Welcome to AP Environmental Science. This assignment is designed to prepare you for the course and help you understand two of the most important problems we need to solve - **biodiversity loss** and **climate change**. In this course, we will focus on the **science** behind these issues but we must also be cognizant of the politics and economics that have caused these problems and are vital to finding their solutions. Please join our Google Classroom using code: **hdx4eim**. Your work is due by 7:30 AM on the first day of school. If you have questions please email me (lmendenhall@bhpsnj.org). I look forward to a fun and productive year.

1. **Course Info** Please complete the "Welcome to APES" information form. This allows me to get to know you and provides important course information.

2. **Biodiversity** Habitats and food webs are an important part of the study of ecosystems and ecosystem management. They are also key to understanding biodiversity loss. The objective here is to get you outside observing and thinking about the natural world. (40 points)

   - Visit an area of your choice for **one** hour. This could be a park near your house, a place you are visiting on vacation, the rain garden at GL, or your backyard.
   - Record the type of **habitat** (eg, wetland), specific location, date, time, and weather conditions.
   - Identify at least **three** abiotic factors that influence what lives in this specific area.
   - Identify **eight** living things seen in that time, including at least one plant, one animal, one fungus, and the original source of most energy on Earth.
   - Take photos of the organisms you observe and make them into a **food web**. Include the common name, scientific name, trophic level, and status (native, nonnative, invasive, endangered, etc) of each. For the photo pictured you would write: Purple Coneflower, *Echinacea purpurea*, producer, native to NJ. If something is too fast to photograph you can find a photo online but be sure to credit your source.
   - Resources: Past students have been successful using iNaturalist for identifications.

3. **Climate Change** Climate change can be confusing and feel overwhelming. The science is relatively straightforward but the information around the issue has become politicized and misinformation abounds. Your task is to untangle the science from the politics. Science is about evidence - what does the evidence tell us about how climate change works, how it is changing the world around us, and what we can do about it? (40 points)
   - Educate yourself on the **carbon cycle** and the **greenhouse effect**. Draw a schematic diagram of these processes.
   - Find four pieces of scientific **evidence** for anthropogenic (human caused) climate change.
   - Decide on the most important **impact** of climate change on humans.
   - Choose one **solution** you would propose to Congress to help slow or even reverse climate change.
   - Share this information with someone else.
   - Write a one page summary highlighting what you learned during your research and sharing your knowledge with someone else.
   - We will have a **quiz** on this in the first week of school.
   - Resources: You can use any resource you wish, just be sure it is credible. Here are some I like: US Government (NASA, NOAA, GlobalChange), International (UN), and News Organizations (BBC, NYT).
   - Read More: Vested interests have spent billions on a misinformation campaign. You can read about this in these articles (Oil Companies, Vested Interests) and the book *Eyes Wide Open: Going Behind the Environmental Headlines*. I used to require this book so there are copies in the summer reading section of the Berkeley Heights Public Library.

4. **Math** Please complete the **Summer Math Review** found on the following pages. Each section includes a problem set and an optional video to help you review content. **Dimensional analysis** (ie, unit cancellation) is used throughout the course so be sure you are comfortable with it. Calculators are permitted but you must show your work. Do not forget to include units in your setup and answer. We will have a **quiz** on this material during the first week of school. (40 points)

5. **Extra** You have the option to complete extra credit assignments to enrich your understanding of course material. During the summer, you can earn up to 20 points completing any of the following assignments: Currents Events, Documentaries, and Take Action. Please follow the instructions in each document.

Math Review

Show your work APES FRQs award one point for the correct setup (with units) and one for the answer so always show your work. Use dimensional analysis for problems involving unit conversions.

Check your answers Reread the question to be sure you answered what was asked. Review each step to make sure you did not make mistakes in your calculations or forget units. Check to see if your answer makes sense. If you get an answer that seems unlikely, it probably is - no one could eat 13 million pounds of corn in a year.

A. PERCENTAGES Environmental science problems often include working with percentages. Tutorial

1. What percentage of 150 is 30?

2. Thirteen percent of a 12,000 acre forest is being logged. How many acres will be logged?

3. 240 acres, or 15%, of a forest is being logged. How large is the forest?

4. A water heater tank holds 280 gallons. Twenty percent of the water is lost as steam. How many gallons *remain* to be used?

B. METRIC UNITS Most problems will require you to make unit conversions. Be careful with #10. Tutorial

5. 14000 millimeters = ? meters

6. 1200 kilograms = ? grams

7. 100 megawatts = ? kilowatts

8. 17 m^2 = ? mm^2

C. SCIENTIFIC NOTATION This ensures we do not gain or lose zeros when working with very large or very small numbers. Tutorial

9. Place the following in scientific notation:
    a. 145,000,000 =
    b. 435 billion =
    c. 0.000348 =

10. $(4 \times 10^3)(3 \times 10^2)$ =

11. $(3.6 \times 10^9) \div (9 \times 10^3)$ =

12. $(1.9 \times 10^{-4}) \div (1.9 \times 10^{-6}) =$

13. The Greenland Ice Sheet contains 2,850,000 cubic kilometers of ice. It is melting at a rate of 0.005% per year. How many cubic kilometers are lost the first year?

D. DIMENSIONAL ANALYSIS Dimensional analysis is simply the "unit cancellation" method. It is a way to convert a quantity given in one unit to an equal quantity of another unit by lining up all the known values and multiplying. In APES it is often an integral part of a larger word problem. Write out the full setup with units to see places to simplify the math. Tutorial

16. Sixty kilometers per hour = ? miles per hour
    (1 km = 0.62 mi)

17. A city that uses 34 billion BTUs of energy each month uses how many kilowatt-hours (kWh) of energy?
    (1 kWh = 3,400 BTUs)

18. A 2.5 million square mile forest is how many hectares?
    (1 square mile = 640 acres) (1 hectare (Ha) = 2.5 acres)

19. If one barrel of crude oil provides 1.6 million BTUs of energy, how many BTUs of energy will one liter of crude oil provide?
    (1 barrel of oil = 160 liters)

20. Fifty eight thousand kilograms of solid waste is equivalent to how many metric tons?
    (1 metric ton = 1000 kg)

21. 5 mm of rain falls in a 100 m^2 field.
    (1 cubic meter = 1000 liters) (1 gram water = 1 mL water)

    a. What volume of rain (in m^3) fell in the field?

    b. If 20% of that rain ran off into the city stormwater drains, how many liters would that be?

    c. How many kg?

22. Between 1950 and 2000, global meat production increased from 52 billion kilograms to 240 billion kilograms. During this period, the global human population increased from 2.6 billion to 6.0 billion.

    a. Calculate the per capita (per person) meat production in 1950 and in 2000.

    b. Use your answers to calculate the change in global per capita meat production during this 50-year period as a percentage of the 1950 value.

Percent Change

$$\text{Percent Change} = \frac{\text{New Value} - \text{Old Value}}{\text{Old Value}} \times 100\%$$

If the result is positive, it is an increase.
If the result is negative, it is a decrease.

23. A new offshore wind project will consist of 200 wind turbines, each with a capacity of 4 megawatts (MW). Each turbine costs $1.2 million to build. Electrical demand in the area to be served by the project is expected to be 2.0×10^6 MWh per year. (MWh = MW x hours)

    a. Calculate how much electricity (in MWh) the wind project needs to generate per year in order to provide 80% of the annual electrical demand in the service area.

    b. Customers in the service area pay $0.20/kWh for electricity. Calculate how much revenue will be produced if the wind turbines provide 80% of the annual electrical demand in the service area.

    c. Assuming all turbines are operating, calculate how many hours the wind turbines must operate to provide 80% of the annual electrical demand in the service area.