

**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 assignment 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.

### **Assignment Guidelines:**

- **Read the directions carefully!**
- Each section should be clearly labeled in your work.
- 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.**
- **You will be required to take a quiz on the information covered in this assignment within the first two weeks of the course. The assignment, along with the quiz, will count as a test grade.**

**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 common chemical name that goes with each symbol:

CO <sub>2</sub>	CO	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>	CH <sub>4</sub>	H <sub>2</sub>	H <sub>2</sub> CO <sub>3</sub>
N <sub>2</sub>	NO <sub>2</sub>	NO <sub>3</sub>	NH <sub>3</sub>	NH <sub>4</sub> <sup>+</sup>	HNO <sub>3</sub>
O <sub>2</sub>	O <sub>3</sub>	P	PO <sub>4</sub> <sup>3-</sup>	S	SO <sub>3</sub> <sup>2-</sup>
SO <sub>2</sub>	SO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaCl	Pb	SO <sub>4</sub> <sup>2-</sup>
U	Rn	Hg	Cl <sub>2</sub>	H <sub>2</sub> O	NO <sub>3</sub> <sup>1-</sup>
NO <sub>2</sub> <sup>1-</sup>	As	CH <sub>3</sub> Hg <sup>+</sup>	Fe	Fe <sub>2</sub> O <sub>3</sub>	CH <sub>2</sub> O

2. Answer each of the following questions in sentence form:
- What is the pH scale? Explain what it measures.
  - 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!
  - What are the average pH ratings of the following common substances in the environment? (memorize these)
    - 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 a calculator!** 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. It is encouraged that you attend SMART lunch in the first week of the course to receive additional help, if needed.

*\*\*\*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 = (final-initial)/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  $300 \times 10^6$  or  $3 \times 10^8$
- 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.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. 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. **These will show up on the first unit test** and you are expected to know each.

<b>Legislation Name</b>	<b>Is this a US or World Treaty, Law or Act?</b>	<b>Date Enacted (Year)</b>	<b>Description of the Legislation (Give the purpose, important founding organizations or people, any major points that you find)</b>
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			

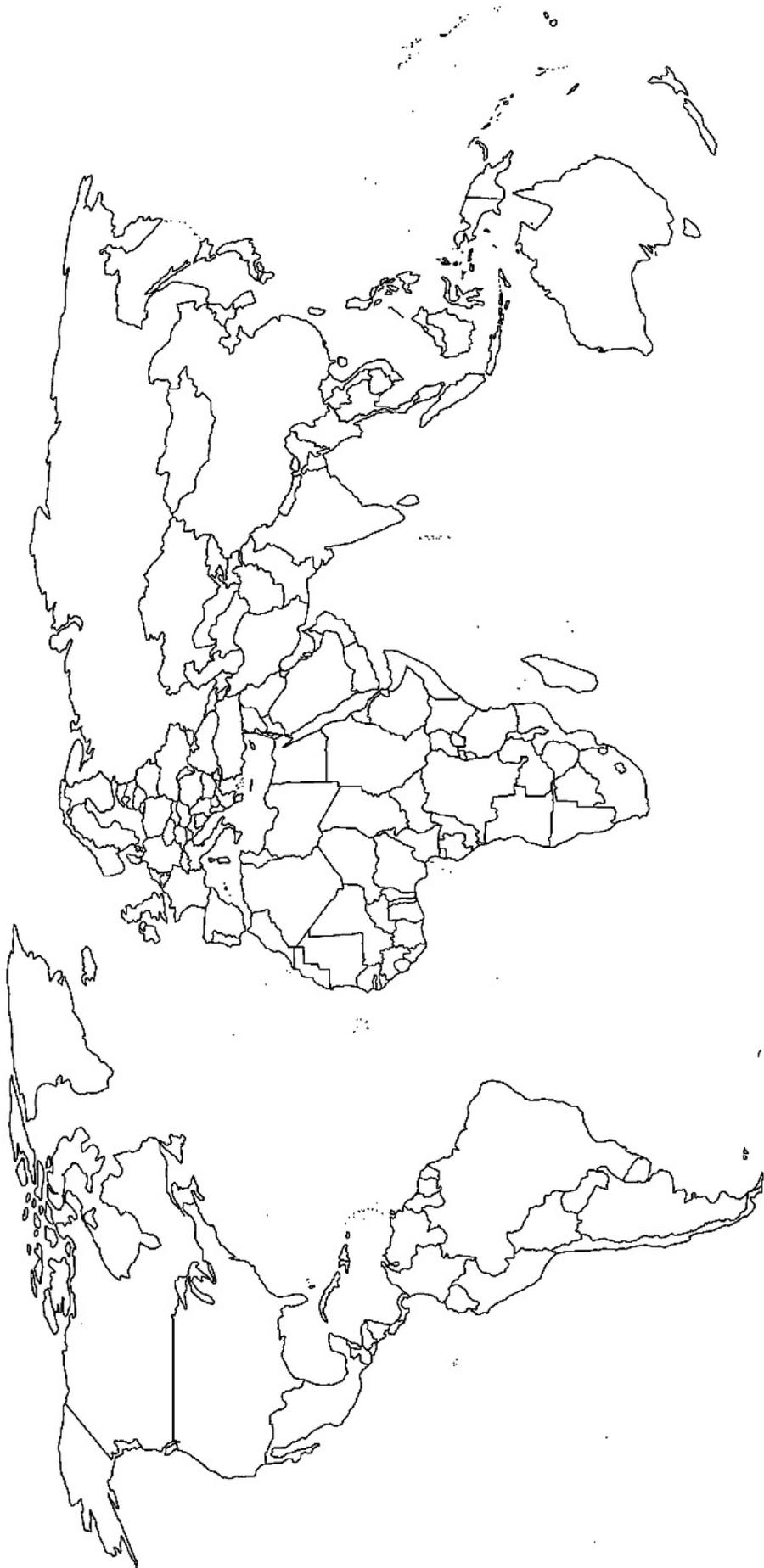
**Section 4: Current Environmental Events and their geographic locations.**

On the world map provided on the next page, label the continents and color/shade each based on the key provided below:

- Africa - red
- Antarctica - blue
- Asia - green
- Australia - yellow
- Europe - orange
- North America - pink
- South America – purple

For each of the environmental events and locations listed below, give a brief description of the event or location on a separate sheet of paper and include when it occurred, if applicable. Remember to handwrite your information and cite your sources, when applicable, in APA format. Locate and label the location on the world map provided. Label the area and/or provide a color-coded or numbered legend that pairs the event with its location.

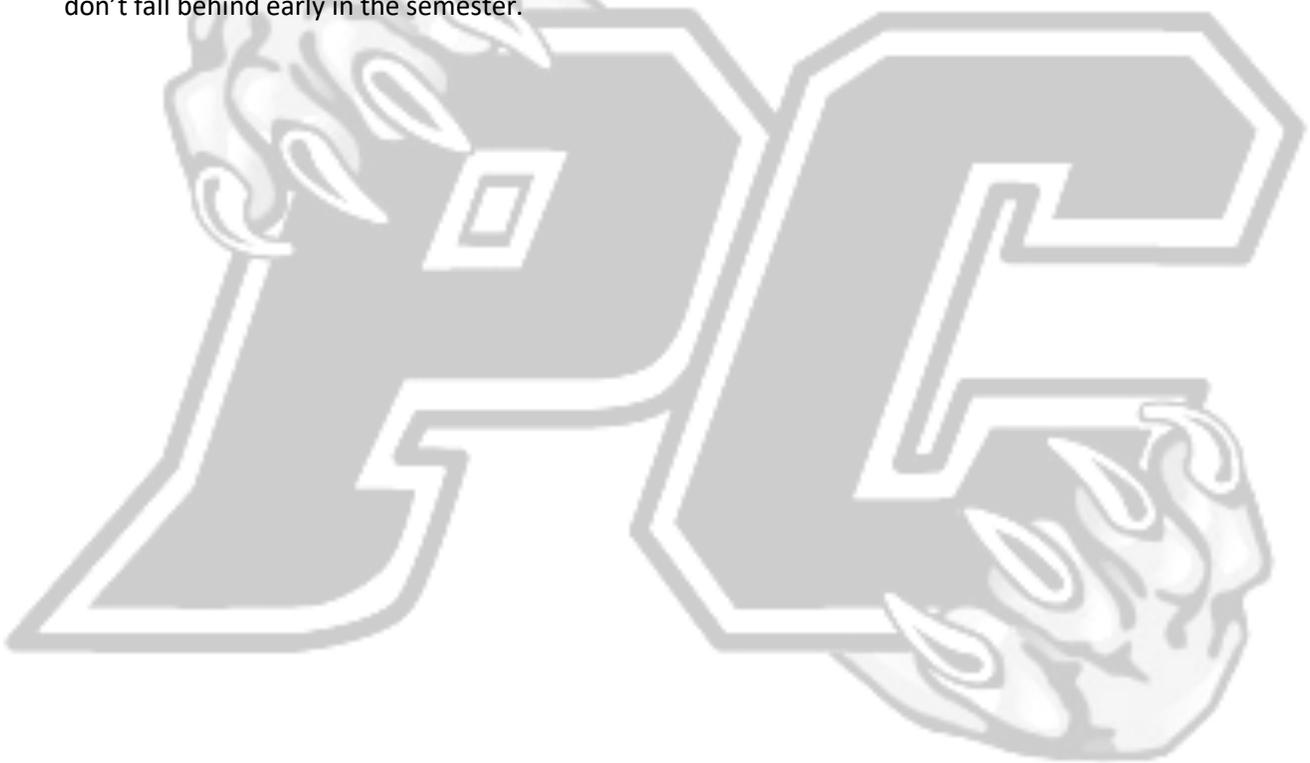
<b>Environmental Event</b>	<b>Description (Related to Environmental Science)</b>	<b>Date(s) Event Occurred</b>
Chernobyl disaster		
Three Mile Island Nuclear Plant		
Fukushima Daichi Nuclear Disaster		
Bhopal		
Love Canal		
1930 Dust Bowl		
Exxon Valdez Oil Spill		
Deepwater Horizon Oil Spill		
Aral Sea		
Fertile Crescent		
Salton Sea		
ANWR (Arctic National Wildlife Refuge)		
Easter Island		
Colorado River		
Nile River		
Amazon Rainforest		
Ogallala Aquifer		
Pacific Plastic Gyre		
Everglades		
Cuyahoga River, Ohio		
Great Barrier Reef		
Three Gorges Dam, China		
Yangtze River, China		



**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 Reading 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, it is recommended that you complete the Chapter 1 section of the Unit 1 Reading Guide to document your notes. It is important that you get in the habit of reading and taking notes, addressing all questions in the reading guides. This will NOT be collected as part of the summer assignment; however, the Unit 1 Test is based on the information found in the Reading Guide. This is just to give you a head start on the course so that you don't fall behind early in the semester.



**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 \_\_\_\_\_/10**

- 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 \_\_\_\_\_/10**

- 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 \_\_\_\_\_/10**

- 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 \_\_\_\_\_/10**

- I have identified all continents and environmental events on the map and provided a key.
- I have researched and recorded information for all of the events listed.
- I have cited all of the sources I used to find my information.
- I have studied the location of events and am ready for a quiz.

**Section 5: Score \_\_\_\_\_/10**

- I have accessed the online textbook and have read through chapter 1 of the online text.
- I have utilized the Unit 1 Reading Guide.

**Summer Assignment Quiz \_\_\_\_\_/50**

**Total Score for Summer Assignment \_\_\_\_\_/100**

**Reminders:**

- This assignment is due **September 9<sup>th</sup>** when you enter the classroom (first semester students only; separate due date for second semester APES students).
- Points will be deducted for assignments turned in after the due date based on the 2019-2020 PCHS Late Work Policy.
- Assignments that are not turned in will receive a 0.
- The assignment will count as a test grade.