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| |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  | |  | pixel |  | |  | |  |  |  | | --- | --- | --- | | Course Name: |  | **Marine Biology** | | Subject Area(s): | Laboratory Science | | Career Path(s): | Marine Sciences, Natural Resources | | School: | Animo Leadership Charter High School | |  | **Contact Information:** Mark Friedman  11044 S. Freeman  Inglewood, CA 90304  310-350-7515  Fax: 310-216-7934  Marklewisfriedman@gmail.com | | District: | Lennox Unified School District | |  |  | | Instructor: | Mark L. Friedman | | Schools with Same or Similar Courses: | None | | Course Description: |  | |  |  |   **Animo Leadership Charter High School**  High School Course Description  Name of Course**: Marine Biology** Grade Level: 9-12  Department: Science   1. **COURSE DESCRIPTION:**   This Marine biology course builds upon and extends biological concepts developed during earlier science courses. Students take an in depth look at the physical, chemical, and geological characteristics of the world’s oceans. They then investigate the structure, functions, behaviours, adaptations, and classification of a variety of plant and animals that live in the marine environment. Students learn how energy flows and matter cycles through the Earth’s ocean system and they investigate the impact of humans on that system. Laboratory activities include dissection, experimentation, data collection, and data analysis that develop scientific investigation and scientific thinking skills. Also included are several field trips to: Cabrillo Marine Aquarium, Sea-Lab, Malibu lagoon and one-half day research trip on UCLA research vessel.  II. LENGTH OF COURSE:  Bottom of Form  √ One Year  If class will meet more than one period per day, indicate: 1 Hour and 30 Minutes  **III. SPECIFIC COURSE DESCRIPTION**  A. Recommended Level:  √ General  √ College Prep  B. GPA Credits  √ Credited (Calculated in GPA)    C. Prerequisites:  Foundations of Science, and/or prior middle school biology course  Concurrent enrolment in or completion of Algebra 1, Geometry or higher  **IV. HIGH SCHOOL GRADUATION CREDITS**  A. Subject Area:  √ Science  B. Credits: 5.0 /Semester  Course is  \*Repeatable  Non repeatable  C. Course meets requirement(s) for:   * High School Graduation * University of California/California State University entrance:   √ Science (laboratory science)  √College Preparatory Electives (includes laboratory science)  **V. COURSE GOALS** *(List a limited number of general goals addressed by this course*)  **Students will:**   1. Understand that water exhibits properties that play a vital role on Earth. 2. Understand how aquatic environments interact with the land and atmosphere. 3. Understand and apply ecological principles to the field of marine biology. 4. Understand how aquatic organisms interact in complex ecosystems. 5. Understand the role of humans in the aquatic environment and how we can act to preserve its health. 6. Understand and apply current technologies to the field of marine biology.   **VI. COURSE OBJECTIVES**  This course addresses and exceeds the California State Science Standards in breadth and depth in the fields of Evolution, Ecology, Dynamic Earth processes, Energy in the Earths system, Biogeochemical cycles, Structure and Composition of the Atmosphere, California Geology and Investigation and Experimentation. It partially fulfils California Science Standards in the fields of: Cell biology, Genetics, Physiology, and Earth’s place in the Universe.. The standards, benchmarks, knowledge and skills listed below are those targeted learning objectives that will be assessed in this course.  **S1 THE STUDENT UNDERSTANDS AND APPLIES THE CONCEPTS OF PHYSICAL SCIENCE.**  S1(9-10)B4 Understands that solutions are homogeneous mixtures of two or more substances.  S1(9-10)B4.1 Understands how the dissolving process results from the random motion of solute particles among particles of solvent (e.g., solid/liquid, liquid/liquid, gas/liquid)  S1(9-10)B4.2 Understands how the nature of a solute determines the physical and chemical properties of the solution (e.g., acid, base, electrolyte, non-electrolyte)  S1(9-10)B4.5 Understands solute concentration (e.g., grams per liter, parts per million, percent composition, dilute, concentrated)  S1(9-10)B4.6 Understands that different substances have different abilities to dissolve in a particular solvent (e.g., soluble, insoluble, precipitate, hard water, soft water, “like dissolves like”, soap, detergents, miscibility)  S1(9-10)B11.1 Understands wave properties and their relationship to one another (e.g., wavelength, frequency, wave speed)  S1(9-10)B11.2 Understands wave behaviours (e.g., interference, diffraction, refraction, reflection, Doppler effect, polarization, light as particle/wave)  S1(9-10)B11.6 Understands how waves are generated and transfer energy when they interact with matter (e.g., echolocation, ear, eye, photosynthesis)  **S2 THE STUDENT UNDERSTANDS AND APPLIES THE CONCEPTS OF LIFE SCIENCE.**  S2(9-10)B1 Understands how organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their evolutionary relationships  S2(9-10)B1.1 Understands the benefits and limitations of biological classification and naming systems (e.g., binomial nomenclature, five-kingdom system).  S2(9-10)B1.2 Understands a variety of ways in which organisms can be classified (e.g., structure, function, biochemistry, behaviour, nutritional needs, embryonic development, cellular/ molecular makeup, genetic system, ecological interactions).  S2(9-10)B1.3 Understands how organisms can be classified on the basis of homologous structures in adult organisms presumed to be inherited from a common ancestor (e.g., evidence from embryology, fossils).  S2(9-10)B1.4 Understands how organisms can be classified on the basis of similar mutant variations in biochemical common to living organisms.  S2(9-10)B1.5 Understands how organisms can be classified on the basis of similar DNA sequences presumed to be inherited from a common ancestor.  S2(9-10)B3 Understands the relationships between organizational levels of multi-cellular organisms  S2(9-10)B3.1 Understands similarities and differences between unicellular and multi-cellular organisms.  S2(9-10)B3.2 Understands organizational levels of multi-cellular organisms (e.g., cells, tissues, organs, organ systems).  S2(9-10)B3.3 Understands how cellular specialization, division of labour, interdependence, and coordination in multi-cellular organisms contributes to a stable (homeostatic) internal environment, despite changes in the outside environment.  S2(9-10)B3.4 Understands how organ systems transport materials, provide cells with nutrients, water, and energy, and remove toxic waste products.  S2(9-10)B3.5 Understands how sensory, feedback and regulatory mechanisms function to maintain homeostatic conditions within multi-cellular organisms.  S2(9-10)B7 Understands how the idea of evolution explains the diversity and unity of life on earth  S2(9-10)B7.1 Understands biological evolution as the process of adaptive change in life forms that occurs over time in a response to a changing environment.  S2(9-10)B7.2 Understands natural selection and how it determines the differential survival of populations in a changing environment.  S2(9-10)B7.3 Understands how a diversity of species and variation within a species increases the likelihood that some members of a population will survive changes in the environment.  S2(9-10)B7.4 Understands that genetic variation within a species is due to mutation (both favourable and unfavourable) and recombination of genes through sexual reproduction.  S2(9-10)B7.5 Understands how natural selection acts on the phenotype rather than the genotype of an organism and often retains lethal alleles in the gene pool through heterozygous individuals.  S2(9-10)B7.6 Understands how new species arise through reproductive and geographic isolation.  S2(9-10)B7.8 Understands fossil evidence for biological diversity and unity, episodic speciation, and species extinction.  S2(9-10)B8 Understands the use of energy in cellular systems  S2(9-10)B8.1 Understands how the light energy is captured by chlorophyll in green plants and converted to chemical energy during photosynthesis (e.g., chemical reactants are carbon dioxide and water, chemical products are glucose and oxygen).  S2(9-10)B8.2 Understands how chemical energy stored in glucose is made available to plant and animal cells by the process of respiration. (e.g., chemical reactants are glucose and oxygen, chemical products are carbon dioxide and water; aerobic and anaerobic respiration, takes place in plants in the absence of chlorophyll or light).  S2(9-10)B8.3 Understands the role of cellular organelles in photosynthesis and respiration  S2(9-10)B9 Understands that the amount of life an environment can support is limited by the availability of matter and energy and the ability of the ecosystem to recycle its resources  S2(9-10)B9.1 Understands how the sun’s energy is captured by living things, converted into matter through photosynthesis, and released for use through cellular respiration.  S2(9-10)B9.2 Understands how matter and energy are passed from one organism to another for growth and metabolic processes (e.g., food webs, food chains, biomass, producers, consumers, decomposers).  S2(9-10)B9.3 Understands how the amount of usable matter and energy decreases during each successive energy change along the food chain; unusable energy is dissipated into the environment as heat (e.g., trophic levels of energy, organisms, and biomass).  S2(9-10)B9.4 Understands how oxygen, water, carbon, nitrogen and water are cycled between the biotic and abiotic environment (e.g., evaporation, condensation, nitrogen-fixing bacteria, photosynthesis in green plants, cellular respiration, decomposers).  S2(9-10)B9.5 Understands carrying capacity and factors that limit the size and growth of populations within an ecosystem (e.g., amount of sunlight, availability of resources, rainfall, competition, predation within food web, parasitism, rate of decomposition).  S2(9-10)B9.6 Understands factors that interfere with the flow of matter, energy and resources through an ecosystem (e.g., air/water pollution, destruction of habitats, disruption in a food chain or recycling process).  **S3 THE STUDENT UNDERSTANDS AND APPLIES THE CONCEPTS OF EARTH AND SPACE SCIENCE.**  S3(9-10)B1 Understands the concept of plate tectonics and the effects of the movement of crustal plates  S3(9-10)B1.2 Understands tectonic forces (e.g., release of thermal energy, convection currents) that cause movement of lithospheric plates.  S3(9-10)B1.3 Understands structural, geophysical and paleontological evidence for plate tectonics (e.g., mountain building, sea floor topography, earthquakes, magnetic reversals, marine fossils at high elevations, and cross continental).  S3(9-10)B1.4 Understands formation of principal geological structures that form as a result of plate tectonics (e.g., volcanoes, mountain ranges, trenches, ridgesfaults, folds).  S3(9-10)B2 Understands geologic time  S3(9-10)B2.1 Knows that, according to current estimates, the earth is 4.6 billion years old.  S3(9-10)B2.2 Understands that many geological and biological processes occur over long periods of time (e.g., mountain building, evolution), while others occur in relatively brief periods (e.g., earthquakes, volcanic action, species extinction, environmental destruction).  S3(9-10)B2.3 Understands how rock formations, relative positioning, composition, and layering can indicate sequences in geologic time.  S3(9-10)B3 Understands that geologic and meteorological processes that are occurring now are the same processes that occurred in the past  S3(9-10)B3.3 Understands how the earth’s climate changes over time in response to changes in its oceans, geology, atmosphere, and solar radiation.  S3(9-10)B4 Understands how the evolution of life on earth has changed the composition of the earth’s atmosphere through time  S3(9-10)B4.5 Knows that an oxygen-rich atmosphere favored the development of aerobic organisms and the production of carbon dioxide.  S3(9-10)B4.6 Understands the effect that humans have had on the atmosphere (e.g., burning of fossil fuels, atmospheric pollutants, destruction of ozone layer).  S3(9-10)B5 Understands the physical and chemical properties of water that make it essential to the earth system  S3(9-10)B5.1 Knows the structure of the water molecule and how it accounts for the physical and chemical properties of water (e.g., as a solvent, crystal formation, neutral pH).  S3(9-10)B5.2 Knows the properties of solid, liquid, and gaseous water states (forms), and temperature and pressure conditions required for changes in state (e.g., density, specific heat, latent heat, freezing point, melting point)  S3(9-10)B5.3 Understands how the earth’s water is processed through the water cycle and the role of the water cycle in geological and meteorological processes.  S3(9-10)B5.4 Understands water’s capacity as a solvent and its role in earth’s processes (e.g., freezing point/density of salt vs fresh water, dependency of aquatic life on dissolved oxygen).  S3(9-10)B5.5 Understands that the chemical reactions of life’s processes take place in water and that water is frequently a reactant or product in these reactions.  S3(9-10)B6 Understands how winds and ocean currents are produced on the earth’s surface  S3(9-10)B6.1 Understands how unequal heating of the earth’s land masses, oceans, and air by the sun create convection currents that distribute heat energy.  S3(9-10)B6.2 Understands conditions that result from temperature and density differences in the air and oceans (e.g., wind, pressure systems, vertical/ horizontal ocean currents).  S3(9-10)B6.3 Understands how the earth’s rotation affects air and ocean currents (e.g., Coriolis effect, prevailing winds) and how its revolution causes seasonal variation in atmospheric and ocean conditions.  S3(9-10)B6.4 Understands how various factors affect short term weather conditions (e.g., temperature, air pressure, wind, humidity) and methods for predicting weather.  S3(9-10)B6.5 Understands how various factors affect long term climatic conditions (e.g., weather patterns, latitude, topography, proximity to large bodies of water, and warm/cold ocean currents).  S3(9-10)B6.6 Understands how ocean currents, climactic and atmospheric conditions affect the distribution of living organisms on earth (e.g., stratification of marine organisms)  S3(9-10)B7 Understands that elements exist in fixed amounts and move through the solid earth, oceans, atmosphere, and living things as part of geochemical cycles  S3(9-10)B7.2 Understands how carbon is cycled among living systems through photosynthesis and respiration.  S3(9-10)B7.4 Understands how nitrogen, oxygen, and water are cycled between living and non-living systems.  **S4 THE STUDENT THINKS SCIENTIFICALLY.**  S4(9-10)B2 Understands the use of hypotheses in science  S4(9-10)B2.1 Understands differences between a guess, hypothesis and theory as these terms are applied in science.  S4(9-10)B2.2 Understands how hypothesis statements can be framed to achieve meaningful results (e.g., cause/ effect statements, correlation of variables, sequence of events).  S4(9-10)B2.3 Understands how a hypothesis is used to select / guide the interpretation of data.  S4(9-10)B2.4 Understands how a hypothesis is used to decide if more data needs to be gathered.  S4(9-10)B2.5 Understands how hypotheses are modified in accordance with collected data.  S4(9-10)B3 Performs error analysis on collected data  S4(9-10)B3.3 Understands sources of error or bias in data analysis.  S4(9-10)B4 Understands that to be valid, scientific explanations must meet certain criteria  S4(9-10)B4.1 Understands that scientific explanations are consistent with experimental and observational evidence about the natural world.  S4(9-10)B4.2 Understands that scientific explanations support accurate predictions about systems being studied.  S4(9-10)B4.3 Understands that scientific explanations are based on fundamental inductive or deductive reasoning processes.  S4(9-10)B4.4 Understands that scientific explanations include reporting methods and procedures that are open to criticism.  S4(9-10)B5 Formulates and revises scientific explanations and models using logic and evidence  S4(9-10)B5.2 Understands the criteria for valid scientific explanations.  **S5 THE STUDENT CONDUCTS SCIENTIFIC INVESTIGATIONS.**  S5(9-10)B2 Uses scientific literature as a source of information in research  S5(9-10)B2.1 Identifies valid and invalid sources of scientific information.  S5(9-10)B2.2 Knows appropriate sources for obtaining various kinds of scientific information (e.g., boiling point of water, famous scientists, causes of disease).  S5(9-10)B3 Designs and conducts scientific experiments  S5(9-10)B3.1 Formulates testable hypotheses.  S5(9-10)B3.2 Develops experimental procedures to prove or disprove a hypothesis.  S5(9-10)B3.3 Understands and controls variables (e.g. dependent and independent variables).  S5(9-10)B3.4 Collects, records and organizes data.  S5(9-10)B3.5 Interprets data to support or refute a hypothesis.  S5(9-10)B3.6 Analyses data for discrepant results and to determine if further testing is required.  S5(9-10)B3.7 Evaluates experimental procedures to identify uncontrolled conditions or sources of error inherent in experimental design.  S5(9-10)B3.8 Proposes explanations for experimental observations.  S5(9-10)B5 Writes concise laboratory reports  S5(9-10)B5.1 Defines problem or poses question with focus and clarity.  S5(9-10)B5.2 Proposes solutions to problem or hypothesis in a manner that is testable.  S5(9-10)B5.3 Describes procedures, techniques, critical materials, and safety precautions so that the experiment is repeatable by others.  S5(9-10)B5.4 Presents data in an organized/ appropriate format (e.g., charts, diagrams, graphs).  S5(9-10)B5.5 Presents interpretation and analysis of data (e.g., error analysis, discrepant results, uncontrolled conditions, statistical variation).  S5(9-10)B5.6 Proposes explanations for experimental observations.  S5(9-10)B5.7 Draws conclusions based upon experimental evidence and discusses their implications for application or further study.  S5(9-10)B5.8 Acknowledges research of others and cites references that have contributed to the design or understanding of experimental observations.  S5(9-10)B6 Presents results of investigation for critical review and feedback.  S5(9-10)B6.1 Presents results in standard form enabling others to critique and review.  S5(9-10)B6.2 Uses feedback to refine an investigation or conduct further study.  **S6 THE STUDENT COMPREHENDS AND USES SCIENTIFIC TOOLS AND TECHNOLOGIES**  S6(9-10)B2 Uses appropriate tools/ technology to conduct scientific investigations accurately.  S6(9-10)B3 Uses proper procedures for using laboratory tools, chemicals, equipment, animals.  S6(9-10)B3.4 Handles animals and biological materials (e.g., dissectible, live animals, cultured organisms) safely, correctly, and humanely.  S6(9-10)B4 Demonstrates safety procedures and knows how to respond when an accident occurs during a science experiment  **S7 THE STUDENT COMMUNICATES AND UNDERSTANDS SCIENTIFIC INFORMATION AND PROCESSES**  S7(9-10)B1 Communicates understanding of scientific concepts and principles  S7(9-10)B1.1 Presents understanding of science concepts in written form (e.g. reports, essays, graphics), supporting statements with application and/or evidence.  S7(9-10)B1.2 Makes oral presentations that demonstrate understanding of science concepts and principles, supporting statements with application and/or evidence.  S7(9-10)B3 Understands scientific information contained in a variety of sources  S7(9-10)B3.1 Acquires information from a variety of sources (e.g., science textbooks, encyclopedia, Internet, interviews, museums, topographical maps, newspaper).  S7(9-10)B3.2 Selects and uses appropriate sources for obtaining various kinds of scientific information.  S7(9-10)B3.3 Understands differences between scientifically valid and invalid sources.  S7(9-10)B3.4 Sites sources of information using appropriate bibliographic format.  **S8 THE STUDENT UNDERSTANDS HOW DEVELOPMENTS IN SCIENCE AND TECHNOLOGY AFFECT SOCIETY AND THE ENVIRONMENT**  S8(9-10)B2.3 Understands how scientific and technological developments influence subsequent developments in science and technology.  S8(9-10)B3 Understands ways that science, technology, and society influence one another  S8(9-10)B7 Understands how humans have impacted the environment and developed practices that alleviate damage to natural resources  S8(9-10)B7.1 Understands the environmental impact of human population growth and resource consumption.  S8(9-10)B7.2 Understands ways in which scientific and technological developments have impacted the environment and availability of natural resources.  S8(9-10)B7.3 Understands methods of conservation that can be used to prevent or reduce resource consumption (e.g., alternative energy sources, improving efficiency of energy and natural resources, recycling of mineral resources, recycling of wood, paper and plastic products).  S8(9-10)B7.4 Understands methods of conservation that can be used to protect the environment (e.g., use of natural predators to replace insecticides; use of bacteria to clean oil spills; promoting environmental stewardship; sewage and water treatment systems; treatment of hazardous waste).  S8(9-10)B8 Identifies the role of science and technology in a variety of careers  **LIFELONG LEARNING STANDARDS**  The standards and indicators checked below are those targeted learning objectives that will be assessed in this course.  Students will be **effective communicators** who:  √ listen objectively with understanding  √speak with clarity of meaning to any audience for a variety of purposes  √ read a variety of materials with understanding  √ write with clarity of meaning to any audience for a variety of purposes  √ use a variety of strategies to communicate information  Students will be **informed thinkers** who:  √ identify, define and solve problems  √ set criteria and analyse alternatives in making decisions  √ use a variety of critical and creative strategies in solving problems and making decisions  √explain their thought processes in arriving at outcomes  √ apply problem-solving and decision-making skills to real life situations  Students will be **self-directed learners** who:  √assess and reflect on their attitudes, skills and behaviors  √set priorities, plan and take action to accomplish goals  √ manage time and resources efficiently  √ apply what they learn to other situations  √explore and prepare for academic, extracurricular and career opportunities  Students will be **collaborative workers** who:  √ contribute to the achievement of group or team goals  √ perform a variety of roles within groups or teams  √ acknowledge and respect contributions of others  √ reflect on group or team and personal performance  Students will be **responsible members of society** who:  √ recognize diverse ethnic, linguistic, cultural and economic backgrounds  √ recognize the rules and processes that govern societies  √demonstrate and exercise the skills required to be a contributing member of a society  √ apply practices that preserve the safety and health of one’s self, others and the environment  Students will be **information processors** who:  √ identify, access, gather and evaluate relevant data  √ convert data into usable information related to need  √ build knowledge by using a variety of information resources and tools including technology  **VII. COURSE OUTLINE**  Unit 1: Chemical Oceanography    A. Overview of basic chemistry principles  1. Mixtures and solutions  2. Composition of matter: atoms, elements, compounds  3. pH of solutions: acids, bases, and salts  4. Osmosis and diffusion  5. Concentration of matter  6. Lab: cohesion and adhesion of water  B. Properties of Water  1. The structure of the water molecule  2. Unique properties of water  3. Solubility of salts- Salinity  4. Density changes in water  5. Lab: Exploring different salinities based on density and temperature changes  Unit 2: Physical Oceanography- Motion in the Ocean    A. Ocean Circulation  1. Identification of surface currents  2. Up-welling and down-welling  3. Deep ocean current patterns  4. Lab: Mapping of the surface currents on a world map    B. Waves  1. Physical characteristics of waves  2. Types of waves  3. Wind as the major cause of waves  4. Lab: A look at the interaction of waves    C. Tides  1. Interaction between the Sun, Moon, and the Earth that cause tides  2. Different tidal patterns  3. Lab: Predicting tides using tide tables  4. Lab: Predicting tides using lunar cycles  Unit 3: Geological Oceanography    A. Structure of the Earth  1. Internal Structure  2. Continental and Oceanic Crust  3. Plate Tectonics  a. Plate movement and the formation of the oceans  b. Structure of the land masses of the ancient, as well as the present Earth  c. Continental drift  d. Lab: Recreating Pangea, piecing together continental plates  4. Sea floor  a. Sea floor spreading  b. Significance of the Mid-Ocean ridges  c. Lab: Sea floor mapping of the mid-ocean ridges  5. Continental margins  a. Continental Shelf, Slope and Rise  Unit 4. Organisms of the Oceans    A. Review of scientific (bi-nomial nomenclature) classification system of organisms    B. Marine Prokaryotes- the first Kingdom  1. Cyanobacteria- the first step  a. Earliest forms of organisms from Earth’s past  b. Processes that helped develop Earth’s atmosphere  c. “How we got from there to here”- a connection to our past    C. Protists- combination of both plants and animals  1. Unicellular algae- plant like protists  a. Diatoms- the major source of Oxygen in the atmosphere  2. Protozoan- animal-like protists  3. Multi-cellular algae: The Seaweeds  a. Green algae  b. Brown algae  c. Red algae  4. Lab: Identification of algae- diatoms and seaweeds (Feather-boa, Giant Kelp, etc,)    D. Kingdom Animalia- structure/ function/ habitat/ importance  1. Invertebrates- those without a spine  a. Phylum Porifera- Sponges  i. Lab: Identification of sponges  b. Phylum Cnidaria- jellies and other stinging critters  i. Lab: Identification of cnidarians  c. Phylum Annelida- segmented worms  i. Lab: Identification of marine worms  d. Phylum Mollusca- critters with soft bodies  i. Types of molluscs  ii. Biology of molluscs  iii. Lab: Identification and dissection of mollusks (squid, clam)  e. Phylum Arthropoda- the armored and jointed appendage organisms  i. Crustaceans- crab, shrimp and lobster  ii. Lab: Identification and dissection of crustaceans  f. Phylum Ecinodermata- the spiny skinned organisms  i. Types of Echinoderms  ii. Biology of echinoderms  iii. Lab: Identification and dissection of echinoderms ( Urchin, Sea Star)    2. Vertebrates- Organisms with a spine  a. Fish-  i. Jawless fish- Agnatha  ii. Cartilaginous fish  a. Sharks  b. Rays and Skates  c. Ratfish  iii. Bony Fish  iv. Lab: Creating a dichotomous key to the fish of Southern California  b. Anatomy and Physiology of Fish  i. Lab: Fish Dissection (perch)  c. Amphibia  d. Reptiles  e. Seabirds  i. Lab: Identification of seabirds along Southern California coasts  f. Types of Marine Mammals  i. Seals, Sea Lions, Walruses  ii. Whales, Dolphins, and Porpoises  iii. Sea Otters and Sirenia (manatee, dugong)  iv. Lab: Identification of Marine Mammals  g. Biology of Marine Mammals  i. Adaptations to a water environment  ii. Echolocation  iii. Lab: How Endothermic Marine Mammals have evolved  iv. Behavior and Migrations  Unit 5 Ecology and Biodiversity    A. Introduction to ecological principles  1. Trophic Structures- food webs and food chains  a. Lab: Food web activity  2. Nitrogen Cycles and other essential nutrients  3. Flow of energy  a. Photosynthesis  b. Respiration  c. Alternative sources    B. Between the Tides  1. Rocky shore communities  2. Lab: Tide Pools-visit to Cabrillo Marine Aquarium    C. Estuaries: meeting of rivers and the sea  1. Characteristics of estuaries  2. Types of estuaries  3. Lab: Malibu lagoon    D. Continental Shelf communities    E. Coral Reefs  1. Types of coral reefs  2. Physical and chemical characteristics of coral reefs  3. Trophic structure of coral reefs  4. Lab: Coral Reefs of Belize and U.S. Virgin Islands-Teacher report back & PowerPoint  F. Life at the Surface  1. Plankton- our drifters  a. Phytoplankton  b. Zooplankton  2. Trophic levels and energy flow    G. Ocean Depths  1. Mid-water communities  2. Ocean floor  a. Physical characteristics of depth  b. Adaptations necessary for survival  c. Ocean floor communities  Unit 6. Human Impacts    A. Resources available  1. Recreational areas  2. Food  3. Oil, Gas and Mining    B. Human Impacts  1. Pollution- water  a. Plastics and solid wastes  b. Pesticides, fertilizers, Oil and other runoffs  2. Pollution- atmosphere  a. Global warming and ocean temperatures  i. Lab: Sea Surface Temperature Profiles  3. Species depletion and extinction  a. Whaling  b. Over fishing, collapse of fisheries and loss thru by-catch  i. Lab: The Sardine Fishery collapse. CalCOFI Reports  4. Habitat destruction  a. Coral reefs  b. Wetlands, estuaries, and mangrove forests  C. El Nino  1. Lab: El Nino  **VIII. INSTRUCTIONAL METHODS and/or STRATEGIES**   1. Lecture 2. Discussion 3. Group Work 4. Readings 5. Lab Work 6. Project-based Learning 7. Library Research 8. Internet Research 9. Videos 10. CD Rom 11. PowerPoint 12. Field trips   **IX. ASSESSMENT**   1. exams 2. quizzes 3. Laboratory practicums 4. laboratory reports 5. homework assignments 6. projects 7. classroom participation 8. performance based assessments 9. **TEXTS AND SUPPLEMENTAL INSTRUCTIONAL MATERIALS**   **Greene, Thomas.  *Marine Science*,** Amsco School Publications, 1998    **Supplemental: (and for teachers instruction)**  Castro, Peter and Michael Huber. *Marine Biology*, 4th edition. McGraw Hill, 2002. | pixel |