

AP Environmental Science Summer Preparation Assignment

Welcome future APES students! This is an advanced science course that combines the disciplines of biology, chemistry, geology, meteorology 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.

This summer assignment packet is due when you walk into class on the first day, Wednesday, August 23, and will be included in your first quarter assignments as a 100 point Laboratory/Project grade. Late packets will be worth a **maximum** of 50% for one day late, and 25% for two days late; on the third day late, the grade for this packet will be a zero. The first test of the quarter will cover content contained in this summer assignment packet.

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 MLA 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.

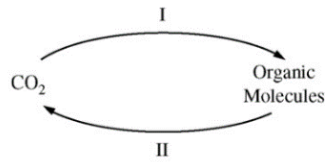
Section 1: Electronic Setup

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. I will use Remind to communicate with you throughout the year. Please use your cell phone to register for the APES reminders by:
 - a. Sending the text message “@apes18chca” (without the quotes!) to 81010. If prompted to enter your name, please include only your first and last names.
2. Email me at kevin.savage@chca-oh.org to introduce yourself. Please let me know the following information:
 - Your name
 - Any special hobbies or interests you have
 - Why you have chosen to take APES
 - Any concerns you have for the upcoming year
3. Complete the checklist at the end of this and turn in with your to turn in (found at the end of this packet).

Section 2: Biology Review

1. Matter continuously cycles through an ecosystem. A simplified carbon cycle is depicted in the diagram below.



- (a) Identify the key metabolic process for step I, and the key metabolic process for step II; briefly explain how each process promotes movement of carbon through the cycle. For each process, your explanation should focus on the role of energy in the movement of carbon.
- (b) Identify an organism that carries out both processes

Answer the following questions related to *photosynthesis*.

2. The color with the shortest wavelength in the visible spectrum is
- (A) Orange
 - (B) Red
 - (C) yellow
 - (D) blue
 - (E) green

Correct Answer: _____

3. If photosynthesis ceased occurring throughout the world, the ultimate effect would be:
- (A) a rapid increase in plant reproduction and proliferation.
 - (B) plants would become the primary energy producers for all living things.
 - (C) immediate decreases in atmospheric carbon dioxide.
 - (D) alternating cooling and warming of the earth.
 - (E) extinction of plants and animals.

Correct Answer: _____

4. Photosynthesis takes place in all of the following except:
- (A) mosses
 - (B) ferns
 - (C) algae
 - (D) fungi
 - (E) leafy plants

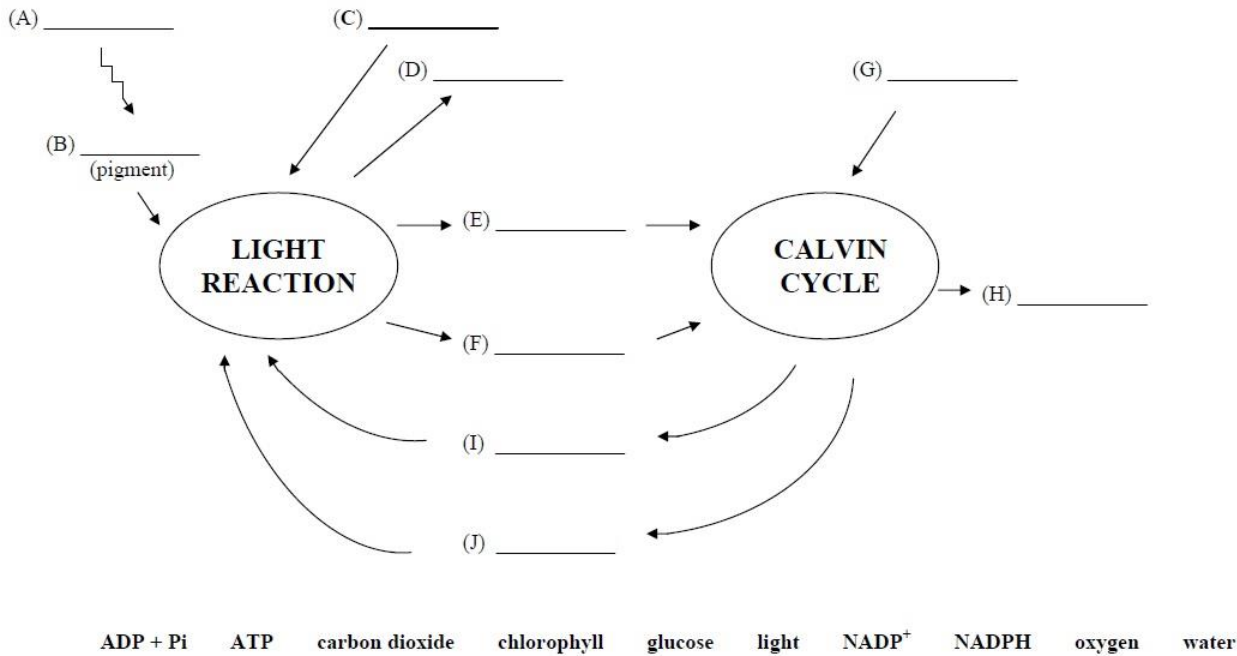
Correct Answer: _____

5. The waxy cuticle found on the leaves of many higher plants functions to
- (A) transfer gases.
 - (B) remove excess water from the plant.
 - (C) protect the leaf from water loss.
 - (D) store chlorophyll and expose the pigment to the maximum amount of sunlight.
 - (E) serve as the site of the electron transfer system.

Correct Answer: _____

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6. Label the figure below using the words provided below the diagram.



7. A simple ecosystem consists of ample grass, a herd of 50 deer, a nest of 2000 rabbits, a cast of 50 hawks, and a sleuth of 5 bears. Deer and rabbits are herbivores, hawks eat only rabbits, and bears eat both deer and rabbits. Draw a simple food web, showing how animals in this ecosystem are fed and, and what the transfer of energy is. Discuss what would happen to the ecosystem if (a) the deer began reproducing rapidly, (b) some rabbits migrated out of the area, and (c) the bears were hunted by humans.

Section 3: 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 may be typed or hand written.

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 |

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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

Section 4: 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 skills below.

Percentage

- $17\% = 17/100 = 0.17$
- Remember that “percent” literally means divided by 100
 - Percentage is a measure of a part of a whole. Or part divided by the whole.
 - 15 million is what percentage of the U.S. population? $15 \text{ million} / 300 \text{ million} = 0.05 = 5\%$
 - What is 20% of this \$15 restaurant check so that I can leave a good tip? $\$15 * 0.20 = \3.00

Rates

- Percent change = $(\text{final} - \text{initial}) / \text{initial}$
- Rates will often be written using the word “per” followed by a unit of time (e.g., miles per hour, gallons per hour)
- Rates are calculating how much an amount changes in a given amount of time

Scientific Notation

- Thousand = 1,000 = 10^3
Million = 1,000,000 = 10^6
Billion = 1,000,000,000 = 10^9
Trillion = 1,000,000,000,000 = 10^{12}

- When using very large numbers, scientific notation is often easiest to manipulate. For example, the population of the United States is about 300 million people = $300 \times 10^6 = 3 \times 10^8$
- When adding or subtracting, the exponent must be the same; add the numbers in front of the 10, and keep the exponent the same.
- If multiplying or dividing, multiply or divide the number in front of the ten, and then add exponents if multiplying or subtract 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 to any other unit accurately if given the conversion factor
- Example: 24 miles per gallon = how many gallons per liter?

$$\left| \frac{24 \text{ mi}}{1 \text{ gal}} \right| \left| \frac{1.6093 \text{ km}}{1 \text{ mi}} \right| \left| \frac{1 \text{ gal}}{3.785 \text{ L}} \right| = \left| \frac{10.2 \text{ km}}{1 \text{ L}} \right|$$

- Other online dimensional analysis tutorials are available at:
 - http://www.chemprofessor.com/dimension_text.htm
 - <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-) = 1000 = 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.

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 sample problems on our website.

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 2500 endangered sea turtles hatch. After one year there were only 1500. What percentage of turtles died?
5. 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)
6. 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?
7. A turtle was crawling at the rate of 38 cm per minute. How many kilometers would the turtle crawl in 2 hours?
8. 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.
9. If a calorie is equivalent to 4.184 joules, how many joules are contained in a 250 kilocalorie slice of pizza?
10. 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.
11. (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.
12. 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 5: Current Events

In environmental science, it is important to know about current issues in the new. One of my goals is to familiarize you with environmental issues that are important to our community, country and world. We will be reading and discussing a variety of current events throughout the school year as well. Over the course of the summer, find 2 recent articles related to environmental science.

All articles should be current (during the past 2 years) and taken from a reliable source. The sources may be scientific publications, popular magazines, newspapers etc. Try the NY Times (especially Tuesday), Washington Post, National Geographic, Discover Magazine, Natural History Magazine, Treehugger.com, etc. I do not care if you use a paper or online copy of your article as long as it is properly cited.

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Each article should relate to a different topic chosen from the following list. As the year progresses you will be able to cover all of the topics!

Environmental Law	Ecosystems	Climate	Evolution	Preserving our biodiversity
Water pollution	Population growth	Cities and waste	Geology	Renewable Energy
Nonrenewable energy	Food/agriculture	Air pollution	Human Health	Forest or Rangeland

Article Analysis Directions:

Include all of the following components and clearly identify each component with headings. Each analysis should be either typed or very neatly written in blue or black ink. Each article should be on its own sheet of paper.

- Title of the Article
- Summary: **brief** summary that tells me what the article is about.
- Analysis:
 - a. Points of view – does the article have more than one side/point of view? If so what are they?
 - b. Bias – Is this article biased in any way? In your opinion, does the author give a positive, negative, or neutral view of the environmental science topic?
 - c. Controversy: Is there any controversy surrounding this article? If so briefly explain it.
 - d. Your perspective: State your perspective on this news article based on your personal knowledge of the topic and your reading of the article.
 - e. Effect on you: How does this topic relate to you or your affect you?
- Attach the article – either a physical copy of the article or a working web address must be included.

Checklist:

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

Name _____ Class Bell: 1 2

Section 1: Electronic Setup

Score _____/10

- I have registered for the Remind text message system.
- I have emailed Dr. Savage.

Section 2: Biology Review

Score _____/25

- I have completed the short answer and multiple choice question about photosynthesis and I am ready for a quiz.
- I have labeled the figure using the word bank provided and am ready for a quiz.
- I have completed the food web activity and answered the related questions, and am ready for a quiz.
- I have cited all of the sources I used to find my information.

Section 3: Chemistry Review

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 4: Math Review

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 5: Current Events

Score _____/20

- I have completed two article current events.
- I have either attached a paper copy of my article, or listed a working web address to my article.

TOTAL SCORE: _____/100

This assignment is due August 23 when you enter the classroom. If you turn in the assignment late, you will only earn a MAXIMUM of 50% for one day late, 25% for two days late, and 0% for three days late (as this is the policy for all late work in APES).