

## PREREQUISITE KNOWLEDGE AND SKILLS

Your success in AP Environmental Science will depend in part on your background knowledge and skills. Below are listed terms and concepts from science that are considered background knowledge. Refresh your memory and review those as needed. We will use these and others to build a deep understanding of ecological relationships and humans' impact. Of equal importance, are your communication skills: reading, writing and presentation. Last is included a set of problems to polish math skills. Despite the changes to the exam format (you WILL be able to use a calculator), it is important to practice how to set up the problems and solutions.

**You should be prepared to take a quiz on the following during the first week of school.**

### PREREQUISITE BASIC SCIENTIFIC CONCEPTS

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

Organic vs. Inorganic	Photosynthesis (reactants and products)
Natural vs. Synthetic	Cellular Respiration (reactants and products)
Kinetic vs. Potential Energy	Aerobic vs. Anaerobic
Radioactive decay	Adaptation
Half life	Mutation
Law of Conservation of Matter	Gene
1 <sup>st</sup> Law of Thermodynamics	Trait
2 <sup>nd</sup> Law of Thermodynamics	Chromosome
Entropy	Gene pool
Organism	Natural Selection
Species	Biodiversity
Population	Extinction
Community	Plate Tectonics
Ecosystem	Weathering
Producers/Autotrophs	Climate Change
Consumers/Heterotrophs	Rocks vs. Minerals
Decomposers	Climate vs. Weather

The full name of each of these chemical abbreviations: CO<sub>2</sub>, CO, C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>, CH<sub>4</sub>,

H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, NO<sub>x</sub>, NO<sup>3-</sup>, NH<sub>3</sub>, O<sub>2</sub>, O<sub>3</sub>, P, P<sub>04</sub><sup>3-</sup>, S, S<sub>02</sub>, Cl, K, NaCl, Pb, Hg, Rn, U

## PREREQUISITE BASIC MATHEMATICAL SKILLS

### 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?  $15 \text{ million} / 300 \text{ million} = .05 = 5\%$
- What is 20% of this \$15 bill so that I can give a good tip?  $\$15 \times .20 = \$15 \times 20/100 = \$3$

### Rates

$$\frac{\text{Rise}}{\text{Run}} \quad \frac{Y_2 - Y_1}{X_2 - X_1} \quad \text{slope} \quad \frac{\text{change}}{\text{time}} \quad y = mx + b \quad \frac{dX}{dt}$$

- 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

$$\text{Thousand} = 10^3 = 1,000$$

$$\text{Million} = 10^6 = 1,000,000 \text{ (people in the US)}$$

$$\text{Billion} = 10^9 = 1,000,000,000 \text{ (people on Earth)}$$

$$\text{Trillion} = 10^{12} = 1,000,000,000,000 \text{ (National debt)}$$

- When using very large numbers, scientific method is often easiest to manipulate. For example, the US population is 300 million people or  $300 \times 10^6$  or  $3 \times 10^8$
- 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

$$\text{Ex. } 9 \times 10^6 / 3 \times 10^2 = (9/3) \times 10^{(6-2)} = 3 \times 10^4$$

### Dimensional Analysis

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

<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	= $10^{12}$

**SAMPLE MATH PROBLEMS**

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

- 1) What is one thousandth divided by one thousand? Show your work in scientific notation. Give the answer in scientific notation and in words.
  
- 2) A population of green frogs in a local pond had 20 individuals. If the population grows by 5% in one year, how many frogs will there be the next year?
  
- 3) One year I had 18 AP Environmental Science students and the next year I had 21 Environmental Science students, what percentage did the population of APES students grow by?
  
- 4) Electricity costs 5 cents per kilowatt hour. In one month one home uses 1.25 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 20 miles to the gallon and your friend's car gets 35 miles to the gallon. You decide to go on a road trip to Atlantic Beach, NC which is 450 miles away. If gas costs \$3 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) The OAHS soccer field is approximately 120 yards by 80 yards. If one inch of rain falls on the field, how many cubic feet of rain fell on the field? (Hint: convert **all** units to feet first)