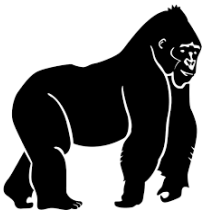
Welcome to AP Environmental Science!!

I am so excited that you've decided to take APES in the 2020-2021 school year. Yes, we will from now on often refer to it as APES, because there has never been a better acronym for something ever. Environmental science is an engaging, relevant, hands-on subject, but also a very broad topic. In order to cover all of the topics and skills necessary for the AP test, there is a summer assignment that you need to complete before school starts. Since some of you have never taken an environmental science course and biology may have been quite a while ago, this will help refresh your memories and we can start the year of with everyone on the same page. It will also be a way to start getting excited about the subject and an excuse to get out in nature!



1) The first assignment is to review some of the basic concepts that we will be using throughout the year. You should have already been introduced to these concepts in previous science & math classes, but you should have a strong grasp of them so that you are ready to apply them. There will be a first day test covering these topics so be prepared! I encourage you to email me if you are having trouble with any of the concepts as you work on them! Quizlet will have a set of the vocabulary list and root words as well, and there is a "Quiz Up" game that you can play to practice as well. I will also be at school probably every day for the 1-2 weeks before the first day of school if you need to email me. How you complete this part of the assignment is up to you. You are just expected to understand the definitions of each of these terms and how to do the basic calculations. You can write out all the definitions, make graphic organizers to help you understand groups of the terms, practice them on Quizlet, etc. You do not need to turn anything in for this part, just be ready for questions regarding them on the **first day test**.

Prerequisite Vocabulary

Adaptation	Chromosome	Gene pool	Photosynthesis
Aerobic	Climate	Habitat	Plate tectonics
Anaerobic	Community	Heterotroph	Pollution
Autotroph	Conservation	Kinetic energy	Population
Biodiversity	Consumer	Latitude	Potential energy
Biomass	Decomposer	Law of Conservation of Matter	Producer
Biome	Ecosystem	Mutation	Toxic
Biosphere	Food web	Natural selection	Trait
Carrying capacity	Fossil fuel	Niche	Trophic level
Cellular respiration	Gene	Organism	Weather

Common SI Units of Measurement

Length	meter (m)
Mass	gram (g)
Time	second (s)
Temperature	Kelvin (K) ***note there is NO degree symbol!!*
Volume	liter (L)
Energy/Work	joule (J)

SI prefixes

giga-	10^9	G-	nano-	10^{-9}	n-
mega-	10^6	M-	micro-	10^{-6}	μ-
kilo-	10^3	k-	milli-	10^{-3}	m-

hecto-	10^2	h-	centi-	10^{-2}	c-
deka-	10^1	da-	deci-	10^{-1}	d-

Prerequisite Math Skills

Accuracy and Precision

Two important aspects of scientific measurements are **accuracy** and **precision**. These terms are sometimes used interchangeably, but in fact have very different meanings:

Accuracy is how close a measured value is to the actual value
Precision is how close multiple measurements are to each other

To illustrate the differences between these two concepts, observe the dartboard examples below:

Low accuracy, but
High precision!

High accuracy, but
Low precision!

High accuracy &
High precision!

In words, if your measurements are *inaccurate*, it means that they are not close to what the actual value is. For example, a piece of wood that is actually 1.3 meters long is measured as being 1.74 meters long. If your measurements are *imprecise*, it means that when you perform the same measurement multiple times, you get different answers. For example, if three people measured the length of the same piece of wood and got 1.74 m, 1.25 m, and 1.13 m. In science, it is important to use laboratory practices that ensure both accuracy & precision, and to be able to identify when your data are inaccurate and/or imprecise. Accuracy means your measurements are close to the real value, and precision is showing that your measurements are consistent.

Scientific Notation

Scientists often express figures in *scientific notation* in order to easily work with numbers of small and large magnitude, and easily express the number of significant digits. The anatomy of a number in scientific notation is as follows:

$$4.6 \times 10^5$$

Coefficient — Base — Exponent

To convert a number written in standard form to scientific notation, place the decimal immediately after the first digit of the number, and drop all non-significant zeroes (review significant figures if needed…). This becomes the coefficient.

Example 1: 85,000 → 8.5

Example 2: 0.000004021 → 4.021

Next, count the number of places the decimal has been moved, remembering that for a number that does not have a decimal you assume it to be at the very end (on the right). This number will become the exponent. (The base will ALWAYS remain a 10.) If you moved the decimal to the **left** then the exponent will be positive; if you moved the decimal to the **right** then the exponent will be negative.

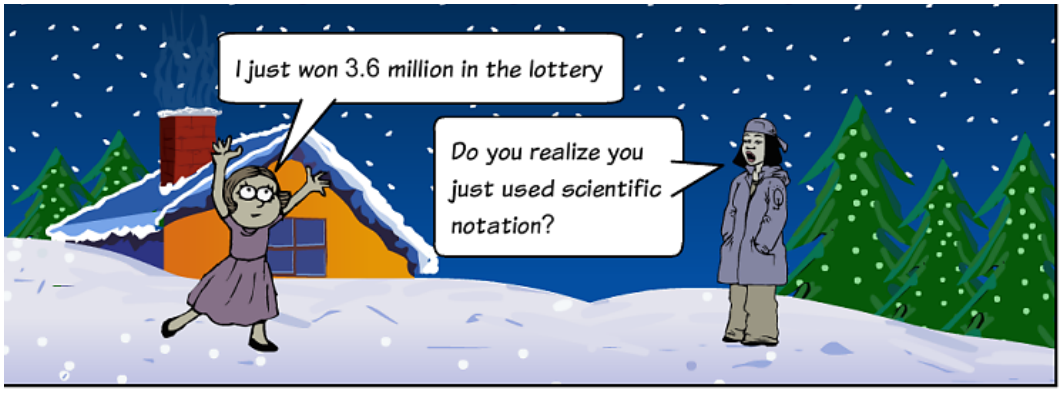
Example 1: Decimal moved 4 places to the left, so exponent is 4. 85,000 → 8.5×10^{4}

Example 2: Decimal moved 6 places to the right, so exponent is -6. 0.000004021 → 4.021×10^{-6}

A number in scientific notation will enable you to write a very large or very small number in a much more concise form. Compare 34,000,000,000,000,000 to 3.4×10^{16} ! One of the first math skills we will practice next year will be doing basic math in scientific notation as well.

To convert a number in scientific notation back to standard form, write the coefficient without the decimal. If the exponent is a positive number, move the decimal that many places to the right, adding zeroes as needed. If the exponent is a negative number, move the decimal to the left that many places, adding zeroes as needed. **Please note that you are moving the decimal a certain number of places, not just adding that number of zeroes!**

Example 1: 7.21×10^{5} → 721,000 Example 2: 9.205×10^{-3} → 0.009205



Math Calculations

Addition & Subtraction: Hopefully you remember the basics!

Multiplication & Division: It will be more common to see multiplication than addition and subtraction in APES!

Percentage: Percent means “for every 100” or "out of 100." The (%) symbol as a quick way to write a fraction with a denominator of 100. As an example, instead of saying "it rained 14 days out of every 100," we say "it rained 14% of the time." Since percentages are often thought of as parts of a larger whole thing, there can a tendency to divide instead of multiply when faced with a problem such as "find 35% of 80." An important tip is to remember that the word “of” always means “multiply”. An understanding of percent also allows you to estimate to check whether your answer is reasonable. In this example, knowing that 35% is between one-quarter and one-half would mean the answer should be somewhere between 20 and 40.

As a percent is a fraction of a whole (the whole is always 100%) it can be written as a decimal. To write a percentage as a decimal simply divide it by 100 (or move the decimal two places to the left). 50% becomes 0.5; 20% becomes 0.2; 1% becomes 0.01 and so on. We can calculate percentages using this knowledge: 50% is the same as a half, so 50% of 10 is 5 because five is half of 10 (10 ÷ 2). The decimal of 50% is 0.5. So another way of finding 50% of 10 is to say 0.5 x 10. Another example: 17.5% of 380 = 380 × 0.175 = 66.5.

You need to be comfortable with the following types of problems:

1) Finding a given percent of a number. Ex: What is 45% of 2,500?

   To solve this kind of problem, remember that the word "of" means multiply, and that the % symbol means "divide by 100". So, 45% of 2,500 is 45/100 x 2,500 or 0.45 x 2,500 = 1,125. Remember to check your answer for reasonableness. You know that 45% is a little under ½. 2,500 / 2 = 1,250. So 1,125 is a reasonable answer.

2) Determining what percent of a whole that a number is. Ex: 54 is what percent of 75?

   For this problem, think of it as an algebra problem and remember, "of" means multiply. So, 54 = ? x 75. To solve for the unknown, we need to divide 54/75 = 0.72 which converts to 72%. Again, think about whether this is reasonable. You know that 50 would be 2/3 or 67% of 75, so it is reasonable that 54 would be 72%.

3) Solving for the whole when given a percent and the part. Ex: You have 15 pencils remaining, which is only 30% of the amount you originally had. How many were there originally?

   Again, set this up as an algebra problem, remembering how to convert a percent into a decimal. So, 15 = 0.30 x ? This means we need to divide 15/0.30 = 50. Does this answer make sense? First of all, our answer should be larger than the amount remaining, and it is. Another way to check that it makes sense is to think about how 50 x 2 = 100 and 15 x 2 = 30.

3) Understanding vocabulary terms is a key skill in science. Instead of memorizing thousands of individual terms, learning the Latin and Greek roots can help you to decipher the meaning of many different terms, even ones that you've never seen before. This is not just useful for understanding science vocabulary, but also many words in the English language as well as other romance languages. For each of the following common roots, look up the definition of the root, find an example word that includes that root, and define that word. Useful websites to try: macroevolution.net and learnthat.org. Your example words do not all have to be specifically science related. For the first day test, be prepared to match roots with definitions (there are some that overlap; I won't give you both of those in the same section) and be able to define a word (real or made up) based on its roots. This chart is due handwritten on the first day of school.

Root	Definition of Root	Example Word	Definition of Example Word
a(n)-			
-able			
aero-			
agri-			
amphi-			
anthro-			
anti-			
arch(ae/i)-			
-ase			
auto-			
bi- bio-			
carcin-			
cen-			
co-			

com-/con-			
de-			
di-			
eco-			
ecto-/exo-			
endo-			
extra-			
foli-			
-gen-			
geo-			
herb- hetero-			
homo-			
hydr-			
hyper-			

hypo- inter- intra- macr- micr- mono- multi- mut- non- photo-			
pre-			
sol-			
sub-			
sym/syn- terr-			

therm-			
tox-			
trans-			
troph-			
turb-			

4) Common chemical elements, ions, and compounds should be recognized quickly. For each of the following 20 formulas, determine its name, and identify what type of substance it is. For the first day test, be prepared to give the name for the formula or vice versa. Due handwritten the first day of school.

Chemical Formula	Name	Element, Compound, or Ion?
C		
CH_4		
Cl		
CO		
CO_2		
H_2		
H_2O		
Hg		

K		
N_2		
NO_3^-		
O_2		
O_3		
P		
Pb		
PO_4^{3-}		
Rn		
S		
SO_2		
U		

5) Environmental Scavenger Hunt! The goal of this part of the assignment is to experience some nature, start thinking about your role and interaction with the environment, introduce yourself to me and the class, and just have fun! There are a variety of possibilities that I hope you will find enjoyable. You should pick at least **TWO** different experiences to complete this assignment, and they must be from different categories. (You can't do two trips to the farmer's market for example!) Each experience needs to be documented separately, but can be completed on the same trip (camping overnight then going for a nature hike the next day for example). You should keep electronics to a minimum during these experiences- consider leaving your phone at home and taking a good old fashioned camera with you, and don't listen to music but rather the sounds of nature. You can use experiences while on vacation, or close to home. Feel free to meet up with others in the class to do an experience together (but you each need to document the experience separately).

Expectations:

1. Each activity must be documented by providing picture evidence.
   - You must appear in your picture (not just your hand etc. I must be able to identify you)
   - Feel free to be creative in what/how you document the experience

Each activity must have a 1-2 paragraph reflection answering the following questions. This can be typed and submitted via www.goformative.com 76WL7U Under Environmental Scavenger Hunt Reflections

2. . This is due by the second day of school. Don't worry if you can't figure out goformative: I'll help on the first day.
   - Which activity (use the number from the list), when, and where
   - Sensory description (what did you see, hear, smell, feel, taste) trying to pay attention to details that you might not have noticed otherwise
   - Was the experience a new one for you or something you've done before? How did the experience reinforce/change your outlook on nature etc.?

3. You will share about the experiences at the beginning of the school year. This can be in the form of a PowerPoint/Prezi, scrapbook, blog post, video, etc. This will be a way of getting to know each other the beginning of the year. These presentations will take place throughout the first two weeks of school, and you won't know when it will be your turn so it should be ready to go on the second day of school! A presentation should be 3-5 minutes long only. The idea of the presentation is to help us get to know your personality so have some fun with it! *Note- you don't need to include the paragraph reflection in your presentation- that is turned in separately!*

Scavenger Hunt Options

1. Fishing- whether you are experienced or a novice, head to a lake, pond, stream, or even the deep sea on vacation and see what you catch. Please note you must have a picture of you ACTUALLY CATCHING something for this to count. You can choose to eat your catch or do catch and release. You do not need a fishing license as long as you are under 18.

2. Camping- spend at least 1 night sleeping outside in a tent (or if it is nice no tent!). This can even be in your own backyard. Cabins/cottages do not count for this activity. If possible, build a campfire and try cooking a meal over it!

3. Non-motorized water activity- paddle boarding, canoeing, river rafting, sailing, paddle boating, even surfing if it is available to you! Local possibilities: Piny Lake run by UNCG Recreation, Salem Lake, Oak Hollow Lake, Nantahala (a little further), US National Whitewater Center (Charlotte).

4. Beachcombing- Wander a beach and search for interesting shells, various algae, different types of sand, etc. Compare what you find at two different beaches! Should have photo evidence of at least 4 unique, natural items found. This is great for a vacation option.

5. Nature hike- explore an area of woods or wetlands while focusing on nature. Look high and low, stop to listen to the sounds, and occasionally stand perfectly still to see if you observe anything that you might miss otherwise. Should have photo evidence of at least 4 unique, natural items found. Local Options include the Greenway Trail, Hanging Rock State Park, Grandfather Mountain, and almost everywhere!

6. Farmer's market- visit a farmer's market and find a food you've never tried before. Find out where the farmers are from and how far they've traveled to bring their food to the market. Compare the prices at the market with prices in your grocery store. Are there foods offered at the market that are not offered in the store? What other goods besides fruits and vegetables are available? Local options: Old Salem Farmer's Market, Piedmont Triad Farmers, Market, the Curb Market but you could also visit one in another location on vacation and compare!

7. Bike trip- variation on a nature hike, this time on wheels. Do a countryside tour, follow a greenway, or do trail riding. Local options- The Greenway Trail, Salem Lake, US Whitewater Center (Charlotte).

8. Gardening experience- whether you plant a small plot of land or try out container gardening, flex your green thumb a bit! Herbs, tomatoes, zucchini, peppers, or salad greens are good ones to try. Pick items you enjoy the most to see if you can grow your own instead of buying them. Try making a salsa garden and making your own salsa! Document your progress throughout the endeavor, and if you are successful you could even bring in some of the fruits of your labor.

9. Park exploration- Visit a State or National Park. What natural features are found in the park that make it important to preserve? Learn about the ecosystem of the area through visiting the park welcome center or nature center or reading the brochures.

10. Nature art- If you are an amateur artist, take your art outdoors. Create a watercolor, sculpture, drawing, or photography of nature. Go macro (landscapes) or micro (details of things like moss, tree bark, etc. are fascinating!) Try something different from what you usually attempt!

11. Zoo/nature preserve/wildlife center visit- Explore a new place or go someplace you've been before. Local options include the Greensboro Science Center, Piedmont Environmental Center, North Carolina Zoo, and more. Take a guided tour or interact with the staff to learn more about the operation of the facility.

12. Environmental volunteer experience- Many parks and community organizations welcome volunteers to assist with trail maintenance, litter removal, etc. Inquire with a park office if you can volunteer. Other possibilities could be through the County Recycling Center, a local farm, or other locations mentioned in other categories.

13. Composting- Start your own compost pile. Can be an open pile, a small bin, or vermicomposting. Document how much wastes your family is able to reduce, and how the compost breaks down over time.

14. Other approved activity- think of something else that doesn't fit in any of these categories? Just ask!