AP® Environmental Science Summer Assignment

Please read the following in its entirety.

Welcome to AP® Environmental Science!

AP® courses are meant to be college-level equivalent. That means we have a lot to cover in AP® Environmental Science (APES) this year and only a short time to do it. College Board® requires us to cover nine units before the exam in early May, including topics from a broad range of disciplines from ecology and macrobiology to sociology and political science. The following is a glance at what we will cover in class.

Big Ideas:

College Board® has laid out four "Big Ideas" that serve as the foundation of the AP® Environmental Science course. These four ideas will connect in some way to everything that we learn this year, so it is important to keep them in the back of your mind as we move through the course.

I. Energy Transfer: *Energy conversions underlie all ecological processes. Energy cannot be created; it must come from somewhere. As energy flows through systems, at each step, more of it becomes unusable.*

II. Interactions Between Earth Systems: *The Earth is <u>one</u> interconnected system. Natural systems change over time and space. Biogeochemical systems vary in ability to recover from disturbances.*

III. Interactions Between Different Species and the Environment: *Humans alter natural systems and have had an impact on the environment for millions of years. Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment.*

IV. Sustainability: *Human survival depends on developing practices that will achieve sustainable systems. A suitable combination of conservation and development is required. The management of resources is essential. Understanding the role of cultural, social, and economic factors is vital to the development of solutions.*

Unit Topics:

As mentioned above we cover nine total units in environmental science and the topics range in scientific discipline. This course will ask you to draw on knowledge from biology, ecology, chemistry, geology, engineering, sociology, political science, and mathematics. The following is the list of units from College Board® that we will discuss.

Unit 0: What is Environmental Science?
Unit 1: The Living World: Ecosystems
Unit 2: The Living World: Biodiversity
Unit 3: Populations
Unit 4: Earth Systems and Resources
Unit 5: Land and Water Use
Unit 6: Energy Resources and Consumption
Unit 7: Atmospheric Pollution
Unit 8: Aquatic and Terrestrial Pollution
Unit 9: Global Change

This overview is not meant to be intimidating but is only meant to prepare you for the task ahead. I promise you that you are up to the challenge, and I will help you in every way that I can along the way, but you will be expected to put in the work. To get ahead and be prepared for what lies in front of you, I am asking that you complete the following ***three-part assignment*** over the summer months.

I look forward to seeing you all in class in the coming school year. Have a great summer! Remember, to also spend some time enjoying and appreciating our natural world.

If you have any questions or just want to share any fun nature-y things you are up to, please don't hesitate to reach out.

See you in class soon!

"Ms. L"

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Summer Assignment Submission Instructions: You may type your responses to each of the following and submit on OnCampus at the start of the school year, or you may bring handwritten responses with you to the first day of class. There will be two OnCampus drop-boxes available for you to submit your responses to Parts I and II at the beginning of the first week of class if you choose to submit electronically. Part III will *require* a handwritten submission.

All parts of the assignment are due the first day we meet for class of the 2024-25 school year.

Part I. Summer Reading

To fully understand how "environments" function you must shift your perspective of how you think of "the environment." If when you try to imagine what "an environment" is, you create an image in your head of a field with trees and little furry animals; you are not wrong, but you are likely not thinking about the entire picture. Where do you place the boundary of an environment? How do human cities fit into your picture? Where do the resources we use to create *everything* come from?

Humans are having a profound impact on the Earth because the planet in its entirety is *one* environment. We have come to learn just how much every natural system on the planet is connected to, influences, and is influenced by everything else – but it has taken nearly a century of scientific research and a shift in the way that we think about our planet.

The following is a list of books from authors who in some way or another have assisted in shifting our collective perspective on the natural world around us. Whether they helped give rise to the very idea of environmentalism, brought the environment into the political world, shifted our perspective on the permanence of ecosystems, forced us to think about trees as much more like humans, or provided a call to action, the following books in one way or another challenge the reader to shift their perspective.

Your Task: Choose one book from the list below to read. A brief description of each book is included at the end of this document (Appendix I) to assist you in making your choice. The books vary in discipline, year of publication, and/or genre reflecting the nature of environmental science as an interdisciplinary research field which draws from our collective understanding of our planet both as one system and a collection of many interdependent systems. If you would like to read a book related to environmental science not included on this list, you may do so only with instructor approval.

Once you have read the book, in a 1–2-page reflection essay, (1) summarize the main point(s) of the book, (2) explain how the book relates to at minimum one of the four Big Ideas, and (3) describe "how the author challenges the reader to shift their own perspective about the natural world."

Summer Reading Options:

Silent Spring, Rachel Carson (1962)
Earth in the Balance: Ecology and the Human Spirit, Al Gore (1992)
The Song of the Dodo, David Quamman (1996)
The Omnivore's Dilemma, Michael Pollan (2006)
The Great Warming: Climate Change and the Rise and Fall of Civilizations, Brian Fagan (2008)
The Sixth Extinction: An Unnatural History, Elizabeth Kolbert (2014)
The Hidden Life of Trees, Peter Wohlleben (2015)
The Nature of Nature: Why We Need the Wild, Enric Sala (2020)
How to Change Everything, Naomi Klein (2021)
How to Save the World for Just a Trillion Dollars, Rowan Hooper (2022)

Part II. FRQ Expectations and Experimental Design

Part of preparing for the AP® Environmental Science Exam in May 2025 is learning how to take the test and what to expect. There will be three long format Free Response Questions (FRQs) which you will have only 70 minutes to complete. (That is just over 22 minutes per question) These FRQs will make up 40% of your exam score by weight. Understanding how to read and answer these questions will help you to maximize both your time and exam score. Review the Guide to FRQ Task Verbs (Appendix II) for tips on how you will be expected to answer certain questions.

One of the three questions **always** requires mathematical calculations, and one will **always** ask about experimental design. We will cover all the math necessary to succeed on the AP® exam in class, but to most efficiently utilize in-class time you will be responsible for reviewing the parts/procedures of experimental design on your own. This will also help to prepare you for any in-class lab experiments. You can expect to be quizzed on experimental design sometime during the first week of class.

Your Task: **Record your answers to the following questions. Be sure to answer all parts of the questions as instructed to earn all possible points for this part of the assignment.**

1. Using appropriate and reliable sources define the following terms in your own words:
   a. Independent Variable
   b. Dependent Variable
   c. Control Variable
   d. Confounding Variable
   e. Experimental Hypothesis
   f. Null Hypothesis

2. On the following page is an excerpt from an actual FRQ that appeared on the 2012 AP® Environmental Science Exam. Answer all parts of (a) and (b).

   Note: Parts (c) and (d) are included for your reference as an introduction to the kind of questions you will be expected to be able to answer by the end of the year. You do not have to provide answers to parts (c) and (d) at this time.

2012 AP® ENVIRONMENTAL SCIENCE FREE-RESPONSE QUESTION

The active ingredients in many pesticides are chemical compounds that kill organisms such as insects, molds, and weeds. Proponents claim that the use of pesticides improves crop yields and thus protects land and soil by reducing the conversion of forests and wetlands to cropland. Opponents of pesticide use claim that pesticides degrade water and soil quality and that other modern agricultural techniques and practices are responsible for the improved crop yields in recent years.

(a) Design a laboratory experiment to determine whether or not a new pesticide (product X) is toxic to minnows, a type of small fish. For the experiment you design, be sure to do all of the following.

  (i) State the hypothesis.

  (ii) Describe the method you would use to test your hypothesis.

  (iii) Identify the control.

  (iv) Identify the dependent variable.

(b) Describe experimental results that would lead you to reject your hypothesis in part (a)(i). (Be specific.)

(c) One strategy for dealing with agricultural pests is integrated pest management (IPM).

  (i) Describe IPM. As part of your description, include TWO specific pest-control approaches that are part of IPM.

  (ii) Identify one environmental benefit of using IPM.

(d) Describe TWO agricultural practices, other than those involving pest control, that increase crop yields.

GO ON TO THE NEXT PAGE.

Part III. Note-Taking Practice

Because we have so much to cover, in class time will move quickly – although how quickly will ultimately be up to you. To stay on pace, you will be expected to follow a reading schedule which will be provided to you along with the course syllabus on the first day of class. This mirrors how most college classes are structured.

You will typically be expected to read up to 3 modules in the textbook between class meetings. At the start of each class I will check your notes on the assigned readings for that day. These reading note checks will serve as the entirety of your homework grades for the course *and* will ensure that you have at least a basic understanding of the material we will cover that day so that in-class time can be spent decoding the more complex concepts and in more hands-on applications of the material.

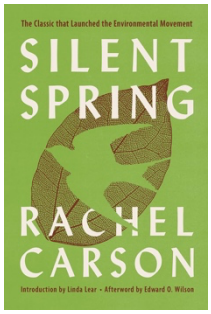
Note: Your reading notes are the exception to "online OnCampus submissions." ALL READING NOTES MUST BE HANDWRITTEN. NO EXCEPTIONS. I will allow notes to be done on a tablet, given that you use a stylus to handwrite the notes. Typed notes of any kind will not be accepted and you will be asked to resubmit handwritten notes for partial credit. Get yourself a notebook for APES (or whatever note-taking format works for you), start jotting down what you learn by hand, and thank me later when you get that 5.

Your Task: Read Modules 0-3 (pages 3-50) in your textbook – *Environmental Science for the AP® Course* (Friedland, Relyea), 4th edition. In your APES notebook record notes on the modules as you read. I will check reading notes for Modules 0-3 on the first day of class.

If you are interested in resources about effective note-taking and/or study strategies, see below:

How to Study to Make it Stick: video
Reading Strategies for a College Textbook: video
Effective Reading and Note-taking: link
Reading for Understanding: The SQW3R Method: link
Techniques and Tips for Listening and Note Taking: link

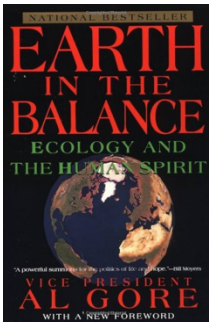
Appendix I. Summer Reading: Book Overviews



Silent Spring, Rachel Carson (1962)

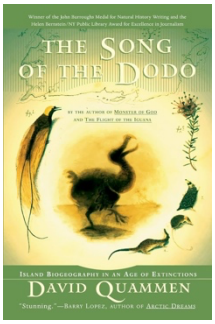
Often referred to as the mother of environmentalism, Rachel Carson, a marine biologist and PA-native, exposed the hazards of the pesticide DDT, questioned humanity's faith in technological progress, and helped set the stage for the environmental movement. In the book's most infamous chapter, *Silent Spring* depicts a nameless American town where all life has been silenced by the harmful effects of pesticide pollution.

***There are also anniversary editions of this book available, any would be acceptable.*



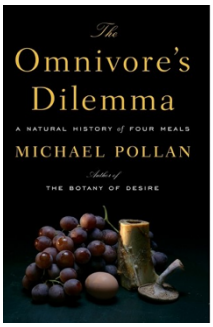
Earth in the Balance: Ecology and the Human Spirit, Al Gore (1992)

In his book, former US Vice President, Al Gore explains that only a radical rethinking of our relationship with nature will save the planet. His book was critical to placing "the environment" on the national agenda and was the first book written by a sitting US Senator to make the *New York Times* bestseller list since John F. Kennedy in 1956. The book focuses on how everyday choices can threaten the climate, water, soil, and plant and animal life. Gore describes how human actions and decisions can endanger or safeguard the ecosystem that sustains us.



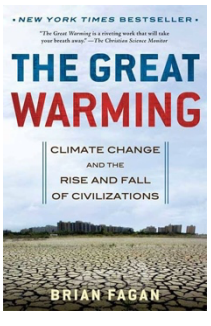
The Song of the Dodo, David Quamman (1996)

In Quamman's landmark book, we learn how the isolation of islands makes them natural laboratories of evolutionary extravagance, as seen in the dragons of Komodo, the elephant birds of Madagascar, and the giant tortoises of the Galapagos. But the dark message of island studies is that isolated ecosystems, whether natural or human-made, are also hotbeds of extinction. And as the world's landscapes, from Tasmania to the Amazon to Yellowstone, are carved into pieces by human activity, the implications of this knowledge are more urgent than ever.



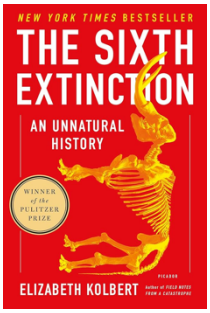
The Omnivore's Dilemma, Michael Pollan (2006)

In Michael Pollan's award-winning book, he asks the question, "What should we have for dinner?", and demonstrates that the answer is far more complex than you think. Pollan's revolutionary examination has changed the way Americans think about food. Bringing wide attention to the little-known but vitally important dimensions of food and agriculture in America, Pollan launched a national conversation about what we eat and the profound consequences that even the simplest everyday food choices have on both ourselves and the natural world.



The Great Warming: Climate Change and the Rise and Fall of Civilizations, Brian Fagan (2008)

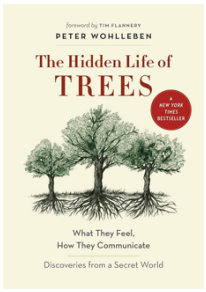
Climate change has affected human society before, and it will certainly do so again. In his *New York Times* bestseller, Fagan shows us how we have already seen climate transform – and sometimes destroy – human societies during the earth's last global warming phase. The lessons of history suggest we may still be underestimating the power of climate change to disrupt our lives today.



The Sixth Extinction: An Unnatural History, Elizabeth Kolbert (2014)

There have been five major extinction events in Earth's 4.6-billion-year history. Each making way for the rise of the next dominant species. In *The Sixth Extinction*, *New Yorker* writer Elizabeth Kolbert discusses the ways that humans are rapidly changing the shape of the Earth and the composition of the atmosphere, unleashing a mass extinction of most living things, quite possibly including ourselves.

***There are more recent editions of this book available, any would be acceptable.*



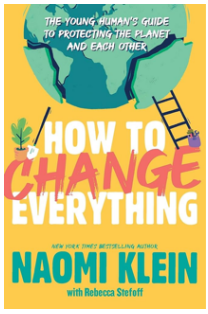
The Hidden Life of Trees, Peter Wohlleben (2015)

A *New York Times*, *Washington Post*, and *Wall Street Journal* bestseller!! In one of the most beloved books of our time, Wohlleben provides an illuminating account of the forest, and shows us the science behind how trees communicate, feel, and live in social networks. Trees are a lot more like us than you might think.

***You may choose to read the illustrated edition if you prefer.*

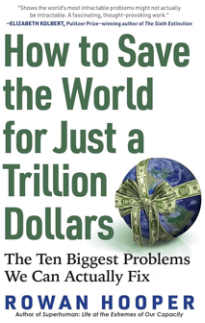
The Nature of Nature: Why We Need the Wild, Enric Sala (2020)

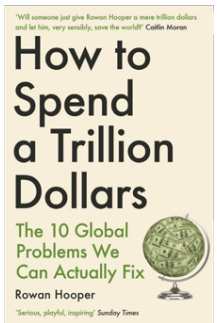
Enric Sala is a world-renowned oceanographer who wants to change the world--and in his memoir, he shows us how. Most of the arguments you hear against more sustainable or environmentally friendly shifts in human industry have to do with the cost of those changes. Sala, director of National Geographic's Pristine Seas project, suggests that once we appreciate how nature works, we will understand why its preservation is both economically practical and essential to our survival.



How to Change Everything: The Young Human's Guide to Protecting the Planet and Each Other, Naomi Klein (2021)

In her empowering and engaging book, along with Rebecca Steffof, Naomi Klein synthesizes over twenty years of reporting and research on climate change and the movements that are trying to combat it. Providing the reader with an accessible guide to understanding and battling what will no doubt be the great challenge of our time.





How to Save the World for Just a Trillion Dollars: The 10 Biggest Problems We Can Actually Fix, Rowan Hooper (2022)

If we can come up with a trillion dollars to bail out banks, imagine what else we could do. In this thought experiment turned publication, Hooper explores the global problems we can fix from ending global poverty, to reversing climate change, refreezing the Arctic, and saving all endangered species, to name just a few. The biggest surprise is how many of these advances are actually within our grasp—if we only dare to pay for them.

Appendix II. A Student Guide to FRQ Task Verbs

Task Verb	Student-Friendly Definition
Calculate	Set up and complete a math problem. Include units and show step-by-step work.
Describe	To give a picture or offer characteristics of something in words. Usually 2-3 sentences.
Explain	Provide cause and effect relationships or a step-by-step explanation. Connect the dots and circle back to the prompt. Usually 3-5 sentences.
Identify	Name, list, and/or give an example. A simple response, usually 1 sentence maximum and with no elaboration.
Justify	Use evidence and explain how the evidence supports the claim. 3 - 5 sentences. Evidence usually includes numbers.
Make a Claim	Pose a 1 - 2 sentence statement that is open to challenge yet based upon scientific knowledge or provided information.
Propose a Solution	Explain how you could solve a problem and use evidence to support your proposal.

Free-Response Question Tips:

1. Circle the task verb.
2. Underline specific scientific vocabulary.
3. Carefully differentiate between the 3 E's (Ecological, Economic, and Environmental) and Human Health when answering a question.

Ecological	The effect that something has on living organisms and their nonliving environment. Ecology tends to focus on very specific populations of living things.
Economic	Related to finances, money, income, costs, subsidies, taxes, or jobs.
Environmental	A broad term that includes many areas of the earth and life sciences. Includes ecology but is more overarching than ecology.
Human Health	Related to human physical, mental, or social well-being, disease or injury.