AP® Environmental Science
Common Summer Assignment
Pinellas County Schools

This assignment was developed by the collective team of AP Environmental Science teachers in order to begin to expand upon your background knowledge for the course content. There are eight options for the assignment. Please contact your teacher to determine how many and which option(s) he/she wishes to have you complete or if you are able to select the option(s) yourself.

Should you have questions or if you would like support with this assignment, please refer to your PCS student email account for information about the AP Summer Assignment Support Sessions (AP SASS) that will be held July 31-August 1 at various locations. You can access your student email account by going to www.office.com and using your PCS username and password to login.

Option 1: Environmental Legislation

For the following list of twelve laws, state the main objective of each law. Cite your sources properly (MLA or APA) on the reference page.

1. Clean Air Act (CAA) of 1970, 1990
2. Clean Water Act (CWA) of 1972
3. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), 1980
4. Endangered Species Act (ESA) of 1973
5. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), 1947
6. Hazardous and Solid Waste Amendments (HSWA) of 1984
7. Occupational Safety and Health Act of 1970 (OSH Act)
8. Resource Conservation and Recovery Act (RCRA) of 1976
9. Safe Drinking Water Act (SDWA) of 1974
10. Solid Waste Disposal Act (SWDA) of 1965
11. Toxic Substances Control Act (TSCA) of 1976
12. Wilderness Act of 1964

<u>Option 2:</u> Environmental Articles (adapted from St. John's College H.S.)

Find three current articles (from May-August of this year) that provide one example each of negative human impact on the environment. Each article must be about a different impact. You may use an online newspaper or journal, as well as ".gov, .edu, or .org" sites. Check the web links on kwanga.net for helpful information. You are encouraged to use articles from local sources.

- One of the articles must focus on Florida.
- One of the articles should focus on alternative energy: geothermal, solar, hydroelectric, wind, nuclear, etc.
- For each article, include the first page of each article printed from the internet, photocopied from a journal, or cut from a newspaper or magazine and answer the following questions. Please number your answers.
    1. Summarize the article in your own words.
    2. What is the problem? When did it begin?
    3. Who are the responsible parties, if they are known?
    4. How severe is the environmental impact?
    5. What are your thoughts on the issue?
- Cite your sources properly (MLA or APA) on a reference page at the end of the section.
- Remember, maintain your integrity and write your original thoughts.

<u>Option 3:</u> Chemistry review

There is a sizeable amount of chemistry in APES. Juniors and seniors should know common polyatomic ions and acids on the list below from their chemistry classes. Sophomores may look these up online; email your teacher if you need clarification. Write the following chemical formulas. For ions, be sure to include the charges.

1. Nitric acid
2. Sulfuric acid
3. Hydrochloric acid
4. Carbonic acid
5. Carbon dioxide
6. Ozone
7. Glucose
8. Oxygen (atmospheric gas)
9. Nitrogen (atmospheric gas)
10. Hydrogen (atmospheric gas)
11. Hydrogen sulfide (dihydrogen monosulfide)
12. Methane
13. Carbon monoxide
14. Nitrogen dioxide
15. Sulfur trioxide
16. Nitric acid
17. Sulfuric acid
18. Hydrochloric acid
19. Carbonic acid
20. Carbon dioxide
21. Ozone
22. Glucose
23. Oxygen (atmospheric gas)
24. Nitrogen (atmospheric gas)
25. Hydrogen (atmospheric gas)
26. Hydrogen sulfide (dihydrogen monosulfide)
27. Methane
28. Carbon monoxide
29. Nitrogen dioxide
30. Sulfur trioxide
31. Sodium hypochlorite
32. Nitric oxide (nitrogen monoxide)
33. Nitrous oxide (dinitrogen monoxide)
34. Calcium carbonate
35. Ammonia
36. Ammonium ion
37. Carbonate ion
38. Chloride ion
39. Calcium ion
40. Hydrogen ion
41. Bicarbonate ion
42. Nitrate ion
43. Nitrite ion
44. Nitride ion
45. Iron(II) ion (ferrous ion)
46. Iron(III) ion (ferric ion)
47. Phosphate ion
48. Sulfate ion
49. Hydroxide ion

<u>Option 4:</u> Math Problems – Show all work and units.

METRIC CONVERSIONS

1. 3.7 m = _____ mm
2. 3.7 m^2 = _____ mm^2
3. 500 GW = _____ W
4. 19 ng = _____ µg
5. 0.66 MW = _____kW
6. 444 mm^3 = _____ m^3

PERCENTAGES

1. Calculate the percentage growth rate for a country with a population of 7 million in a year in which it had 100,000 births, 70,000 deaths, 30,000 immigrants, and 40,000 emigrants.

2. If the concentration of mercury in a water supply changes from 55 ppm to 8 ppm in a ten year period, what is the percent change of mercury concentration? What is the percent change per year?

3. If 25% of a natural area is to be developed, leaving 500 acres untouched, how many acres will be developed?

4. A natural gas power plant operates at 60% efficiency. If one cubic meter of natural gas provides 1000 BTU of electricity, how many BTU of waste heat is produced?

DIMENSIONAL ANALYSIS / UNIT CONVERSIONS / FACTOR LABEL

Conversion factors:

1 mi^2 = 640 acre (ac)
1 ac = 0.405 hectares (ha)
1 barrel oil = 42 gallons (gal)
1 L = 0.264 gal
1 kilowatt-hour (kWh) = 3.4 x 10^4 British Thermal Units (BTU) = 8.6 x 10^5 calories (cal)

5. A 200-square mile area of a forest occupies how many acres, in both standard and scientific notation?

6. A 200-square mile area of a forest occupies how many hectares, in both standard and scientific notation?

7. How many kWh does a city consume monthly, if it uses 70 billion BTUs of energy each month?

8. One barrel of crude oil produces six million BTU of energy. How many BTU will one liter of crude oil provide, in both standard and scientific notation? How many calories of energy will one gallon of crude oil provide, in both standard and scientific notation?

Option 5: Timeline

Create a timeline with the following important events, people, and laws in environmental science. You will need to attach several papers/poster board, etc. Together to create a timeline. For each item with an asterisk, you will also need to describe each event, person, or law in one or two sentences. Use your textbook and searches on the web to get the descriptions of each item.

Must be hand-made. No typing allowed. It is too easy to copy and paste the description of each item and I want you to learn the information. Do your OWN work. You may work with other students to look up the information, but I want the descriptions in your own words.

Study your timeline as you make it. The items on your timeline are important and you need to know them for the AP Exam.

Include 6-8 pictures on your timeline. These could be pictures of people or events or a place. You can draw them or print them on the computer and paste on.

- 10,000 years ago: Agricultural revolution
- 275 years ago: Industrial revolution
- *1838: John Muir (data born) - why was he important?
- *1854: Walden by Henry David Thoreau
- *1862: Homestead Act
- 1872: Yellowstone National Park founded
- *1875: American Forestry Association founded
- 1890: Yosemite plus Sequoia National Park founded
- *1891: General Revision Act
- *1892: Sierra Club founded
- *1900: Lacey Act
- 1901-09: Golden Age of Conservation (Theodore Roosevelt)
- 1903: First national wildlife refuge established
- *1905: Gifford Pinchot
- *1905: Aldo Leopold
- *1905: Audobon Society founded
- *1906: Antiquities Act
- 1907: Congress became upset because Roosevelt was protecting so much forest land, so they banned further withdrawals
- 1912: U.S. National Park service founded
- 1930s: Dust Bowl
- *1933: Civilian Conservation Corps founded
- *1933: Soil Conservation Service founded
- *1934: Taylor Grazing Act
- *1934: Migratory Bird Hunting Stamp Act
- *1940: Fish plus Wildlife Services founded

- 1947: FIFRA (Federal Insecticide, Fungicide, and Rodenticide Control Act)
- *1962: *Silent Spring* published by Rachel Carson
- *1963: Wilderness Act
- *1968: Wild and Scenic Rivers Act
- *1969: Cuyahoga River in Clevland, Ohio, caught fire
- *1969: NEPA (National Environmental Policy Act)
- 1970: First Earth Day
- 1970: Environmental Protection Agency established Clean Air Act
- 1973: Endagered Species Act
- *1973: OPEC oil embargo
- 1974: Roland and Molina (UCI) announce that CFCs are depleting the ozone layer
- *1976: RCRA (Resource Conservation and Recovery Act)
- *1977: Clean Water Act
- *1977: Surface Mining Control and Reclamation Act
- *1978: Love Canal, NY (toxic waste leaks into residential houses)
- *1979: 3 Mile Island Nuclear accident
- *1980: Alaskan Lands Act
- 1980: CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act AKA Super-Fund)
- *1984: Bhopal, India (chemical toxic cloud kills 2,000)
- *1986: Chernobyl
- *1987: Montreal Protocol
- *1989: Exxon Valdez
- *1992: Energy Policy Act of 1992
- *1994: Desert Protection Act
- 1999: World population hits 6 billion
- *1997-2005: Kyoto Protocol
- *2010: BP Oil Spill
- *2015: COP21

APES Timeline Rubric

All events are included with **descriptions** for items containing an asterisk	_____ out of **54** points
Timeline contains at least **6** pictures.	_____ out of **30** points
Timeline is hand-made and all items are **hand written** and in your own words.	_____ out of **8** points
Neatness and creativity	_____ out of **8** points
TOTAL	_____ out of 100

Option 6: Major APES Topics.

The following topics are major topics and there will be several questions on the AP exam from these topics. We will cover these in class, but the better you know these the better you will do in class, and on the AP exam. Please describe each of the topics, making sure that you cover all the aspects listed. (4pts per topic)

Eutrophication

- What it is?
- What causes it (including the chemical / compounds involved)? What are the environmental effects?

Acid Rain

- What it is?
- What causes it (including the chemical / compounds involved)? What are the environmental effects?

Soil Layers

- Describe the different layers of soil, including their composition. (5 minimum) Draw or include a diagram of these soil layers.

Greenhouse Effect

- What it is?
- What causes it (including the chemical / compounds involved)? What are the environmental effects?

Nitrogen Cycle

- Describe the nutrient cycle, including the chemicals / compounds involved.
- Explain why the cycle is important, and one human caused action that can mess up the cycle. Draw or include a diagram of the cycle.

Phosphorous Cycle

- Describe the nutrient cycle, including the chemicals / compounds involved.
- Explain why the cycle is important, and one human caused action that can mess up the cycle. Draw or include a diagram of the cycle.

Mining

- Describe any TWO types of mines.
- Explain the environmental consequences of those types of mines.
- Explain “reclamation” and describe how each of the mines you chose could be reclaimed.

Option 7: **Friedland Ch 1,2,20 reading guide by module** ☐

Pages: 1-6	**MODULE 1 GUIDE** **"Environmental Science"**	**Due**:

Key Term ID's (flashcards):

Fracking	*Environment*	*Environmental Science*	*Ecosystem*
Biotic	*Abiotic*	*Environmentalist*	*Environmental studies*

1. *Opening Story* - What is fracking used for, and how does the process work?

2. *Opening Story* - What are the advantages and disadvantages to fracking?

3. *Opening Story* - What does the debate about fracking demonstrate about the types of problems Env Sci addresses?

4. What is the importance of studying *systems* in ES, rather than isolated events or individual actors?

5. Why does the blending of many different disciplines present both challenges and opportunities to environmental scientists? (figure 1.1)

6. The Earth is a single interconnected system, but it can be subdivided into many smaller systems. How does the nature of the problem to be studied determine the scale of the system chosen? (figure 1.2)

7. How have tool use and social cooperation enabled humans to alter their environment more than other species?

8. How did early *homo sapiens* impact their environment when they entered a new area? What does this show?

9. List at least 5 major ways humans have altered our environment in the last 10,000 years.

10. So far in history, technological development has led to both increased human well-being and increased environmental disruption. Why has this been the case?

Review Q's (pg 6)	**Module Summary** (your own words - What's important? Connections? Meaning?)
1. 2. 3. 4.	

***Pages**: 7-18; 26*	**MODULE 2 GUIDE** **"Environmental Indicators and Sustainability"**	**Due:**

Key Term ID's (flashcards):

Ecosystem services	*Environmental indicator*	*Biodiversity*	*Genetic diversity*
Species diversity	*Background extinction rate*	*Greenhouse gases*	*Anthropogenic*
Development	*Sustainability*	*Sustainable Development*	*Ecological footprint*

1. Could humanity survive without Earth's ecosystem services? Explain.

2. Why are high levels of genetic diversity (in a population) and species diversity (in an ecosystem) considered important environmental indicators? How are they beneficial?

3. There are at least 2 million species on Earth, and species have been naturally evolving and going extinct for billions of years. Why should we care if human activity is driving other species extinct as we grow?

4. What factors have contributed to total world grain production increasing, but per-person production stagnating?

5. Why is the level of greenhouse gases in our atmosphere a critical environmental indicator, & how are we impacting it?

6. What is the difference between renewable and non-renewable (finite) resources? Which are more sustainable?

7. What is the relationship between a country's economic development and resource consumption?

8. What happened on Easter Island, and why is it significant to our study of sustainability and environmental science?

9. Why is the ecological footprint the tool of choice for most measures of lifestyle impact on the environment?

10. Humanity's ecological footprint is already beyond what Earth can sustain, yet approximately 1/3 of the world population lives on less than $2 per day. How can we provide resources for everyone while reducing our footprint?

Review Q's (pg 18)	**Module Summary** (your own words - What's important? Connections? Meaning?)
1. 2. 3. 4. 5.	

***Pages**: 18-25*	**MODULE 3 GUIDE** **"The Scientific Method"**	**Due**:

Key Term ID's (flashcards):

Scientific method	*Hypothesis*	*Null Hypothesis*	*Replication*
Sample Size (n)	*Accuracy*	*Precision*	*Uncertainty*
Theory	*Control group*	*Natural experiment*	*Environmental justice*

1. Why is the scientific method necessary in order to advance human understanding of the world?

2. What role do hypotheses play in scientific inquiry, and why are null hypothesis used sometimes?

3. Why is dissemination of findings & peer review of research so important in science?

4. What is required for an idea to be considered a theory, in a scientific sense? Consider "the theory of evolution".

5. What is the purpose of a control group in an experiment?

6. Why are both natural AND controlled experiments necessary to increasing scientific understanding?

7. How do the roles of natural experiments and controlled experiments differ in the scientific process?

8. If you had to summarize the scientific worldview in a single sentence, what would it be?

9. What factors make research in environmental science particularly difficult?

10. What are the goals of the environmental justice movement, and why are they relevant to achieving sustainability?

Review Q's (pg25)	**Module Summary** (your own words - What's important? Connections? Meaning?)
1. 2. 3. 4. 5.	

Pages: *33 - 43 ; 64 - 65*	**MODULE 4 GUIDE** **"Systems and Matter"**	**Due:**

Key Term ID's (flashcards):

Matter	*Mass*	*Atom*	*Element*
Periodic table	*Molecule*	*Compound*	*Isotopes*
Radioactive decay	*Half-life*	*Covalent & ionic bonds*	*Acid*
Base	*pH*	*Law of matter conservation*	*Bio terms on pg. 41*

1. *Opening Story* - What does the story of Mono Lake illustrate about human interactions with complex natural systems?

2. What is the difference between an atom, a molecule, a compound, and an isotope?

3. What occurs during radioactive decay? Include reference to how the half-life is determined.

4. Scientists nearly always start their search for alien life by looking for planets with water. Why is it so essential to life?

5. Water has a high 'specific heat capacity', and requires a lot of energy to change its temperature. Use this property to explain why coastal areas by water tend to have more mild temperature swings than inland regions.

6. How can it be determined whether a substance is an acid or a base? What would need to be measured?

7. Suppose 'Solution A' has a pH of 3, 'Solution B' has a pH of 7, and 'Solution C' has a pH of 10. If Solution B contains 10,000,000 H+ ions in a given volume, how many ions will each of Solution A and Solution C have in equal volumes?

8. As a tree grows, its' mass increases. Why is this not a violation of the law of conservation of matter?

9. If matter is conserved & there is no "somewhere else" to dispose of waste, why isn't Earth filled with waste matter?

10. Why are cells considered the basic unit of life? What essential features or behaviors does "life" have?

Review Q's (pg 42-43)	**Module Summary** (your own words - What's important? Connections? Meaning?)
1. 6. 2. 3. 4. 5.	

Pages: *43 - 54 ; 55-56*	**MODULE 5 GUIDE** **"Energy, Flows, and Feedbacks"**	**Due:**

Key Term ID's (flashcards):

Energy	*Power*	*Electromagnetic radiation*	*Photon*
Potential energy	*Chemical energy*	*Kinetic energy*	*Temperature*
1st law of thermodynamics	*2nd law of thermodynamics*	*Energy efficiency*	*Energy quality*
Open vs closed system	*Inputs & outputs in a system*	*Negative feedback loop*	*Positive feedback loop*

1. How does the sun transmit energy from millions of miles away into the Earth system?

2. 'Energy' and 'power' are often confused, but aren't the same. Why do we say 'power plants' instead of 'energy plants'?

3. Exothermic reactions give off heat when they occur. Explain what happens in terms of potential and kinetic energy of the molecules. Do they violate the 1st law of thermodynamics?

4. Use the 2nd law of thermodynamics to explain why lights, engines, muscles, electronics, etc get warm while operating.

5. The 2nd law of thermodynamics says all systems become increasingly random over time, yet life has evolved and become very complex. How has life been able to persist so well?

6. How can the efficiency of an energy transformation be calculated?

7. Use thermodynamics and the concept of energy quality to explain why we can only burn a gallon of oil as fuel once.

8. What can inputs, outputs, steady states, and feedback loops tell us about the health of environmental systems?

9. Are positive feedbacks always good? Are negative feedbacks always bad? What's the difference between them?

10. *WTS* - What are the key goals and action steps of Florida's Everglades restoration plans, in terms of inputs and outputs?

Review Q's (pg 54)	**Module Summary** (your own words - What's important? Connections? Meaning?)
1. 2. 3. 4. 5.	

***Pages**: 701-710; 721-722*	**MODULE 65 GUIDE** **"Sustainability and Economics"**	**Due**:

Key Term ID's (flashcards):

Well-being	*Economics*	*Externality*	*GDP*
Genuine Progress Indicator	*Technology transfer*	*Leapfrogging*	*Natural capital*
Human capital	*Market failure*	*Ecological Economics*	*Valuation*

1. *Opening Story* - Why would environmental scientists be interested in the social and political impacts of maquiladoras, as well as environmental ones?

2. *Opening Story* - What does the expansion of maquiladoras illustrate about the interaction between economic, political, and environmental forces when considering problems in environmental science?

3. In a market economy, how do supply and demand distribute scarce resources to best satisfy infinite wants?

4. How would the price of goods and services change if the costs of externalities were included in their prices?

5. Is GDP alone an adequate measurement of a population's well-being? What other factors must be considered?

6. According to the Kuznets Curve, how does the environmental impact of a country change as it develops?

7. Why is the process of valuation important in measuring and monitoring natural capital and ecosystem services?

8. What characteristics must a sustainable economic system have, and how does ours compare? (*figures 65.6 & 65.7*)

9. Free markets have enabled incredible economic growth for much of the world over the past few centuries. However, there are many critiques saying that they do not actually produce the best outcomes for everyone. Explain these critiques and evaluate the extent to which you agree with them.

Review Q's (pg 710)	**Module Summary** (your own words - What's important? Connections? Meaning?)
1. 2. 3. 4. 5.	

Pages: *711-720; 730-733*	**MODULE 66 GUIDE** **"Regulations and Equity"**	**Due:**

Key Term ID's (flashcards):

Environmental worldview	*Anthropocentric worldview*	*Stewardship*	*Ecocentric worldview*
Precautionary principle	*United Nations*	*World Bank*	*WHO*
NGO	*EPA*	*Command&control regulation*	*Incentive-based regulation*
Triple bottom line	*UN Millennium Dev Goals*	*Greenbelt movement*	*Environmental equity*

1. How do the 3 worldviews and precautionary principle influence our evaluation & response to environmental issues?

2. What role do the wide range of world agencies, NGOs, and US agencies play in helping countries develop sustainably?

3. What types of factors are most important to examine if we want to measure human status in a country? (ie HDI & HPI)

4. Why are BOTH command-and-control and incentive-based types of regulation necessary to encourage sustainability?

5. Propose an idea for a new green tax that would reduce an environmentally harmful activity by increasing its price.

6. When examining a situation through the triple bottom line, how will our conclusions differ from traditional analysis?

7. Suppose you wanted to investigate the sustainability of agriculture in California using the triple bottom line. What types of questions would you ask in each domain? What data could you collect to answer those questions?

8. Why are issues of global poverty, inequality, and environmental justice important to our quest for sustainability?

9. What do you think are the main keys to sustainably developing a poor nation looking to meet the triple bottom line?

10. *Science Applied* - What is your assessment of the potential for cap-and-trade as a mechanism to control CO_2 emissions?

Review Q's (pg 720-721	**Module Summary** (your own words - What's important? Connections? Meaning?)
1. 2. 3. 4. 5.	

Option 8: Study Book

Obtain the following study book: *5 Steps to a 5: AP Environmental Science*. The book is updated annually. Get as recent a guide as you can. You may ask to borrow one from your teacher or order one online.

- BRING YOUR STUDY GUIDE (OR SEND YOUR TEACHER AN ONLINE ORDER RECEIPT) ON THE FIRST DAY OF SCHOOL.
- Read the introductory sections and take one of the practice exams.
- If you wish, you may also purchase a set of the "Barron's A.P. Environmental Science flash cards."