Environmental Science (CHM 105)
Course Syllabus

Instructor: Mr. Butz

Course Description: AP Environmental Science is a course that is designed to be the equivalent of a one-semester, introductory college class in environmental science. The goal of AP Environmental Science is to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems both natural and human-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. The following themes provide a foundation for the structure of the AP Environmental Science course: science is a process, energy conversions underlie all ecological processes, the Earth itself is one interconnected system, humans alter natural systems, environmental problems have a cultural and social context, and human survival depends on developing practices that will achieve sustainable systems.

Course Prerequisites: Successful completion of Earth Science, Biology, Chemistry, and Algebra.

Summer Reading Assignment: During the summer preceding the school year, students are required to read a book that is related to the study of the environmental sciences. A list of acceptable books will be provided by the instructor prior to the summer. Each student is required to submit a formal book report, and be prepared to provide a brief overview of the book at the start of the school year.

Textbook: *Environmental Science: Toward a Sustainable Future*, 12th edition by Wright

Environmental Student Workbook. 3rd Edition, Biozone International LTD

Laboratory and Field Investigations: The laboratory component of AP Environmental Science is designed to complement the classroom portion of the course by allowing students to learn about the environment through first hand observation. In this course we will be conducting research both in the lab and in the field as often as possible. Experiences both in the laboratory and in the field provide students with important opportunities to test concepts and principles that are introduced in the classroom, explore specific problems with a depth not easily achieved otherwise, and gain an awareness of scientific investigation.

Long-Term Research Project: Throughout the year, the class will be conducting a long-term study of nearby Hedges Lake. Once a month, we will visit two sites on the lake to perform chemical and biological tests in order to asses the health of its aquatic ecosystem. The purpose of this study is to learn about the seasonal changes that take place within the lake and how they affect its chemistry, how human activity may be impacting the lake, and how scientific skills learned in the classroom are applied to real scientific research. Our study will place special emphasis on invasive species and nutrient pollution. After the AP exam in May, each student will be required to prepare a formal research report presenting the results of our study.

Weekly Current Event Journals: Each week, all throughout the year, students are required to read, review, and submit an article that is relevant to an environmental science topic that is being covered in class. This important aspect of the course is designed to keep students informed of current events related to the environmental sciences.

Grading Policy: Grades will be based on laboratory reports (2x), current event articles (1x), quizzes (1x), homework (1x), tests (3x), and a final project (23% of total grade).

Course Outline:

Topics	**Reading and Homework Assignments, Lab Investigations, and Activities**
Environmental Problems and Their Causes **Scientific Principles, Matter, and Energy** (1 Week) • Population Growth • Resources • Pollution • Sustainability • Environmental History • Scientific Inquiry • Matter • Energy	Chapter 1: *RQ 1, 2, 3, 9* Summer Reading Presentations Environmental Literacy Quiz State of the Environment Worksheet Chapter 3 *RQ 1, 2, 9, 10 11, 12* Hands-On Lab: Experimental Design – Grass Decomposition

Ecological Systems (4 Weeks) • Ecological Principles and Dynamics • Ecosystems • Biomes • Aquatic Ecosystems • Energy Flow • Biogeochemical Cycling • Primary Production • Habitats and Species Interactions • Evolutionary Change • Food Chains and Webs • Energy Pyramids • Biological Succession	Chapter 5 *RQ 2, 3, 6, 10, 11,* Easter Island Article Biomes Map Activity Biomes Graph Activity Hands-On Lab: Biotic and Abiotic Factors of Local Ecosystems Hands-On Lab: Primary Productivity of Terrestrial Ecosystems Hands-On Lab: Photosynthesis /Respiration Hands-On Lab: Primary Productivity of Aquatic Ecosystems Hands-On Lab: Nutrient Cycling Oak Leaf Decomposition Worksheet Trophic Level Worksheet Energy Pyramid Worksheet Hands-On Lab: Net Primary Productivity Food Web Worksheet Hands-On Lab: Secondary Succession

Water Resources (4 Weeks) • Hydrologic Cycle • Properties of Water • Water Shortages • Irrigation • Standing Water Ecosystems/Limnology • Flowing Water Ecosystems • Watersheds • Long Distance Transport • Water Conservation	Chapter 10 *RQ 1, 2, 3, 6, 10, 11, 14,* Water Use Worksheet Water Loss Worksheet Long Distance Transport Worksheet Map Lab: Local Water Resources Map Lab: Local Watersheds Local Water Resources Worksheet Hands-On Lab: Evapotranspiration Discharge Rate Worksheet Groundwater Flow Model Demo Map Lab: Groundwater Flow Virtual Lab: Landfills and Groundwater Pollution Hands-On Lab: Soil Salinization Drowning New Orleans Article

Water Pollution (5 Weeks) • Point/Non-Point Pollution • Input/Output Controls • Sediment Pollution • Nutrient Pollution/Eutrophication • Thermal Pollution • Disease Causing Organisms • Toxic Organic Compounds • Heavy Metals/Toxic Inorganic Compounds • Water Quality Assessment • Groundwater Pollution • Water Quality Legislation • Wastewater Treatment • Primary Treatment • Secondary Treatment • Tertiary Treatment • Disinfection • Biosolid Disposal • Septic Systems	Chapter 20 *RQ 1, 2, 4, 5, 7, 10, 11* Hands-On Lab: Algal Bloom Biological Oxygen Demand and Dissolved Oxygen Worksheet Hands-On Lab: Biological Oxygen Demand #1 Hands-On Lab: Biological Oxygen Demand #2 Hands-On Lab: Thermal Pollution (Effect of Temperature. on Dissolved Oxygen) Nitrates in Drinking Water Worksheet Chemical Dumping Worksheet Hudson River PCB videos Canaries in a Stream Worksheet Mercury in Northeastern Lakes Article Arsenic in Drinking Water Worksheet "Swim for the River" Video Hands-On Lab: Water Testing Hands-On Lab: Water Quality Index "A Civil Action" Film Groundwater Pollution Worksheet Wastewater Worksheet Wastewater Treatment Diagram Worksheet Hand-On Lab: Primary Wastewater Treatment Living Machine Article All About Sludge Worksheet Hands-On Lab: Solar Aquatic Wastewater Treatment(Water Hyacinths) Hands-On Lab: Biogas Generators

Atmospheric Science, Weather and Climate, Climate Change, and Air Pollution (6 Weeks) • Atmospheric Structure • Weather • Climate • Paleoclimatology • Ice Core Data • Global Climate Change • The Kyoto Protocol • Ozone Depletion • The Montreal Protocol • El Nino and the Southern Oscillation • Coral Bleaching • Primary and Secondary Air Pollution • Photochemical Smog • Acid Precipitation • Indoor Air Pollution	Chapter 18 RQ 1, 2, 3, 4, 6, 7, 9, 11, 13, 16, 17, 18 Chapter 19 RQ 1, 3, 5, 7, 9, 12, 14 Koppen Climate Classification Worksheet Computer Lab: Climographs Computer Lab: Vostok Ice Core Data Computer Lab: Humans and Climate Change Data Global Warming and Sea Level Rise Worksheet Hands-On Lab: The Greenhouse Effect Humans and Global Climate Change Worksheet "An Inconvenient Truth" Video Ozone Depletion Worksheet

• Air pollution Control and Prevention • Air Pollution Legislation • Cap and Trade Programs	Color the El Nino Activity El Nino La Nina Worksheet "What's Up With The Weather" Video Is there Global Warming? Article Hands-On Lab: Automobile Exhaust Analysis Air Pollution Worksheet Computer Lab: Particulate Matter Air Maps Computer Lab: Ground Level Ozone Air Maps Air Pollution and Light Bulbs Worksheet Hands-On Lab: Effect of Acid Precipitation on Building Materials Hands-On Lab: Acid Rain and Radishes Cambridge High School Air Pollution Worksheet Indoor Air Pollution Worksheet Cap and Trade Game #1 Mercury Cap and Trade Game

Energy Resources (6 Weeks) • Fossil Fuels • Fossil Fuel Alternatives • Carbon Sequestration Technology • Energy Units of Measure • Electrical Power Generation • Nuclear Power • Hydropower • Wind Power • Biomass Power • Geothermal Power • Solar Power • Fuel Cell Technology	Chapter 14 *1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15* Chapter 15 *RQ 1, 2, 3, 4, 6, 7, 8, 9, 10,* Chapter 16 *RQ 1, 2, , 3, 4, 5, 6, 7, , 8, 9, 10, 11, 12, 13, 14* Energy Use Graphs Worksheet Geology of Oil Worksheet Hands-On Lab: Geology of Coal Coal Liquification/Gasification Demo Hands-On Lab: Ethanol Production Hands-On Lab: Methanol Production Hands-On Lab: Biodiesel Production America and Cars Worksheet Biodiesel Worksheet Ethanol vs. Gasoline Worksheet Hands-On Lab: Soap from Biodiesel Hands-On Lab: Energy Content of Fuels Energy Units Worksheet Hands-On Lab: Light Bulb Efficiency Efficiency of Power Plants Worksheet Nuclear Now! Article Hands-On Lab: Radiation and Radishes Wind Power Worksheet "Who killed the Electric Car?" Video "Fueling America's Future" Video Hands-On Lab: Photovoltaic Cells Hands-On Lab: Fuel Cells

Food Resources and Agriculture (2 Weeks) • Food Production and Sustainable Agriculture • Hunger and Malnutrition • Biotechnology • Pest Control • Bioaccumulation • Forest Management • Soil Science • Soil Conservation • Rocks, Minerals, and Plate Tectonics Review	Chapter 11 *RQ 1, 2, 3, 5, 10, 11, 13, 14, 16* Chapter 12 *RQ 1, 2, 4, 5, 8, 9, 12* Chapter 13 *RQ 1, 2, 3, 4, 5, 6, 7, 9, 10* Agricultural Census Worksheet New York's Agricultural Climate Data Worksheet Hunger in the United States Article Computer Lab: Should We Grow Genetically Modified Plants? Are Genetically Modified Foods Safe? Worksheet Hands-On Lab: Roundup Ready Genetically Modified Plants Hands-On Lab: Effect of Nutrients on Plant Growth Hands-On Lab: Lethal Dose 50 LD-50 Worksheet #1 LD-50 Worksheet #2 Pesticides Spraying Worksheet Bioaccumulation Worksheet From Forest to Farm Worksheets #2, #3, #4, & #5 Forest Fire Math Hands-On Lab: Soil Analysis Soil Profiles Worksheet Soil Textural Triangle Worksheet Plate Tectonics Worksheet

Population Dynamics (2 Weeks) • Demography • Exponential Growth • Demographic Transition • Age Structure Diagrams • Carrying Capacity • Overpopulation • Population Control	Chapter 8 *RQ 2, 4, 5, 7, 8, 9, 12,11,12* , 13 Chapters 9 *RQ 1, 2, 3, 7, 8* Population Dynamics Worksheet World Population Map Activity Population Trends of the United States Worksheet Age Structure Pyramids Worksheet Computer Lab: Ecological Footprint World Population Growth Worksheet Doubling Time Worksheet World Population Internet Worksheet Population and Survivorship Worksheet Carrying Capacity in the Kaibib Worksheet Carrying Capacity and Oaks Worksheet Human Carrying Capacity Worksheet

Biodiversity and Wildlife Management (2 Weeks) • Biological Wealth • Habitat Destruction • Exotic Species • Wildlife Management	Chapters 4 *RQ 1, 2, 3, 4, 5, 8, 12* Chapter 6 *RQ 1, 2, 3, 4, 5, 6, 7, 8,* Chapter 7 *RQ 2, 4, 5, 7, 10, 12, 14* Biodiversity Graph Predation/Prey Graph Worksheet Biodiversity and Fragmentation Worksheet "Biological Diversity: The Oldest Human Heritage" by Edward O. Wilson, Reading Assignment Computer Lab: Invasive Species Report Hands-On Lab: Exotic Species Competition in Texas Fish Banks Computer Simulation Game

Solid Waste Disposal (1 Week) • Municipal Waste • Hazardous Waste • Environmental Hazards	Chapter 21 *RQ 1, 2, 3, 5, 7, 8, 9, 12,* Chapter 22 *RQ 2, 3, 4, 5, 6, 8, 9,* Chapter 17 *RQ 5, 6, 10,* Graphing Garbage Activity Hands-On Lab: Landfills and Garbage Decomposition Energy and Recycling Worksheet Tires and the Environment Worksheet

Public Policy and the Environment, Urban Land Use (1 Week) • Economic Resources • Environmental Policy • Environmental Law • Urbanization • Land Use Planning • Sustainable Communities	Chapter 2 *RQ 10, 11, 12, 14* Chapter 23 *RQ 2, 4, 7, 11, 12, 15* Environmental Law Review Worksheet