

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 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 assignment must be **fully handwritten** in a neat and organized format.
- 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. **Do not add in grades, only check what has been completed.**

Section 1: 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 complete the following on a clean sheet of paper. This must be handwritten (pen or pencil is acceptable.)

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?
- Blood
 - Rain
 - Freshwater (lake or river)
 - Ocean water

Section 2: Math Review

The APES exam has a significant amount of math and **does not allow the use of calculators!** Most students find that with a little practice, the math is not difficult, but as many of us have not had practice with setting up and solving problems without a calculator in a long time, in the beginning it can be daunting.

****In this class, it will be assumed that you are able to solve math problems using the following skills.****

Percentage

- $17\% = 17/100 = .17$
- Remember that “percent” literally means divided by 100.
- Percentage is a measure of the part of the whole. Or part divided by whole.
- What is 20% of this \$15 bill so that I can give a good tip? $\$15 \times .20 = \$15 \times 20/100 = \$3$

Rates

- Percent change = $(\text{final}-\text{initial})/\text{initial}$
- All of the above are ways to look for 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 miles per hour. The word per means to divide, so miles per gallon is actually the number of miles divided by one gallon.
- Rates are calculating how much an amount changes in a given amount of time.

Scientific Notation

Thousand = $10^3 = 1,000$

Million = $10^6 = 1,000,000$ (people in the US)

Billion = $10^9 = 1,000,000,000$ (people on Earth)

Trillion = $10^{12} = 1,000,000,000,000$ (National debt)

- When using very large numbers, scientific method is often easiest to manipulate. For example, the US population is 300 million people or 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.
 - Ex. $9 \times 10^6 / 3 \times 10^2 = (9/3) \times 10^{(6-2)} = 3 \times 10^4$

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?

$$\frac{24 \text{ mi}}{1 \text{ gal}} \times \frac{1.6093 \text{ km}}{1 \text{ mi}} \times \frac{3.7854 \text{ gal}}{1 \text{ L}} = \frac{150 \text{ km}}{1 \text{ L}} = 150 \text{ km/L}$$

- Online dimensional analysis tutorials are available:
 - http://www.chemprofessor.com/dimension_text.html
 - <http://www.chem.tamu.edu/class/fyp/mathrev/mr-da.html>

Prefixes

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

Complete each of the following problems including a detailed set up with labeled units and proper scientific notation. **NO CALCULATORS!** You must show all work to get credit. Must be handwritten (pen or pencil is acceptable.)

- All problems should be expressed in scientific notation (do not write out large numbers with multiple zeros as place holders). If you need assistance with this, please refer to the provided reference materials listed above.
1. What is ten million times three thousand?
 2. What is thirty-four million plus two hundred fifty-six thousand times four hundred?
 3. 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 the next year?
 4. One year we had 120 APES students and the next year we had 150 APES students. What percentage did the population of APES students grow by?
 5. One year we had 2500 endangered sea turtles hatch. After one year there were only 1500. What percentage of turtles died?
 6. 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)
 7. 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?
 8. A turtle was crawling at the rate of 38 cm per minute. How many kilometers would the turtle crawl in 2 hours?
 9. 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?
 10. 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.
 11. You purchase a home that is 2500 square feet of living space. How many square meters of living space is this?
 12. If a calorie is equivalent to 4.184 joules, how many joules are contained in a 250 kilocalorie slice of pizza?
 13. 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.

14. (Using the information in 13) Calculate the pounds of coal consumed by the power plant each day assuming that one pound of coal yields 5,000 BTUs of heat.
15. 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?)

Section 3: Environmental Legislation

Create a chart similar to the one on this page and fill in the missing information pertaining to important legislation in **your own handwriting**. You may print out a copy of this table, but make sure to include plenty of space to add in as many specific details as needed to justify the question. We will study MANY different environmental policies throughout the year. This is just to get you started.

Legislation Name	Is this a US or World Treaty, Law or Act?	Date Enacted (Year)	Description of the Legislation (Give the purpose, important founding organizations or people, any major points that you find)
Kyoto Protocol			
Montreal Protocol			
Agenda 21			
London Dumping Convention			
Helsinki Convention			
CITES			
SMRCA			
RCRA			
Lacey Act			
Clean Water Act			
Safe Drinking Water Act			
Clean Air Act			
Antiquities Act			
Endangered Species Act			
CERCLA			

Section 4: Movie Assignment

You are to watch a movie selected from the list below. From this movie, you are to hand write a 2-4-page report that addresses the following aspects listed below. **This MUST be written in pen; black or blue ink only.** Your report should be in paragraph format and NOT in question/answer format.

- a. What was the environmental situation addressed in the movie?
- b. Was this situation natural or man-made?
- c. Exactly how did this situation occur (what is the cause)?
- d. What were the positive and/or negative effects of this situation? (Any legislation created is a positive effect.)
- e. How was this situation fixed – if at all?
- f. Was anyone held responsible for this situation?
- g. How was fault determined?
- h. What consequences did they face – if any?
- i. What were the long-term ecological impacts of this event – if any?
- j. What did you already know about this situation before watching this movie?
- k. What is the most interesting thing(s) you learned by watching this movie?
- l. Provide your own insight into what you learned from watching the movie. (What did you like/not like? How would you change it and why?)

Movie Suggestions:

- An Inconvenient Truth (PG)
- Blue Vinyl (NR)
- Erin Brockovich (R)
- Fern Gully (G)
- Fire Down Below (R)
- Gorillas in the Mist (PG-13)
- Happy Feet (PG)
- Ice Age (PG)
- Ice Age: The Meltdown (PG)
- Outbreak (R)
- Pelican Brief (PG-13)
- Recycled Life (NR)
- The China Syndrome (PG)
- Wall-E (G)
- Contagion (PG-13)
- Avatar (PG-13)
- The Day After Tomorrow (PG-13)
- The Perfect Storm (PG-13)
- Promised Land (R)

Section 5: Online Textbook Access

It will be imperative that you keep up with your reading through the course of this class. You will need to be able to access the online textbook. To do so, go to <http://pcapes.weebly.com>. Go to the TEXTBOOK page of the website and download the PDF copy for future use. Please note that there is not a school-provided hard copy of this textbook; if you choose, you may wish to purchase a copy of the textbook through an outside vendor.

Next, locate the Unit 1 Study Guide found on the course website: <http://pcapes.weebly.com>. Once you have accessed the book, read through all of Chapter 1. As you read, complete the Chapter 1 section of the Unit 1 Study Guide (Questions 1-13). This should also be handwritten in your own words (pen or pencil is acceptable.) **You will turn this in on the day of the first unit test along with the rest of the study guide (separate from the rest of the summer assignment).**

Checklist:

This checklist should be completed and attached to the front of your work. **Do not add in grades, only check what has been completed.** Please place this completed checklist at the front of your assignment before you turn it in.

Name _____

Section 1: Score _____/20

- 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 2: Score _____/20

- 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 3: Score _____/20

- I have researched and recorded information for all of the legislation listed.
- I have cited all of the sources I used to find my information.
- I have studied the legislation and am ready for a quiz.

Section 4: Score _____/20

- I have completely watched the movie I selected.
- I have attached a paper copy of my report.

Section 5: Score _____/20

- I have accessed the online textbook and have read through chapter 1 of the online text.
- I have completed the chapter 1 assignment and am ready for a quiz.

Reminders:

- This assignment is due **September 5th** when you enter the classroom.
- Points will be deducted for assignments turned in after the due date based on the 2017-2018 PCHS Late Work Policy.
- Assignments that are not turned in will receive a 0.
- The assignment will count as half a test grade.
- You will be required to take a quiz on the information covered in this assignment that will be weighted as a half test grade.