

AP Environmental Science Summer Assignment 2026/2027

Welcome future APES students!

This is an advanced science course that combines the disciplines of biology, chemistry, geology and physics to investigate global environmental issues. We will discover how the Earth's systems function together and how humans have affected our planet. We will also examine our personal consumption habits and learn ways to be responsible global citizens in the face of serious environmental issues.

Because this is a college level course, you will be responsible for learning a large amount of material on your own. I will help you as we go, but it will be your responsibility to take notes, study and learn your vocabulary! We also work on the assumption that you have a general science background that includes earth science, biology, chemistry and algebra. The purpose of this project is to help you prepare for the APES content by getting organized, reviewing some background information, and getting familiar with some of the basic concepts of environmental science and your own consumption habits.

General Guidelines:

- **Read the directions for each section carefully!**
- Each section should be clearly labeled.
- Each section of the project must be fully completed, neat and typed when specified.
- Each piece of the project should be bound together in some way.
- All research/information needs to be **appropriately cited using APA format**. A quick Google search will help you with formatting.
- All work is to be completed on your own. You may not work with other students to complete this assignment.
- The checklist, provided at the end of this packet, should be completed and attached to the front of your work.
 - PLEASE PRINT OUT ANY WORK YOU COMPLETED DIGITALLY -- A digital copy of this packet is on Google Classroom for your reference. Please make a copy and print out anything digital.

Section 1: Electronic Setup

In this course, we will be using technology extensively to help you learn basic content and communicate as scientists in the 21st century. Complete each of the following tasks to ensure that you are ready to begin on the first day of class!

1. Join the Google Classroom –
 - If that does not work, use this link:
2. Join College board AP classroom:
 - THIS WILL BE PROVIDED IN SEPTEMBER
3. Email me at hvarner@jefftwp.org introducing yourself. Please include the following information at least:
 - Your name
 - Any special hobbies or interests you have
 - Why you have chosen to take APES
 - Any concerns you have for next year
4. Read through the APES Course and Exam Description– this will also be posted on Google Classroom
5. Complete the checklist to turn in (found at the end of this packet).

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Section 2: Chemistry Review

Chemistry is a big part of environmental science. It is highly recommended that you take chemistry before registering for this course. In order to review some of the basic chemistry concepts you will need to complete the following on a clean sheet of paper. This may be typed or handwritten.

1. For each of the following, write out the chemical name that goes with the symbol:

CO ₂	CO	C ₆ H ₁₂ O ₆	CH ₄	H ₂
N ₂	NO ₂	NO ₃	NH ₃	NH ₄
O ₂	O ₃	P	PO ₄ ³⁻	S
SO ₂	SO ₃	H ₂ SO ₄	NaCl	Pb
U	Rn	Hg	Cl	H ₂ O

2. Write at least a paragraph that explains the following:
 - a. What is the pH scale? What does it measure?
 - b. How do the numbers on the pH scale compare? Example – is a pH of 4 twice as strong as a pH of 2? Hint- the pH scale is not linear!
 - c. What are the average pH ratings of the following common substances in the environment?
 - i. Blood
 - ii. Rain
 - iii. Freshwater (lake or river)
 - iv. Ocean water

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Section 3: Math Review

The APES exam has a significant amount of math and the **2020 exam was the first year that allows the use of calculators!** Therefore, the math required this year may be more challenging than in years past. Complete the math problems on the following page to prepare yourself for the type of math questions that appear on the exam. *****In this class, it will be assumed that you are able to solve math problems using the following skills*****

Percentage

$$17\% = 17/100 = 0.17$$

- Remember that “percent” literally means divided by 100.
- Percentage is a measure of the part of the whole, or part divided by whole.
- 15 million is what percentage of the US population? $15 \text{ million} / 300 \text{ million} = 0.05 = 5\%$
- What is 20% of this \$15 bill so that I can give you a good tip? $\$15 \times 0.20 = \$15 \times 20/100 = \$3$

Rates

- percent change = $(\text{final} - \text{initial}) / \text{initial}$
- All of the above are ways to look at rates. The second equation is the easiest way to calculate a rate, especially from looking at a graph. Rates will often be written using the word “per” followed by a unit of time, such as cases per year, grams per minute or mile per hour. The word per means to divide, so miles per gallon is actually the number of miles driven divided by one gallon.
- Rates are calculating how much an amount changes in a given amount of time.

Scientific Notation

$$\text{Thousand} = 10^3 = 1,000$$

$$\text{Million} = 10^6 = 1,000,000 \text{ (people in the US)}$$

$$\text{Billion} = 10^9 = 1,000,000,000 \text{ (people on Earth)}$$

$$\text{Trillion} = 10^{12} = 1,000,000,000,000 \text{ (national debt)}$$

- When using very large numbers, the scientific method is often easiest to manipulate. For example the US population is 300 million people of 300×10^6 or 3×10^8
- When adding or subtracting, exponents must be the same. Add the numbers in front of the ten and keep the exponent the same.
- When multiplying or dividing, multiply or divide the number in front of the ten and add the exponents if multiplying or subtract the exponents if dividing
 - Example $9 \times 10^6 / 3 \times 10^2 = (9/3) \times 10^{(6-2)} = 3 \times 10^4$

Dimensional Analysis

You should be able to convert any unit into any other unit accurately if given the conversion factor. Example: 24 miles/gallon = how many kilometers/ liter?

24 mi	1.6093 km	3.7854 gal	=	150 km
1 gal	1 mi	1 L		1 L

Online dimensional analysis tutorials are available:

- http://www.chemprofessor.com/dimension_text.htm
- <http://www.chem.tamu.edu/class/fyp/mathrev/mr-da.html>

Prefixes

m (milli)	= 1/1,000	= 10^{-3}	M (mega)	= 1,000,000	= 10^6
c (cent)	= 1/100	= 10^{-2}	G (giga)	= 1,000,000,000	= 10^9
k (kilo)	= 1000	= 10^3	T (tera)	= 1,000,000,000,000	= 10^{12}

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Helpful Review Videos for your Math Review

- [Metric System: Units of Distance](#)
- Decimals --
 - [Adding Decimals](#)
 - [Multiply Decimals](#)
 - [Dividing Decimals](#)
- [Averages](#)
- Percentages --
 - [Finding Percentages](#)
 - [Percentage of a Whole Number](#)
 - [Growing by a Percentage](#)
- [Scientific Notation](#) --
 - [Subtracting in Scientific Notation](#)
 - [Multiplying and Dividing in Scientific Notation](#)
- [Dimensional Analysis](#)

Complete each of the following problems including a detailed set up with labeled units and proper scientific notation. You must show all the work to get credit.

All problems should be expressed in scientific notation (do not write out large numbers with multiple zeros as place holders) -- see the information above for more information.

1. A population of deer had 200 individuals. If the population dropped 15% in one year, how many deer were lost? What is the total population of deer for the next year?
2. One year we had 2500 endangered sea turtles hatch. After one year there were only 1500. What percentage of turtles died?
3. Electricity costs 6 cents per kilowatt hour. In one month one home uses one megawatt of electricity. How much will the electric bill be? (be sure to look at the conversion chart for the conversion factor from kilo to mega)
4. Your car gets 12 miles to the gallon and your friend's car gets 20 miles to the gallon. You decide to go on a road trip to Virginia Tech, which is 300 miles away. If gas costs \$4 per gallon and you decide to split the gas money, how much money will you save by driving your friend's car?
5. A turtle was crawling at the rate of 43 cm per minute. How many kilometers would this turtle crawl in one day (24 hours) if it did not rest and continued to crawl at a continuous pace?
6. There are 125 blades of grass in a square cm of lawn. Assuming the grass stand is even, how many blades of grass would be found in a lawn measuring 8 meters by 6 meters? Use scientific notation in your answer.
7. If a calorie is equivalent to 4.184 joules, how many joules are contained in a 250 kilocalorie slice of pizza?
8. A coal-fired electric power plant produces 12 million kilowatt-hours (kWh) of electricity each day. Assume that an input of 10,000 BTUs of heat is required to produce an output of one kilowatt-hour of electricity. Calculate the number of BTUs of heat needed to generate the electricity produced by the power plant each day.
9. (Using the information in 8) Calculate the pounds of coal consumed by the power plant each day assuming that one pound of coal yields 5,000 BTUs of heat.
10. If a city of 10,000 experiences 200 births, 60 deaths, 10 immigrants and 30 emigrants in the course of a year, what is its net annual percentage growth rate? (By what percentage did the population change?)

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Section 4: Introduction to Environmental Science

You will read through **Chapter 1** in the text and complete the assignment below. The text is posted on Google Classroom as a PDF for your reference.

- “Testing Your Comprehension” Pg 19 #1-10
 - Please answer all questions in complete sentences!
- “Seeking Solutions” Pg 19 #3
 - Please answer this question in an essay format. A **MINIMUM of three paragraphs**.
 - Do **NOT** choose Global Climate Change as your environmental issue. I understand it is a very important environmental issue we are currently facing but it cannot be discussed to its entirety in three paragraphs. You may choose one aspect of climate to discuss in this reflection. (i.e. Sea level rise, loss of biodiversity, acidification of the oceans, etc.)
- “Calculating Ecological Footprints” Pg 20 #1-4
 - In order to answer questions 1-3 you must complete the chart above the questions. Please recopy or retype the chart that is shown.
 - Question 4 asks you to calculate your own personal ecological footprint. You can do this by going to the websites listed in the textbook. Please pay particular attention to this question as it will be used in multiple discussions throughout the course.

Section 5: Summer Reading [OPTIONAL but RECOMMENDED]

Rachel Carson’s *Silent Spring* was first published in three serialized excerpts in the *New Yorker* in June of 1962. The book appeared in September of that year and the outcry that followed its publication forced the banning of DDT and spurred revolutionary changes in the laws affecting our air, land, and water. Carson’s passionate concern for the future of our planet reverberated powerfully throughout the world, and her eloquent book was instrumental in launching the environmental movement and many of the environmental issues that Carson discusses remain relevant today, such as pollution, habitat destruction, and the use of chemicals in agriculture. It is without question one of the landmark books of the twentieth century.

A [PDF copy of her book](#) has been posted to Google Classroom, however you are welcome to borrow it from a local library, from Mrs. Vandigriff in D-4, or purchase it. Amazon has it listed for \$19 paperback or \$0.99 for Kindle. Audible also has the ebook as an option, if you have a subscription. **ISBN-13** : 978-0618249060

Read Chapters 1-8 in preparation for the first day of school. The first part of the book is about the Harm of DDT and why it should be stopped. Chapters 9 - 16 will focus on how this will be accomplished and what steps Rachel Carson took to achieve this goal. She was making a Call to Action!

After reading the book, answer the following questions:

1. What is the main argument of "Silent Spring"?
2. What is the significance of the title "Silent Spring"?
3. What are some of the key environmental issues Carson addresses in the book?
4. Describe the impact of pesticides, particularly DDT, on the environment as outlined in "Silent Spring".
5. How does Carson argue that pesticides like DDT affect ecosystems and human health?
6. What historical events or movements influenced Carson's writing of "Silent Spring"?
7. How did the publication of "Silent Spring" contribute to the environmental movement?
8. How does Carson propose we address the environmental issues she presents in "Silent Spring"?
9. How can individuals apply the lessons and insights from "Silent Spring" in their daily lives to promote environmental conservation?

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Checklist:

Please place this completed checklist at the **front** of your assignment before you turn it in.

Name _____

Section 1: Score _____/25

- I have read the course syllabus.
- I have emailed Mrs.Varner
- I have registered for College Board **and** joined Google Classroom.

Section 2: Score _____/25

- I have identified all of the chemical compounds and I am ready for a quiz.
- I have written at least one paragraph about pH and I am ready to explain it to someone else.
- I have cited all of the sources I used to find my information.

Section 3: Score _____/25

- I have read through the math review material and understand how to solve these types of problems.
- I have completed all of the review problems and am ready to take a math quiz.

Section 4: Score _____/25

- I have read through chapter 1 of the online text.
- I have completed the chapter 1 assignment all in complete sentences.
- I have written a short essay about an environmental issue I deem to be most important
- I have completed my own Ecological Footprint online.
- I have studied the material in Chapter 1 and am ready for a quiz.

Section 5: OPTIONAL but RECOMMENDED

- I have read chapters 1-8 in the book "Silent Spring" by Rachel Carson
- I have answered the questions provided.
- I am ready to discuss the first half of the book with the class and have further questions.

This Assignment is due the FIRST DAY of school when you enter the classroom. If you turn in the assignment late, you will lose 10% per day that it is late (as this is the policy for all late work in APES).