, plan experiments, make observations and communicate results.	1. Demonstrate a basic conceptual understanding of the fundamental concepts and definitions needed to solve problems in classical Newtonian mechanics.