AP Environmental Science Summer Work

Mrs. Groves

2017-2018

Instructions:

Welcome to AP Environmental Science! In preparation for the rigorous, rewarding year ahead of you, please join our google classroom group by entering the class code **xqpmn45**. I will be in communication with you over the summer via the google classroom page.

Your assignment:

1. Complete, study, and learn Part A: Basic Scientific Concepts and Part B: Basic Mathematical Skills of the attached Prerequisite Knowledge and Skills packet. You will NOT have a calculator to use on the AP exam, therefore you should not use a calculator while completing Part B. Note cards are suggested (for Part A). You will have a test on the concepts and skills covered in these sections during the first week of school.
2. Watch the movie The Lorax and be prepared to discuss the first week of school. Link: https://youtu.be/8V06ZOQuo0k

Good luck and email me with questions!

Best,
Mrs. Groves
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Prerequisite Knowledge and Skills (tested on first week of school)

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 year, your success in the class is also dependent upon what you bring to it at the onset. Over the summer, review the scientific concepts and mathematical calculations below. We will be building upon and referencing them throughout the year. This specific assignment will not be graded; however you should be prepared to take a quiz on these skills and concepts during the first week of school

This includes two parts: Basic scientific knowledge and Math Skills. Information to help you study for this test is on the next few pages.

Part A: 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 Matter
- 1st Law of Thermodynamics
- 2nd Law of Thermodynamics
- Entropy
- Organism
- Species
- Population
- Community
- Ecosystem
- Producers/Autotrophs
- Consumers/Heterotrophs
- Decomposers
- Photosynthesis (reactants & products)
- Cellular Respiration (reactants & products)
- Aerobic vs. Anaerobic
- Adaptation
- Mutation
- Gene
- Trait
- Chromosome
- Gene pool
- Natural Selection
- Biodiversity
- Extinction
- Plate Tectonics
- Weathering
- Climate Change
- Rocks vs. Minerals
- Climate vs. Weather

You will also need to know the full name of each of these chemical abbreviations: CO_2, CO, $C_6H_{12}O_6$, CH_4, H_2, H_2O, N_2, NOx, NO^-, NH_3, O_2, O_3, P, PO_4^{3-} S, SO_2, Cl, K, NaCl, Pb, Hg, U

Part B: Prerequisite Basic Mathematical Skills

You should also be prepared to perform mathematical calculation WITHOUT USING A CALCULATOR. You won't be allowed to use one on the APES Examination, so unless we are crunching data from a lab, we won't be using one in class, either. Sometimes these calculations are fairly simple and you can complete the problems in your head. However, the APES exam requires that you SHOW ALL WORK for credit for the calculations on the free-response questions. This worksheet is designed to assess your skills for the type of calculations you will encounter on the exam. Read through the following information and complete the following problems on a separate piece of paper. The problems are separated into sections that represent the various types of problems and operations you need to master. I encourage you to use dimensional analysis and to refrain from using a calculator to solve these problems because you will not be using a calculator in class. **This will NOT BE GRADED; however, there will be a test on the material the first week of school.**

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.
    - 15 million is what percentage of the US population? 15 million / 300 million = .05 = 5%
    - What is 20% of this $15 bill so that I can give a good tip? $15 x .20 = $15 x 20/100 = $3

Rates

Rise	Y_2-Y_1	slope	change	y=mx+b	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 mile per hour. The word per means to divide, so miles per gallon is actually the number 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 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 x 10^6 or 3 x 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. $9x10^6 / 3x10^2 = (9/3) \times 10^{(6-2)} = 3 \times 10^4$

Dimensional Analysis

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

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 (cent)	=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	$=10^{12}$

Scientific Notation

Practice by writing the following numbers in scientific notation:

1) One million
2) Forty eight thousand
3) 5878300
4) Six hundred
5) 0.015
6) 3950
7) 3 one thousandths
8) 0.2220
9) 1267
10) 0.0005

Convert the following to regular notation:

1) 2.45×10^4

2) 9.1×10^2

3) 7.5469×10^4

4) 1.970×10^5

5) 8×10^1

6) 8.556×10^1

7) 1.23456×10^7

8) 5.000×10^3

9) 9.444×10^2

10) 6.08×10^3

Use Scientific Notation (and only Scientific Notation) solve the following problems:

1) $(6.235 \times 10^{-8}) \times (6.7 \times 10^2) =$

3) $(2.34 \times 10^{-6}) \times (3.3 \times 10^4) =$

4) $(1.45 \times 10^6) \times (2.30 \times 10^{-3}) =$

5) $(9.81 \times 10^{12}) \times (4.02 \times 10^3)$

Dimensional Analysis

1) 8,640 mm -> cm

2) 175 lbs -> kg

3) 33.2 kg/L -> kg/mL

4) 3.8 Km/sec -> miles /year

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5) A 100 square mile area of National Park is how many acres? How many hectares?

6) A factory using four million BTUs of energy each month is using how many kilowatt-hours of energy?

7) Twelve hundred metric tons of solid waste is how many kilograms?

8) The total amount of freshwater on earth is estimated to be 3.73 x 108 km^3. What is the volume in cubic meters? In liters?

9) Traveling at 70 miles/hour, how many minutes will it take to drive 175 miles to San Antonio?

10) Joanna was trying to make her grandmother's cookie recipe but was not sure if her conversions were correct. (see below)

Percentages

1) If 35% of a natural area is to be developed, leaving 500 acres untouched, how many acres are to be developed?

2) If the concentration of mercury in a water supply changes from 65 ppm to 7 ppm in a ten-year period, what is the percentage change of the mercury concentration?

3) Fifteen million is what percentage of the U.S. population of 300 million?

4) What is 20% of a $34.80 bill so you can give a good tip?

5) Calculate the percentage growth rate for a country with a population of 6 million in a year in which it had 100,000 births, 70,000 deaths, 30,000 immigrants, and 50,000 emigrants.

Energy Problems

1) How much energy is required to raise the temperature of 1000 gallons of water by 25°C?

2) By how many degrees Fahrenheit can the temperature of one metric ton of water be raised with the addition of 110 thousand BTUs of heat?

3) How much energy, in kJ, does a 75 Watt light bulb use when it is turned on for 25 minutes.

Sample Math Problems

Be sure you are able to complete the following types of problems.

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

2) A population of deer had 200 individuals. If the population grows by 15% in one year, how many deer will there be the next year?

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

4) Electricity costs 6 cents per kilowatt hour. In one month one home uses one megawatt hour of electricity. How much will the electric bill be? (be sure to look at the prefixes chart on the previous page for the conversion of kilo to mega)

5) Your car gets 15 miles to the gallon and your friend's car gets 25 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 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. (Hint: convert all units to feet first).

7) An MP3 takes up about 16 kilobytes of memory per second of music. If you owned a one terabyte hard drive and filled it with only mp3s, how many days worth of music would you have? (keep track of units: kilobytes to terabytes and seconds to days)