**AP Environmental Science: Des Moines Public Schools**

**2019-2020 CURRICULUM GUIDE SCI501/502 SCI517/518**

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| **AP Environmental Sciences** |
| The AP Environmental Science course is designed to be the equivalent of a one-semester, introductory college course in environmental science, through which students engage with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world. The course requires that students identify and analyze natural and human-made environmental problems, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving or preventing them. Environmental Science is interdisciplinary, embracing topics from geology, biology, environmental studies, environmental science, chemistry, and geography.  **AP Environmental Science** **– Course Content:**  Environmental science is interdisciplinary; it embraces a wide variety of topics from different areas of study. There are several unifying themes that cut across topics. The following are course themes:  • 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. • Human survival depends on developing practices that will achieve sustainable systems.  **AP Environmental Science** **– Topic Outline:**  I. Earth Systems and Resources  II. The Living World  III. Population  IV. Land and Water Use  V. Energy Resources and Consumption  VI. Pollution  VII. Global Change  **AP Environmental Science** **Exam: Format of Assessment – 3 Hours**  **Section I: Multiple Choice | 100 Questions | 90 Minutes | 60% of Exam Score**  • Discrete Questions and Questions in Sets  **Section II: Free Response | 4 Questions | 90 Minutes | 40% of Exam Score**  • Data Set (1 question)  • Document-Based Question (1 question)  • Synthesis and Evaluation (2 questions)  **Link to DMPS Grading Resources:** <http://grading.dmschools.org>  **Link to Course Resources**: <http://science.dmschools.org>  **Link to Course Information @ AP Central:** <http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/2128.html> |

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| Semester 1 Topics | College Board Curriculum Framework Alignment |
| Eco Footprint: Energy and Transportation | **V. Energy Resources and Consumption**  A.Energy Concepts (energy forms; power; units; conversions; Laws of Thermodynamics)  B. Energy Consumption  1. History (Industrial Revolution; exponential growth; energy crisis) 2. Present global energy use 3. Future energy needs  C. Fossil fuel resources (formation of coal, oil and natural gas; extraction/purification methods; world reserves and global demand; synfuels; environmental advantages/disadvantages of sources)  **VI. Pollution**  A1. Air Pollution (Sources - primary and secondary; major air pollutants; measurement units; smog; acid deposition - causes and effects; heat islands and temperature inversions; indoor air pollution; remediation and reduction strategies; clean air act and other relevant laws)  A2. Noise (sources; effects; control measures)  **VII. Global Change**  B. Global Warming (greenhouse gases and the greenhouse effect; impacts and consequences of global warming; reducing climate change; relevant laws and treaties) |
| Eco Footprint: Alternative Energy | **V. Energy Resources and Consumption**  D. Nuclear Energy (nuclear fission process; nuclear fuel; electricity production; nuclear reactor types; environmental advantages/disadvantages; safety issues; radiation and human health; radioactive wastes; nuclear fusion)  E. Hydroelectric Power (dams; flood control; salmon; silting; other impacts)  F. Energy conservation (energy efficiency; CAFE standards; hybrid electric vehicles; mass transit)  G. Renewable Energy (solar energy; solar electricity; hydrogen fuel cells; biomass; wind energy; small scale hydroelectric; ocean waves and tidal; geothermal; environmental advantages/disadvantages |
| Eco Footprint: Water/Waste | **I: Earth Systems and Resources**  C. Global Water Resource and Use (Freshwater/Saltwater; ocean circulation; agricultural, industrial, and domestic use; surface and  groundwater issues; global problems; conservation)  **VI: Pollution**  A3. Water Pollution (types; source, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems, clean water act and other relevant laws)  A4. Solid Waste (Types; disposal; reduction)  B. Impacts on the Environment and Human Health  1. Hazards to human health (Environmental risk analysis; acute and chronic effects; dose-response relationships; air pollutants; smoking and other risks)  2. Hazardous chemicals in the environment (Hypes of hazardous waste; treatment/disposal of hazardous waste; cleanup of contaminated sites; biomagnification; relevant laws) |
| Semester 1 Topics | **College Board Curriculum Framework Alignment** |
| MCE:  Ecology and Biodiversity | **II. The Living World**   1. Ecosystem Structure (biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes) 2. Energy Flow (photosynthesis and cellular respiration; food webs and trophic levels; ecological pyramids) 3. Ecosystem Diversity (biodiversity; natural selection; evolution; ecosystem services) 4. Natural Ecosystem Change (climate shifts; species movement; ecological succession)   **VII. Global Change**  C. Loss of Biodiversity (habitat loss; overuse; pollution; introduced species; endangered and extinct species; maintenance through conservation; relevant laws and treaties) |
| MCE:  Human Population and Land Use | **III. Population**   1. Population Biology Concepts (population ecology; carrying capacity; reproductive strategies; survivorship) 2. Human Population 3. Human population dynamics (historical population sizes; distribution; fertility rates; growth rates and doubling time; demographic transition; age-structure diagrams) 4. Population Size (strategies for sustainability; case studies; national policies) 5. Impacts of population growth (hunger; diseases; economic effects; resource use; habitat destruction)   **IV: Land and Water Use**  D. Other Land Use   1. Urban land development (planned development; suburban sprawl; urbanization) 2. Transportation infrastructure (Federal highway system; canals and channels; roadless areas; ecosystem impacts) 3. Public and Federal Lands (Management; wilderness areas; national parks; wildlife refuges; forests; wetlands) 4. Land Conservation Options (Preservation; remediation; mitigation; restoration) 5. Sustainable land use strategies |
| MCE:  Pollution\* (ungraded topic) | **VI. Pollution**  A1. Air Pollution (Sources - Primary and Secondary; major air pollutants; measurement units; smog; acid deposition - causes and effects; heat islands and temperature inversions; indoor air pollution; remediation and reduction strategies; clean air act and other relevant laws)  A2. Noise (Sources; effects; control measures)  A3. Water Pollution (types; source, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems, clean water act and other relevant laws) |
| Scientific Practices | **Scientific Practices – College Board Framework**  Apply scientific practices to the solution of environmental problems.  Interpret data correctly, Form conclusions of sustainability using the three lenses  Develop an evidence-based argument  Communicate conclusions accurately and meaningfully |

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| Semester 2 Topics | College Board Curriculum Framework Alignment |
| Food:  Earth Systems and Resources | **I. Earth Systems and Resources**  A. Earth Science Concepts (geologic time scale; plate tectonics, earthquakes, volcanism; seasons; solar intensity and latitude)  D. Soil and Soil Dynamics (rock cycle; formation; composition; physical and chemical properties; main soil types; erosion and other soil problems; soil conservation)  **II. The Living World**  E. Natural Biogeochemical cycles (carbon, nitrogen, phosphorus, sulfur, water, conservation of matter) |
| Food:  Land and Water Use | **IV. Land and Water Use**  A. Agriculture   1. Feeding a growing population (human nutritional requirements; types of agriculture; Green Revolution; genetic engineering and crop production; deforestation; irrigation; sustainable agriculture) 2. Controlling pests (types of pesticides; costs and benefits of pesticide use; integrated pest management; relevant laws)   B. Forestry (tree plantations; old growth forests; forest fires; forest management; national forests)  C. Rangelands (overgrazing; deforestation; desertification; rangeland management; federal rangelands)  **I. Earth Systems and Resources**  C. Water Resources and Use (freshwater/saltwater; agriculture, industrial, and domestic use; surface and groundwater issues; global problems; conservation) |
| Foods:  Pollution | **VI. Pollution**  A3. Water Pollution (types; Sources, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems; Clean Water Act and other relevant laws)  B2. Hazardous Chemicals in the Environment (types of hazardous waste; treatment/disposal of hazardous waste; cleanup of contaminated sites; biomagnification; relevant laws) |

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| Semester 2 Topics | College Board Curriculum Framework Alignment |
| Oceans:  Earth System & Resource | **I. Earth Systems and Resources**  B. The Atmosphere (composition; structure; weather and climate; atmospheric circulation and Coriolis Effect; atmospheric-ocean interactions; ENSO)  **VII. Global Change**  A. Stratospheric Ozone (formation of stratospheric ozone; ultraviolet radiation; causes of ozone depletion; effect of ozone depletion; strategies for reducing ozone depletion; relevant laws) |
| Oceans:  Land and Water Use | **IV: Land and Water Use**  E. Mining (mineral formation; extraction; global reserves; relevant laws and treaties)  F. Fishing (fishing techniques; overfishing aquaculture; relevant laws and treaties)  G. Global Economics (globalization; World Bank; Tragedy of the Commons; relevant laws and treaties)  **II. The Living World →**  A. Ecosystem Structure (keystone species) |
| Oceans:  Pollution\*  (ungraded topic) | **VI. Pollution**  A. Pollution Types  2. Noise Pollution (sources; effects; control measures  3. Water Pollution (types; sources, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems; clean water act and other relevant laws)  B. Impacts of the Environmental and Human Health  1. Hazards to human health (Environmental risk analysis; acute and chronic effects; dose-response relationships; air pollutants; smoking and other risks). 2. Hazardous chemicals in the environment (types of hazardous waste; treatment/disposal of hazardous waste; cleanup of contaminated sites; biomagnification; relevant laws). 3. Economic Impacts (cost-benefit analysis; externalities; marginal costs; sustainability) |
| Scientific Practices | **Scientific Practices – College Board Framework**  Apply scientific practices to the solution of environmental problems.  Interpret data correctly  Form conclusions of sustainability using the three lenses  Develop an evidence-based argument  Communicate conclusions accurately and meaningfully |
| 2019-2020 Option \*CB Redesign | **Semester 1 Topics:** Ecosystems, Biodiversity, Populations, Earth Systems & Resources, and Scientific Practices  **Semester 2 Topics:** Land & Water Use, Energy Resources, Pollution, Global Change, and Scientific Practices  \*If using this option, please scroll to the bottom to find new topic scales under review in the 2019-2020 school year. All schools will adopt this option in the 2020-2021 school year |

**Standards-Referenced Grading Basics**

The teacher designs instructional activities and assessments that grow and measure a student’s skills in the elements identified on our topic scales. Each scale features many such skills and knowledges, also called learning targets. These are noted on the scale below with letters (A, B, C) and occur at Levels 2 and 3 of the scale. In the grade book, a specific learning activity could be marked as being 3A, meaning that the task measured the A item at Level 3.

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| **The Body of Evidence in a Process-Based Course** |
| **Process-Based SRG** *is defined as an SRG course design where the same scale recurs throughout the course, but the level of complexity of text and intricacy of task increase over time.*  AP Environmental Science does have a traditional unit-based design. In some topics, however, students cycle through the same topic repeatedly as they progress through the course, with changing content and an increasing complexity of the text, analysis, and writing expectations throughout.  To account for this, process-based courses like this have their evidence considered in a “Sliding Window” approach. When determining the topic score for any given grading topic, *the most recent evidence* determines the topic score. Teacher discretion remains a vital part of this determination, but it is hard to overlook evidence from the most recent (and therefore rigorous) assessments. |





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| Eco Footprint: Energy and Transportation |
| **Text and Resources** |
| *KIA Project Cycle: Eco Footprint*  Teacher Notes: 3C: Clean Air Act is included in this process 2C: including smog and acid rain  Example for EcoFootprint: Energy and Transportation -Exit for 3A using teacher created data; 2B-D will be similar entrance/exit tickets -Shorter unit test over just energy and transportation -At this time, collect draft of energy transport audits and they will be graded in the science practices standard -Whatever the score is for the unit test will update grades because they are a more recent look at what they know. -Science practices have pieces of evidence with score, and at end of project the still turn in the four parts of their projects and grades can be updated/replaced.  Example 4: Investigate how our past energy use has influenced our current and future energy needs and global demands as well as environmental impacts. |

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| **Topic** | **4** | **3** | **2** |
| **Eco Footprint: Energy and Transportation** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A: Apply energy concepts to calculate your household energy consumption and compare to the state and nation.    3B: Compare and contrast the different forms of non-renewable energy (include environmental impacts and world reserves).  3C: Explain remediation and reduction strategies for air pollution.    3D: Describe the impacts of climate change and ways to reduce climate change. | 2A: Identify and describe energy concepts:       -energy forms (kinetic and potential)       -power       -energy units (kW, BTU)       -energy conversions       -calculate household energy consumption  2B: Describe the formation, extraction, and purification methods for different forms of non-renewable energy:        -coal        -oil        -natural gas  2C: Identify and describe air pollutant concepts:        -primary air pollutants        -secondary air pollutants        -Clean Air Act  2D: Identify and describe climate change concepts:        -greenhouse gases        -greenhouse effects        -relevant laws (Kyoto Protocol, Paris Agreement COP21 |

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| Eco Footprint: Alternative Energy |
| **Text and Resources** |
| *KIA Project Cycle: Eco Footprint*  Teacher notes:  2B: Solar power: photovoltaic cells, solar water heater, passive solar design  Alternative Energy: Jigsaw alternative energies because we will need to fly through a lot of this information  Example 4: Draft a proposal to present to the City of Des Moines that will allow Des Moines to be more sustainable in its energy use. |

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| **Topic** | **4** | **3** | **2** |
| **Eco Footprint: Alternative Energy** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A: Evaluate the use of nuclear  energyon the environment and human health.    3B: Evaluate different forms of renewable energy.    3C: Discuss the impacts of using alternative fuels/vehicles and mass transit. | 2A: Identify and describe nuclear energy concepts:       -radiation       -nuclear fusion       -nuclear fuels       -nuclear reactor types  2B: Identify and describe different forms of renewable energy:       -solar energy, solar electricity       -hydrogen fuel cells       -biomass       -wind energy       -small scale hydroelectric,       -large scale hydroelectric (dams)       -ocean/tidal waves       -geothermal  2C: Identify transportation concepts:       -CAFE standards       -forms of mass transit  -alternative fuels |

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| Eco Footprint: Water/Waste |
| **Text and Resources** |
| *KIA Project Cycle: Eco Footprint*  Teacher notes:  Example 4: Provide a draft sustainable waste management plan to the city of Des Moines that encompasses MSW and hazardous waste.  Alternative fuels: hydrogen fuel cells, ethanol, biodiesel, hybrid vehicles, electric vehicles, etc. |

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| **Topic** | **4** | **3** | **2** |
| **Eco Footprint: Water/Waste** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A: Evaluate the impacts associated with the use of freshwater resources.  3B: Evaluate various ways of managing MSW.    3C: Evaluate various ways of managing hazardous waste. | 2A: Identify and describe freshwater concepts:       -use by agriculture, industry, and domestic       -waste water/sewage treatment; purification       -septic systems       -relevant laws: Safe Drinking Water Act  2B: Identify and describe municipal solid waste concepts:       -landfills       -incinerators       -reduce, reuse, recycle       -composting  2C: Identify and describe hazardous concepts:       -hazardous waste       -components of hazardous waste       -management strategies; deep well injection, surface impoundments; hazardous waste landfills       -relevant laws: CERCLA (Superfund Act), RCRA |

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| MCE: Ecology and Biodiversity |
| **Text and Resources** |
| *KIA Project Cycle: My Community Ecology*  Teacher notes:  Example 4: Develop a strategy to minimize the environmental impact on an ecosystem and its biodiversity at a proposed development site. |

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| **Topic** | **4** | **3** | **2** |
| **MCE:**  **Ecology and Biodiversity** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A: Based on our development site, predict the impact of removing a species on the structure and function of ecosystem.    3B: Develop an argument for the conservation of biodiversity in an ecosystem.  3C: Apply understandings of ecosystem services to a given site.  3D: Form conclusions about how creating a road through a development site could lead to a change in the ecosystem. | 2A: Identify and describe   * biological population * biological communities * species interaction (mutualism, commensalism, predation, parasitism) * major terrestrial and aquatic biomes * Keystone species * food webs * trophic levels * ecological pyramids (energy, biomass, population) * primary productivity * laws of thermodynamics   2B: Define and describe biodiversity and the Endangered Species Act  2C: Identify and describe ecosystem services  2D: Identify ways an ecosystem can change (climate shifts; species movement; ecological succession; loss of biodiversity). |

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| MCE: Human Population and Land Use |
| **Text and Resources** |
| *KIA Project Cycle: My Community Ecology*  Teacher notes: 3A and 3B: Given a case study (method for collecting evidence)  2C: Strategies for controlling population size i.e. policies, contraception, education for women |

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| **Topic** | **4** | **3** | **2** |
| **MCE:**  **Human Population and Land Use** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A:  Apply the population vocabulary terms to populations of plants, animals or humans.    3B: Evaluate the need for the expansion of an area due to demographic changes over time.  3C: Generalize the impacts of population growth on land use, resources, water quality, and human health.  3D: Evaluate contrasting strategies to control population growth.    3E: Categorize the protections provided for public and federal lands. | 2A: Identify and describe the population vocabulary terms:  -carrying capacity  -logistic growth  -exponential growth  -biotic potential  -r and k-strategists  -survivorship curve  2B: Identify and describe demographic vocabulary terms:  -fertility rates  -demographic transition  -age-structure diagrams  -growth rates and doubling time (calculate)  2C: Identify the impacts of population growth:  -hunger, diseases, economic effects, habitat destruction, suburban sprawl, urbanization, principles of Smart Growth  2D: Describe various case studies for controlling population size.  2E: Identify different protections of public and federal land:  -wilderness areas  -national parks and national forests  -wildlife refuges  -greenbelts and wetlands |

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| MCE: Pollution\* (ungraded topic) |
| **Text and Resources** |
| *KIA Project Cycle: My Community Ecology*  Teacher Notes:  2C: Water purification (wetlands), Clean Air Act, Clean Water Act, economic incentives (green subsidies), public education/awareness, etc. |

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| **Topic** | **4** | **3** | **2** |
| **MCE:**  **Pollution\***  **(ungraded topic)** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A:Explain the impacts of the major air pollutants on the biotic and abiotic components of an ecosystem.    3B: Explain the impacts of water pollution on the biotic and abiotic components of an ecosystem.  3C: Summarize different strategies to reduce air and water pollution. | 2A: Identify and describe air pollution terms:  -primary and secondary  -major air pollutants such as carbon dioxide  -smog  -acid deposition (causes/effects)  -indoor air pollution  2B: Identify and describe water pollution terms:  -types of water pollution  -water quality  2C: Identify reduction and remediation strategies. |

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| Scientific Practices |
| **Text and Resources** |
| Teacher Note:  Develop an evidence-based argument: Must cover ALL evidence-based arguments provided by individual projects.  \*\*\*CHANGE THE PROJECTS RUBRICS TO ALIGN WITH THIS SECTION\*\*\*  Example 4: Make connections to a real world local environmental problem. |

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| **Topic** | **4** | **3** | **2** |
| **Scientific Practices** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | Apply scientific practices to the solution of environmental problems.   * Interpret data correctly * Form conclusions of sustainability using the three lenses * Develop an evidence-based argument * Communicate conclusions accurately and meaningfully | A level 2 in scientific practices fails to meet the learning goal in two areas.   * Interpret data correctly * Form conclusions of sustainability using the three lenses * Develop an evidence-based argument * Communicate conclusions accurately and meaningfully |

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| 2019-2020 Option \*CB Redesign |
| Semester 1 Topics: Ecosystems, Biodiversity, Populations, Earth Systems & Resources, and Scientific Practices  Semester 2 Topics: Land & Water Use, Energy Resources, Pollution, Global Change, and Scientific Practices  \*If using this option, please scroll to the bottom to find new topic scales under review in the 2019-2020 school year. All schools will adopt this option in the 2020-2021 school year |

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| **Topic** | **4** | **3** |
| **Ecosystems** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A. Analyze the global distribution and environmental aspects of terrestrial and aquatic biomes.  3B. Develop a model of the cycling of nutrients (biogeochemical cycles) in an ecosystem.  3C. Make a claim on how energy flows through trophic levels.  3D. Create a food web for a given ecosystem and predict the effects of the removal of a species. |

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| **Topic** | **4** | **3** |
| **Biodiversity** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A. Explain levels of biodiversity and their importance to ecosystems (Island Biogeography).  3B. Describe how natural and human disruptions impact ecosystem services and biodiversity.  3C. Describe the process of succession in an ecosystem and how succession can impact biodiversity.  3D. Develop an argument for the conservation of biodiversity in a given ecosystem. |

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| **Topic** | **4** | **3** |
| **Populations** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A. Explain the relationship between survivorship curves and reproductive strategies.  3B. Describe the impacts of population growth on land use, resources, water quality, and human health (carrying capacity, age structure diagrams).  3C. Evaluate the need for the expansion of an area due to demographic changes over time.  3D. Describe the dynamics of human populations due to social, cultural, and environmental factors. |

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| **Topic** | **4** | **3** |
| **Earth Systems & Resources** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A. Describe the physical and chemical properties of soil.  3B. Explain how environmental factors can result in atmospheric circulation (layers of atmosphere, solar radiation, Coriolis effect).  3C. Evaluate the characteristics of a local watershed (area, length, slope, soil, vegetation type)  3D. Describe how the sun’s energy affects the Earth’s surface (weather, climate, el nino, la nina). |

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| **Topic** | **4** | **3** |
| **Scientific Practices** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | Apply scientific practices to the solution of environmental problems.   * Interpret data correctly * Form conclusions of sustainability using the three lenses * Develop an evidence-based argument * Communicate conclusions accurately and meaningfully |

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| Foods: Earth Systems and Resources |
| **Text and Resources** |
| *KIA Project Cycle: Foods*  Teacher Notes: 3A is related to the soil lab.  3C: Use the crop selected in the farm system to show all BGC through the crop.  2C: Sulfur and rocks can be added.  Example 4: Investigate the soil quality of my school grounds and develop recommendations for improving soil quality and minimizing erosion. |

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| **Topic** | **4** | **3** | **2** |
| **Foods:**  **Earth Systems and Resources** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.*    Investigate the soil quality of my school grounds and develop recommendations for improving soil quality and minimizing erosion. | 3A: Assess the physical and chemical properties of soil.    3B: Evaluate appropriate soil conservation strategies to minimize soil degradation.    3C: Develop a model of the cycling of nutrients (biogeochemical cycles) in an agricultural ecosystem. | 2A: Identify and describe soil terms:  -Factors of soil formation.  -Soil horizons.  -Physical properties of soil.  -Chemical properties of soils.  2B: Identify and describe soil conservation strategies  - Explain the causes of soil degradation  -Provide examples of soil conservation techniques.    2C: Illustrate the following biogeochemical cycles.  -Water  -Carbon  -Nitrogen  -Phosphorus |

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| Foods: Land and Water Use |
| **Text and Resources** |
| *KIA Project Cycle: Foods*  Teacher Notes: |

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| **Topic** | **4** | **3** | **2** |
| **Foods:**  **Land and Water Use** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A: Evaluate the sustainability of different **agricultural practices.**  3B: Evaluate the effectiveness of different pest management strategies.  3C: Develop an argument for using a specific livestock management practice.  3D: Evaluate the impacts of various farming practices on **water** quality and availability | 2A: Identify and describe **agricultural practice** terms:  -Types of agriculture: industrial/monoculture, subsistence, organic, conventional  -The Green Revolution  -GMOs  2B: Identify and describe pest management strategy terms: -Chemical pesticides -Biological pesticides  -Integrated pest management -Bioaccumulation  -Biomagnification  2C: Identify and describe terms for livestock management practices:  -Confinements (CAFO)  -Rangeland management  -Federal rangeland  -Overgrazing  2D: Identify and describe **water** use terms:   * Types of water pollution (point source, nonpoint source) * Sources of water pollution (nutrients, pesticides) * Cultural eutrophication * Salinization * Groundwater pollution * Irrigation practices |

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| Oceans: Earth Systems and Resources |
| **Text and Resources** |
| *KIA Project Cycle: Oceans*  Teacher notes:  2B: Laws related to ozone= Montreal Protocol  3B: Sustainability of an ecosystem= without ozone, increased UV radiation. Currents change, disruption of ocean food chain, human health/skin cancer/cataracts,  3A: Include upwelling in ENSO discussions |

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| **Topic** | **4** | **3** | **2** |
| **Ocean:**  **Earth Systems & Resources** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A: Describe the relationships between ENSO and global weather patterns.  3B: Describe the effects of stratospheric ozone depletion on the sustainability of an ecosystem. | 2A. Identify and describe atmospheric circulation terms:  - weather (temperature, humidity, pressure)  - climate  - Coriolis Effect  - El Niño Southern Oscillation (ENSO)  2B. Identify and describe the following atmosphere terms:  -layers of the atmosphere  - formation of stratospheric ozone  - causes of ozone depletion  - strategies for reducing ozone depletion  - laws related to ozone depletion |

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| Oceans: Land and Water |
| **Text and Resources** |
| *KIA Project Cycle: Oceans*  Teacher Notes:  2A:   * Extraction Techniques- Surface mining, subsurface mining, oil drilling on land, offshore drilling * Water Pollutants: Acid mine drainage, oil spills, operations of mines and oil drilling * Laws and Treaties: Mining Act of 1872, Surface Mining Control and Reclamation Act, Mineral Leasing Act   2B:   * Fishing Techniques: Drift Netting, Purse Seining, Long lining, bottom trawling, cages * Fishing Laws and Treaties: Magnuson- Stevens Act of 1976/Exclusive Economic Zone, Marine Mammal Protection Act, CITES   2C: Key aspects of ToC   * Public Resource * Non-Renewable Resource * Common/unregulated |

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| **Topic** | **4** | **3** | **2** |
| **Ocean:**  **Land and Water Use** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | 3A: Describe the effects of various extraction techniques on water and land quality.  3B.1: Explain the cause and effect of overfishing  3B.2: Describe how to overcome the issue of overfishing.  3C: Given a case study, explain why or why not the situation qualifies as a Tragedy of the Commons. | 2A. Identify and describe the following aspects of resource extraction:   * Extraction techniques * water pollutants * Laws and treaties   2B: Identify and describe the following aspects of fishing:   * Fishing techniques * Aquaculture * Laws and Treaties   2C: Identify the key aspects of a Tragedy of the Commons |

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| Oceans – Pollution\* (ungraded topic) |
| **Text and Resources** |
| *KIA Project Cycle: Oceans*  Teacher Notes: |

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| **Topic** | **4** | **3** | **2** |
| **Oceans:**  **Pollution\***  **(ungraded topic)** | In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal. | 3A: Develop a strategy to remove noise pollution from the environment | 2A: Identify pollution:   * sources * effects * control measures of noise pollution   2B: Identify and describe the following aspects of pollution: hazards to human health   * Environmental risk analysis * Acute and Chronic effects * Dose-response relationships * Smoking and Risks   2C: Identify and describe the following aspects of pollution: economic impacts   * Cost benefit analysis * Externalities * Marginal Costs * Sustainability |

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| SRG Scale Score | Topic: AP-Style Assessments | AP Exam  Score Conversion |
| 4 | In addition to meeting the learning goal, the student demonstrates in-depth inferences and applications that go beyond the goal. | **90-100%** |
| 3.5 | Student’s performance reflects exceptional facility with **some**, but not all Level 4 learning targets. | **80-89%** |
| 3  Learning Goal | Student’s performance reflects success on **all Level 3** learning targets. | **70-79%** |
| 2.5 | Student’s performance reflects success on **some**, but not all, Level 3 learning targets. | **60-69%** |
| 2 | Student’s performance reflects success on **all Level 2** learning targets. | **50-59%** |
| 1.5 | Student’s performance reflects success on **some,** but not all, Level 2 learning targets. | **40-49%** |
| 1 | Student’s performance reflects insufficient progress towards foundational skills and knowledge. | **20-39%** |