AP Environmental Science **Summer Assignment 2014**

READING ASSIGNMENT
Rogers, Heather. *Green Gone Wrong.* New York: Scribner, 2010.
Can purchase hardback, paperback, or e-reader edition.

*While reading this nonfiction book, be sure to look up any words you are unfamiliar with, annotate as needed, highlight meaningful quotes or passages, and notate any passages or information you do not understand.

PREREQUISITE KNOWLEDGE AND SKILLS
AP Environmental Science (APES) is a college level course that combines material from earth science, biology, chemistry, physics, math, and social studies. You are expected to enter the course with a good understanding of basic scientific and mathematical concepts and skills, as well as strong reading, writing, and speaking abilities. Although we will continue to develop these skills throughout the school year, your success in the class is also dependent upon what you bring to it at the onset. One goal of this assignment is to help you brush up on these skills and concepts. Review the concepts below as well as the mathematical calculations on the next page; we will be building upon and referencing them throughout the school year. You should be prepared to take a quiz on these skills during the first week of school. If you do not receive at least an 85% on the quiz, you will need to attend tutoring with me until you are able to achieve an 85%.

PREREQUISITE BASIC SCIENTIFIC CONCEPTS:
You should be familiar with the following terms/concepts from Biology, Chemistry, and Earth Science:

-Organic vs. Inorganic
-Natural vs. Synthetic
-Kinetic vs. Potential Energy
-Radioactive Decay
-Half-Life
-Law of Conservation of Energy
-1st Law of Thermodynamics
-2nd Law of Thermodynamics
-Entropy
-Organism
-Population
-Community
-Ecosystem
-Aerobic vs. Anaerobic Respiration
-Photosynthesis (reactants & products)
-Cellular Respiration (reactants & products)
-Gene
-Trait
-Chromosome
-Gene Pool
-Natural Selection
-Biodiversity
-Extinction
-Plate Tectonics
-Weathering
-Climate Change
-Climate vs. Weather
-Rocks vs. Minerals
-Producers/Autotrophs
-Consumers/Heterotrophs
-Decomposers
-Mutation
-The full name of each of these chemicals:
CO_2, CO, $C_6H_{12}O_6$, CH_4, H_2, H_2O, N_2, NO_X, NO_3, NH_3, O_2, O_3, P, PO_4^{-3}, S, SO_2, Cl, K, NaCl, Pb, Hg, Rn, U

PREREQUISITE BASIC MATHEMATICAL SKILLS (NOTE: You will NOT be able to use a calculator of any type on the AP Exam.)

Percentage
17% = 17/100 = 0.17
Remember that "percent" literally means divided by 100
Percentage is a measure of the part of the whole; or part divided by whole times 100
15 million is what percentage of the US population? 15 million/300 million = 0.05 x 100 = 5%
What is 20% of a $15 bill, so that I can leave a good tip? $15 x 0.20 = $15 x 20/100 = $3

Rates

Rise $Y_2 - Y_1$	Change	dx
Run $X_2 - X_1$	Time	dt

All of the above are ways to look at 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 driven 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 USA)
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 notation is often easiest to manipulate. For example, the US population is 300 million people or 300 x 10^6 or 3 x 10^8

When adding or subtracting, exponents must be the same. Add or subtract the numbers in front of the 10 and keep the exponent the same.

Example: $9 \times 10^6 + 3 \times 10^4 = 900 \times 10^4 + 3 \times 10^4 = 903 \times 10^4 = 9.03 \times 10^6$

When multiplying or dividing, multiply or divide the numbers in front of the 10 and add the exponents if multiplying or subtract the exponents if dividing.

Example: $9 \times 10^6 / 3 \times 10^4 = (9/3) \times 10^{(6-4)} = 3 \times 10^2 = 300$

Dimensional Analysis

You should be able to convert any unit into any other unit accurately if given the conversion factor. Online tutorials are available:

http://www.youtube.com/watch?v=KrDxGIhqP3s
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}

Math Problems

1. What is one million times one thousand? Show your work in scientific notation. Give the answer in scientific notation and words.

2. A population of deer had 250 individuals. If the population grows by 15% in one year, how many deer will there be next year?

3. One year I had 40 AP Environmental Science students and the next year I had 50 AP Environmental Science students, what percentage did the population of APES students grow by?

4. Electricity costs six cents per kilowatt hour. In one month, one home uses one megawatt hour of electricity. How much will the electric bill be? (Pay attention to units!)

5. Your car gets 20 miles to the gallon and your friend's car gets 25 miles to the gallon. You decide to go on a road trip to NCSU, which is 100 miles away. If gas costs $4 per gallon and you decide to split the gas money, how much money will you save in gas by driving your friend's car?

6. Virginia Beach is 10 miles wide and 30 miles long. If one inch of rain falls on Virginia Beach, how many cubic feet of rain fell on Virginia Beach? (1 mile = 5280 feet)

7. An MP3 player takes up about 25 kilobytes of memory per second of music. If you owned a 750 gigabyte hard drive and filled it with only MP3 files, how many days worth of music would you have? (Pay attention to units!)

8. Battery electric vehicles (BEVs) have been introduced to consumers as an alternative way to reduce the environmental effects caused by use of internal-combustion engine (ICE) vehicles. A comparison of both vehicle types can help determine whether the use of BEVs would be beneficial in the future. Where calculations are required, show your work.
   (a) Assume that the fuel efficiency of the ICE vehicle is 25 miles per gallon (mpg) and that gasoline costs $3.75 per gallon (gal). Calculate the cost of gasoline per mile.
   (b) The charger supplies energy to the BEV battery at an average rate of 4.0 kilowatts (kW) and fully charges the BEV battery in 7.0 hours. The car will run for 100 miles on a full charge. The cost of electricity is $0.11 per kilowatt-hour (kWh).
      (i) Calculate the cost of the electricity to fully charge the battery. Assume that the battery is not charged to begin with.
      (ii) Calculate the cost of electricity per mile to drive the BEV.

   When it is driven 100 miles, the ICE vehicle contributes 72.8 pounds (lb) of CO_2 from the burning of the gasoline. The drilling, refining, and transportation costs of getting the gasoline to the gas station add an additional 17.7 lb of CO_2 per 100 miles. The BEV does not emit any CO_2 itself, but the extraction, transportation, and combustion of the coal that produced the electricity at the power plant add 63.6 lb of CO_2 for the same 100 miles.
   (c) Calculate the difference in the amount of CO_2 that would enter the atmosphere if both cars were driven 100 miles.

9. $(9 \times 10^{-10}) \times (1 \times 10^{-6}) =$

10. $2.2 \times 10^{5} - 4.3 \times 10^{6} =$

11. $(9 \times 10^{-3}) \times (8 \times 10^{2}) =$

12. $1.8 \times 10^{3} + 8.5 \times 10^{5} =$

13. $(2 \times 10^{-16}) / (2 \times 10^{-10}) =$

14. $(7 \times 10^{-10}) / (1 \times 10^{0}) =$