APES Summer Adventures

AP Environmental Science 2019-2020

Summer Assignment

Welcome to AP Environmental Science (APES). I am excited and looking forward to working with you in the coming school year. We have a lot to do next year, so you need to get a head start over the summer. That means that you need to get outside and experience as many aspects of the biosphere as you can. Tough assignment! There are four more formal parts to the summer assignment explained in detail below. These will give you a brief overview of all the topics we will cover next year and an outline of some of the associated prerequisites and math calculations. Over the course of the year we will learn more about the science and social issues associated with each of the topics but what is included here will give you a solid basis of what to expect.
You are responsible for completing this packet on time no matter when you sign up for the course.

Environmental Science is an interdisciplinary science that will incorporate aspects of Earth Science, Biology, Chemistry, Physics, Economics, Geography, Government and more. The major topics of this class are as follows:

Earth Systems and Resources – atmosphere, soil, groundwater, and geology
The Living World – ecosystems and cycles
Populations – demographics, dynamics and growth
Land and Water Use – agriculture, forestry, mining, fishing and global economics
Energy Resources and Consumption – fossil fuels, nuclear energy, renewables, conservation and consumption
Pollution – types of pollution and its impact, waste disposal
Global Change – ozone, climate change, loss of biodiversity

If you have any questions during the summer:
NORTH STUDENTS: you may contact Mr. Hoblitzell at hoblitzelle@middletownk12.org. You should also check our Google Classroom page for any updates. The code is: 7j3sq8.

SOUTH STUDENTS: you may contact Mrs. Matri at matrik@middletownk12.org. You should also check our Google Classroom page for any updates. The code is: 04zy2j9 South students are also required to join the APES Summer 2019 Remind Group. Text @a8aa94 to 81010.

Keep in mind, these email accounts will not be checked daily and it may take days, even a week or more before you receive a response.

Before you start anything,
Purchase or Get one from my room & Begin A Field Notebook*

Purchase one standard sized ***bound*** composition book. I also have a number of these books in my classroom and will give you one for FREE! They are used but have plenty of life left in them. Besides, reuse is one of the three R's in environmental science! The firm covers are preferable to the more flexible ones. No spirals or off-sized notebooks will be allowed. This will be your field/lab notebook for the entire year. Decorate the edge/binding so that you can recognize yours in a hurry when they are stored on a shelf in class. Label the front cover with your full name.
Create a title page with:

Full Name
Advanced Placement Environmental Science
Middletown High School South/ North
2019-2020
Mrs. Matri/ Mr. Hoblitzell

APES is a college level course with certain prerequisites (Biology, Chemistry, Earth Science). You are expected to enter the course with a significant understanding of basic scientific and mathematic concepts and skills, not to mention strong reading, writing, and speaking skills. Although we will continue to work toward developing your skills in all of these areas, your success in this class will be highly dependent on what you bring to it at the onset. Over the summer, brush up on everything below.

1. elements
2. compounds
3. molecules
4. atoms
5. ions
6. nucleus
7. protons
8. electrons
9. neutrons
10. organic vs. inorganic
11. natural vs. synthetic
12. electromagnetic radiation
13. energy vs. matter
14. kinetic vs. potential energy
15. radioactive decay
16. half-life (including how to calculate)
17. law of conservation of matter
18. 1st law of thermodynamics
19. entropy
20. metabolism
21. mutation
22. organism
23. species
24. producers/autotrophs
25. consumer/heterotrophs
26. photosynthesis (know the balanced equation)
27. cellular respiration (know the balanced equation)
28. aerobic
29. anaerobic
30. adaptation
31. trait
32. gene
33. chromosome
34. gene pool
35. evolution
36. extinction
37. the layers of Earth
38. fossil fuels (name and how formed)
39. fault
40. weathering
41. erosion
42. rocks vs. minerals
43. rock cycle
44. the full name of each of these chemical abbreviations:

C, CO_2, CO, H_2CO_3, $C_6H_{12}O_6$, CH_4, $CaCO_3$, H_2, H_2O, N_2, NO, NO_2, N_2O, NO^{-2}, NO^{-3}, NH_3, NH^{4+}, O_2, O_3, P, PO_4^{-3}, S, SO_2, SO_3, SO_4^{-2}, H_2S, Cl, K, Mg, Ca, NaCl, Fe, Zn, Pb, Hg, Al, As, Rn, U, HNO_3, H_2SO_4

I: <u>Individual</u> research and Lab Report (65 pts) DUE DATE: Before 2 pm on SEPTEMBER 5, 2019

The ability to design an experiment in order to test a hypothesis is an important part of any science course. The APES exam will include questions on experimental design. You must choose one of the four questions below, come up with a specific hypothesis and design an experiment to test it. You will conduct the experiment and draw specific conclusions after your analysis and interpretation of the results. If you would rather conduct an experiment on something other than what's listed below, please discuss it with me first.

a. What's in the air in or around my home?
   Design an experiment to examine air particulates in or around your home or both.

b. What type of soil would a plant grow best in?
   Design an experiment to test soil types and plant growth. You cannot use soil from the school garden.

c. How long does it take something to break down in the environment?
   Design an experiment to determine how long it will take for a biodegradable substance to break down in the environment.

d. What can we add to plants to increase/decrease their growth?
   Design an experiment to determine a method or product to encourage plant growth or inhibit growth. You cannot use the school garden.

The field notebook entries will be those that record your observations, thoughts, data, etc. Begin your field entries with a title, date, time of day, description of location and location conditions (such as weather). Make sure you note which components of the experiment are the dependent and independent variables as well as the control. You should also include a description of your test subject and test area.

You will hand in your data and lab report before 2 pm on September 5, 2019. Drop your work off to me in my room or you can leave it in my mailbox in the main office if I am not in my room. There will be a 10 point deduction for every day it is late. Please plan accordingly. **Make sure you use the report format below! You can print your report, put it in your field book, and turn both in at the same time for credit OR hand in your field book and submit your report on classroom. Handwritten lab reports will NOT be accepted**.

APES Lab Report Format

Your report is your tool for expressing what you did, why you did it, and what you learned in the process. Even if your understanding of the procedure, techniques, and results is perfect and your results error-free, a poorly-written report will not indicate that you really understand what you have done. Writing reports is not difficult if you remember a few guidelines. Most scientific reports are divided into the sections that follow and each section is a heading in the report. Complete your report based on the experiment you designed and conducted over the summer.

1. **Abstract**
   The abstract should contain a brief summary of purpose, methods, results, and conclusions of the whole experiment. It is generally no longer than three or four sentences. It may be easier after you have written the rest of the report to write the abstract.

2. **Introduction (Question and Claim/Hypothesis)**
   Write your introduction in such a way that the reader will be interested in reading the rest of your report. The introduction should include:
   a. What was the purpose of your work/ what is its importance to the environment and/ or society? (Why did you do whatever it was that you did?)
   b. What is your hypothesis? (What did you think would happen - CLAIM)
   c. What are your variables? Control?

3. **Materials and Methods**
   How did you test your hypothesis? What were your methods?
   This section should include a description of the characteristics of the study area (when applicable) and a summary of what was done and what equipment was used. The procedure should be presented in chronological order and in past tense. Steps in the procedures should be numbered and in complete sentences. You should use the scientific names the first time you mention a species-if applicable (e.g. "The study area was dominated by sycamore trees, ***Platanus occidentalis***"). Thereafter, you only need to use the common name. Your methods section should be complete enough so that anyone reading it would be able to reproduce your experiment with nothing but your report to follow. Think of this section like a cooking recipe: list of ingredients followed by the procedures for cooking.

4. **Results (Data Tables, Pictures, Graphs)**

The results section contains nothing more than results. It is not a discussion of what you found (this comes next), it is not a conclusion about what you found (this comes after the discussion), but is only the bare-bones reporting of the facts. State the results of the experiment without opinion, interpretation, or explanation. This is the first time, other than in the abstract, that results have been mentioned. All tables and graphs should follow immediately behind this section. Every table and figure should be numbered and referenced in the text. If you include tables or figures that you do not reference, then they are unnecessary. All tables and figures must be labeled with a one-sentence description or title that tells what is being shown. The reader should not have to refer back to the text to understand the information they are looking at. Descriptions of tables go above the table, whereas descriptions of figures are placed at the bottom of the figure.

5. **Discussion/Analysis (Evidence and Reasoning)**

This is the most important portion of the report. In this section, you will discuss your data and any trends or relationships that appeared in the data. The first item that should be addressed here is the interpretation of the results. Provide insight as to **why** such trends may have occurred. Secondly, in this section you should discuss why your results support your hypothesis or not. Are your results consistent with what you expect? Why or why not? Answer the questions you asked in the introduction section. Any problems encountered during the procedure that may have caused errors should be discussed. This may be a separate paragraph. Pay close attention to both human error and equipment error. Whenever necessary, suggest other experiments that should be done, or additional data that should be collected to answer your initial questions (in your introduction) more thoroughly.

6. **Conclusion**

Conclusions are based on data, and they should follow from your discussion. All conclusions drawn should relate to the statement of the problem (your hypothesis/claim). Did your results confirm your hypothesis or not? Why or why not? What did you learn from this experiment?

FIELD NOTEBOOK
15 points

CATEGORY	3	2	1
Date and time	Date and time recorded for all entries	Date and time recorded for most entries	Date and time recorded for some entries
Conditions of experiment location (temp, sunlight, precip, etc.)	All appropriate location conditions noted in detail including past weather conditions that may influence the experiment if applicable	Appropriate location conditions noted including past weather conditions that may influence the experiment if applicable	Some appropriate location conditions noted
Condition of experimental subject(s)	Detailed descriptions of the experimental subject(s)	Good descriptions of the experimental subject(s)	Some descriptions of the experimental subject(s)
Number of Entries	At least 10 entries	At least 7 entries	At least 4 entries
Neatness	Neatly written; very easy to read and understand	Neatly written; easy to read and understand	Poorly written or Neatly written but entries are difficult to understand

LAB REPORT GRADING RUBRIC

50 points total *(add total score based on rubric and multiply by 2*)

CATEGORY	4 3 or 2	3 2 or 1.5	2 1.5 or 1	1 or 0.5
Components of the report 2 pts	All required elements are present and additional elements that add to the report (thoughtful comments, graphics) have been added	All required elements are present	One required element is missing, but additional elements that add to the report (thoughtful comments, graphics) have been added	Several required elements are missing
Abstract and Introduction 4 pts	Theoretical background for this lab is clearly explained. (Why was this lab performed) What will be measured is apparent and correct.	Most of the theoretical background for this lab is clearly explained. What will be measured is apparent.	Some of the theoretical background is missing or incorrect. What will be measured is apparent.	The theoretical background is not clearly explained. What will be measured is not apparent.
Materials and Procedure 3 pts	Procedures are listed in clear steps. Each step is numbered and is a complete sentence. All materials and set up used in the experiment are clearly and accurately described.	Procedures are listed in a logical order, but steps are not numbered and/or are not in complete sentences. Almost all materials and the setup are clearly and accurately described.	Procedures are listed but are not in a logical order or are difficult to follow. Most of the materials and setup are accurately described.	Procedures do not accurately list the steps of the experiment. Many materials are described inaccurately OR are not described at all.
Diagrams/Figures* 3 pts	Clear, accurate diagrams are included and make the experiment easier to understand. Diagrams are labeled neatly and accurately with variables showing what is being measured. Variables match those used in the Introduction.	Diagrams are included and are labeled neatly and accurately. Some of the variables being measured are not labeled; titles missing.	Diagrams are included and are labeled. Some of the things being measured are not labeled with variables.	Needed diagrams are missing OR are missing important labels.
Tables/ Graphs* 3 pts	Professional looking and accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled. Units are included.	Accurate representation of the data in tables and/or graphs. Graphs and tables are missing labels and/or titles.	Accurate representation of the data in written form, but no graphs or tables are presented.	Data are not shown OR are inaccurate.
Discussion/Analysis 4 pts	The relationship between the variables is discussed and trends/patterns logically analyzed. Possible sources of error are discussed as well as suggestions for further experimentation/ data collection.	The relationship between the variables is sort of discussed and trend/patterns analyzed. Possible sources of error are discussed.	The relationship between the variables is discussed but no patterns, trends, or predictions are made based on the data. Possible sources of error are mentioned.	The relationship between the variables is not discussed nor are possible sources of error.
Conclusion 4 pts	Conclusion includes whether the findings support the hypothesis and thorough explanation of what was learned from the experiment	Conclusion includes whether the findings supported the hypothesis and what was learned from the experiment.	Conclusion includes whether the findings supported the hypothesis OR what was learned from the experiment	No conclusion was included in the report OR shows little effort and reflection.
Scientific Concepts 2 pts	Report illustrates an accurate and thorough understanding of scientific concepts underlying the lab.	Report illustrates an accurate understanding of most scientific concepts underlying the lab.	Report illustrates a limited understanding of scientific concepts underlying the lab.	Report illustrates inaccurate understanding of scientific concepts underlying the lab.

* If the report only contains Figures OR Tables/Graphs, then this category should be double the point value.

II: Chapter 1 questions - Chapter test during the week of September 15, 2019.

The block schedule and the fact that we don't start until September, puts us behind in terms of class time to cover the APES curriculum. In order to make up for some of this time, you will be learning the material from Chapter 1 over the summer. We will review some of the concepts when you return to school and I will assess your knowledge with a test.

You will need to research the answers to the questions below. If there is a word used in the question that you don't understand, look it up. You may use books, periodicals, and everyone's favorite, the Internet to find the answers. WARNING: be wary of opinion pages and blogs. These are what an individual or two thinks, and may not be the scientific consensus. The following websites should be helpful in your search:

www.envirolink.org

www.enviroliteracy.org

www.nationalgeographic.com

www.sierraclub.org

www.epa.gov

www.usgs.gov

www.earth911.org

www.globalstewards.org

Note: Save your answers to these questions as they will be an excellent study guide when preparing for the AP Exam.

1. What is environmental science and what scientific fields are related to environmental science?
2. What is environmentalism?
3. What is natural capital?
4. Differentiate between natural resources and natural/ecosystem services. Give at least two examples of each.
5. Define an ecosystem including biotic and abiotic factors. Give an example of a biotic and abiotic factor.
6. What is an environmentally sustainable society?
7. What is an environmental indicator? What are the five key global environmental indicators?
8. Define biodiversity then distinguish between ecosystem, species, and genetic diversity.
9. What is the leading cause of species extinctions?
10. Describe the Greenhouse Effect. List four common greenhouse gases.
11. Define the term anthropogenic.
12. Distinguish between a renewable and non-renewable resource and give at least three examples of each.
13. Differentiate between a developed and a developing nation in terms of resource use, wealth, and health. According to the United Nations, are China and India developed or developing nations?
14. What is an ecological footprint?
15. Define pollution and distinguish between point source and nonpoint sources of pollution. Give an example of each.
16. Review the scientific methods and design of experiments (hypothesis, theory, independent variable, dependent variable, control).
17. What is the difference between controlled experiments and natural experiments?
18. Why are natural experiments in environmental science more challenging?
19. What is "baseline data"? What are shifting/sliding baselines? Give an example.
20. Identify the five root causes of the environmental problems we face today.

III: Math Practice (15 pts) DUE DATE: At the beginning of your class on Sept. 5 or 6, 2019

NAME:_____ BLOCK: _____ DATE: _____

Complete the following problems. You must show your work and use proper units for full credit. There will be a two (2) point deduction for every day that this is late. Try to complete the questions without a calculator since you won't be able to use one on the exam in May. You can submit this on the classroom page. Don't forget to show your work. ☺

1. If the current human population is approximately 7.6 billion and is growing at an annual rate of 1.09%, approximately how many people will be added next year if this rate stays the same?

    a. How long would it take to double the population at this rate?

2. In 1988 the California sea otter population was 1600 individuals. In 2017 the population rose to 3100 individuals. What is the percent change in the sea otter population from 1988 to 2017?

3. If your air conditioner uses 500 watts of energy per hour on a daily basis, and your energy cost is $0.10 per kWh, and there are 30 days in the month, how much does the energy used by the air conditioner cost you per month?

4. A sample of radioactive waste has a half-life of 60 years and an activity level of 8 curies. After how many years will the activity level of this sample be 0.25 curies?

5. 1 kWh = 3,410 BTU 1lb coal = 12,000 BTU
   If you use 1000 kWh of electricity an hour, how many pounds of coal are needed to generate this electricity?

Use the table below to answer the questions.

Country	Area of tropical rain forest (square kilometers)	Area of deforestation per year (square kilometers)	Annual rate of tropical forest loss (%)	Annual Carbon Footprint (metric tons)
A	1,800,000	50,000		
B	55,000	3,000		
C	22,000	6,000		
D	530,000	12,000		
E	80,000	700		

6. What is the annual rate of tropical rain forest loss, as a percentage of total forest area, in each of the five countries? Answer by filling in the blank column on the table.

7. What is the annual rate of tropical deforestation collectively in all of the countries represented in the table?

8. According to the table, and assuming the rates of deforestation remain constant, which country's tropical rain forest will be completely destroyed first?

9. Assuming that the rate of deforestation in the Country D remains constant, how many years will it take for all of its tropical rain forests to be destroyed?

10. Assuming that a hectare (1.0 hectare = 0.01 square kilometer) of tropical rain forest absorbs 0.85 metric tons (1 metric ton = 2,200 pounds) of carbon dioxide per year, what would the total carbon released or carbon footprint be in metric tons of carbon dioxide per year from deforestation in each of the five countries in the table?