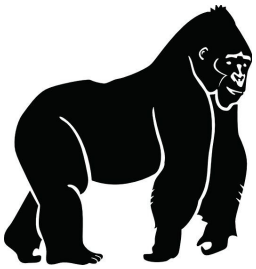
Welcome to AP Environmental Science!!

We are so excited that you've decided to take APES in the 2019-2020 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. This year, you will have one of two teachers for this course: Mrs. Hickman or Mrs. Watts.



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 you may have taken biology 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) Your first assignment is to complete the following questions AND email the answers to both of us at leslie.hickman@dsisdtx.us and nicole.watts@dsisdtx.us :

- Why you are taking APES?
- What you are most looking forward to?
- What you are most nervous about?
- What questions do you have about the course?
- What questions do you have for me to get to know us better?

2) The next 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 and math classes, but you will need to have a strong grasp of them and be are ready to apply them at the start of the school year. There will be a first day test covering these topics, so be prepared! We encourage you to email us if you are having trouble with any of the concepts as you work on them. You are 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, 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
Aerobic
Anaerobic
Autotroph
Biodiversity
Biomass
Biome
Biosphere
Carrying capacity
Cellular respiration
Chromosome
Chromosome
Climate
Community
Conservation
Consumer
Decomposer
Ecosystem
Food web
Fossil fuel
Gene
Gene pool
Habitat
Heterotroph
Kinetic energy
Latitude
Law of Conservation of Matter
Mutation
Natural selection
Niche
Organism
Photosynthesis
Plate tectonics
Pollution
Population
Potential energy
Producer
Toxic
Trait
Trophic level
Weather

Common SI Units of Measurement

What is being measured	Unit Name	Unit Symbol	What is being measured	Unit Name	Unit Symbol
Length	meter	m	Amount of substance	mole	mol
Mass	gram	g	Volume	liter	l
Time	second	s	Energy/Work	joule	J
Temperature	Kelvin	K **note there is NO degree symbol!			

SI prefixes

Factor	Name	Symbol	Factor	Name	Symbol
giga-	10^{9}	G-	nano-	10^{-9}	n-
mega-	10^{6}	M-	micro-	10^{-6}	μ-
kilo-	10^{3}	k-	milli-	10^{-3}	m-
hector-	10^{2}	h-	centi-	10^{-2}	c-
deka-	10^{1}	da-	Deci-	10^{-1}	d-

Prerequisite Math Skills

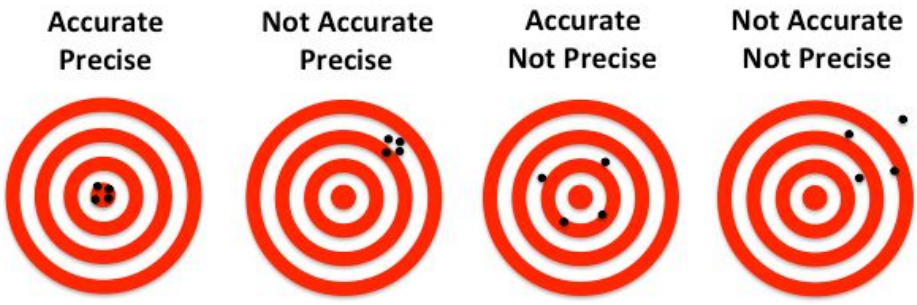
Accuracy and Precision

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:



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, 1.24 m, and 1.14 m. In science, it is important to use laboratory practices that ensure both accuracy and 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 zeros (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 by Hand

Addition & Subtraction: Hopefully you remember the basics! Here's some tips to remember:

1) The order doesn't matter for addition, but does for subtraction. You can add a series of numbers in whatever order is most convenient and you will still get the same answer.

2) Remember that when you subtract a negative number, it is the same as adding it.

3) It is important that you line up numbers vertically so that the ones place match, tens place match, etc. This is especially important with numbers that have different magnitudes. Often it is easiest if you arrange them from largest to smallest:
3.14 + 57.8 + 0.046 □ 57.8

$$\begin{array}{r} 3.14 \\ +\ 0.046 \\ \hline 60.986 \end{array}$$

4) Don't forget to carry/borrow (regrouping) properly!!

5) For some "shortcut" advanced hints check out:
http://www.mathsisfun.com/numbers/addition-tips-tricks.html,
http://www.mathsisfun.com/numbers/subtraction-by-addition.html, and
http://www.mathsisfun.com/numbers/subtraction-quick.html but if these just confuse you ignore them!

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

1) Spend some time reviewing your times tables. You don't want to miss points because you thought 7 x 8 = 54 or 6 x 5 = 25.

2) Remember that you can do multiplication in any order and get the same answer. So if you are multiplying 42 x 5,713 it makes more sense to write it like this:

$$\begin{array}{r} 5{,}713 \\ \times\ \ 42 \\ \hline \end{array}$$

3) If there are zeros at the end, leave them off and then add them back in at the end. For example if you are multiplying 24,500 x 420 set it up as 245 x 42 = 10,290 then add the 3 zeroes to the end to get the answer of 10,290,000. If you leave the zeroes in, you are likely to get mixed up as you try to work the problem. (We will solve this in an easier way later on by using scientific notation!)

Long division: You have probably forgotten how to do this. Here are some tips!

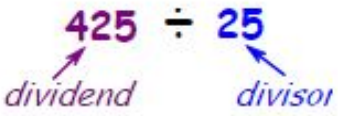
1) Set it up properly! The number you are starting with (called the dividend) goes inside the symbol and the number you are dividing it by (called the divisor) goes to the left on the outside.

2) If there is a decimal point in the dividend, the decimal in the answer will be immediately above it. If there is no decimal point in the dividend, you should put it at the end of the number.

3) Work from the left to the right. If the divisor doesn't go into the first digit, just put a zero as a place holder above and move to the next digit.

4) Full process from mathisfun.com:

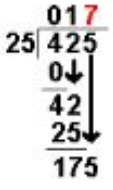
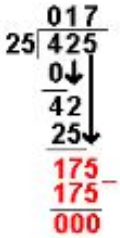
Let's see how it is done with:



- the number to be divided into is called the dividend
- The number which divides the other number is called the divisor

And here we go:

25⟌425	4 ÷ 25 = 0 remainder 4	The first digit of the dividend (4) is divided by the divisor.
0 25⟌425		The whole number result is placed at the top. Any remainders are ignored at this point.
0 25⟌425 0	25 × 0 = 0	The answer from the first operation is **multiplied** by the divisor. The result is placed under the number divided into.
0 25⟌425 0 4	4 − 0 = 4	Now we **subtract** the bottom number from the top number.
0 25⟌425 0↓ 42		Bring down the next digit of the dividend.
0 25⟌425 0↓ 42	42 ÷ 25 = 1 remainder 17	**Divide** this number by the divisor.
01 25⟌425 0↓ 42		The whole number result is placed at the top. Any remainders are ignored at this point.
01 25⟌425 0↓ 42 25	25 × 1 = 25	The answer from the above operation is **multiplied** by the divisor. The result is placed under the last number divided into.

	42 − 25 = 17	Now we **subtract** the bottom number from the top number.
		Bring down the next digit of the dividend.
	175 ÷ 25 = 7 remainder 0	**Divide** this number by the divisor.
		The whole number result is placed at the top. Any remainders are ignored at this point.
	25 × 7 = 175	The answer from the above operation is **multiplied** by the divisor. The result is placed under the number divided into.
	175 − 175 = 0	Now we **subtract** the bottom number from the top number.
		There are no more digits to bring down. The answer must be 17

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 - as 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 to be completed and due on the first day of school!

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

chem-			
chlor-			
chrom-			
chron-			
-cid-			
circ-			
co-			
com-/con-			
contra-			
de-			
derm-			
di-			
dorm-			
dys-			
eco-			
ecto-/exo-			
endo-			
epi-			
eu-			
extra-			
foli-			
-gen-			
geo-			
herb-			

hetero-			
homo-			
hydr-			
hyper-			
hypo-			
inter-			
intra-			
iso-			
lign-			
lysis-			
macr-			
micr-			
mono-			
multi-			
mut-			
neo-			
non-			
para-			
photo-			
poly-			
post-			
pre-			
pro-			
re-			

semi-			
sol-			
sub-			
super-			
sym/syn-			
terr-			
therm-			
tox-			
trans-			
troph-			
turb-			

4) Common chemical elements, ions, and compounds should be recognized quickly. For each of the following, determine its name, identify what type of substance it is, and how it is important to environmental science (e.g. common pollutant, source of energy, etc.) For the first day test, be prepared to give the name for the formula or vice versa. (*Due first day as well*)

Chemical Formula	**Name**	**Element, Compound, or Ion?**	**Importance to Environmental Science**
C			
$C_6H_{12}O_6$			
CH_4			
Cl			
CO			
CO_2			
H			
H_2			

H_2O			
Hg			
K			
N			
N_2			
NaCl			
NH_3			
NO_3^-			
O			
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, and just have fun! Find and take a "selfie" with each item. Write a brief description to go with the selfie. Create a google slideshow with the images and descriptions. You need to be in the shot! No taking images off the internet! Each object can only count for one item on the list, but you have choices. You have two options to earn credit:

Option A:

a) Take a selfie – you in an ecosystem. Description should include: type of ecosystem; type of biome ecosystem is part of; location of ecosystem; 3 abiotic factors and 3 biotic factors: Example of adaptations organisms have to be able to survive in this ecosystem

AND

b) Choose any 30 items from the list below and take a selfie then write appropriate descriptions for EACH item. Remember each object (selfie) can count only for one item on the list! You cannot use items from your ecosystem as any of the 30 items!

Option B:

Take a selfie and write appropriate description for 40 items on the list below. REMEMBER each object (selfie) can count only for one item on the list!

Example of description to go with selfie (should be on slide with photo):

The bee in the photo below is serving as a (19) pollinator. The bee will move from flower to flower feeding on nectar the plant has to offer. As the bee feeds on the nectar it will rub up against the pollen produced by the flower's stamen. Some of the pollen will adhere to the bee's body. When the bee moves to a new flower, some of the pollen attached to its body will stick to the sticky stigma of the female's pistil on the new flower. This is known as cross pollination, where the pollen of one flower is used to fertilize the egg of a different flower.

Scavenger Hunt List:

1. Sedimentary Rock	26. A lake, sea, river, pond, or Ocean
2. Tragedy of the Commons	27. Climate
3. Traditional Agriculture	28. Weather
4. Organic Produce	29. Turbidity
5. Fertilizer	30. Carbon Footprint
6. Example of REUSE	31. Your favorite animal
7. Example of RECYCLE	32. Electricity
8. Solar Panel	33. A population
9. Windmill	34. A community
10. A sustainable farming practice	35. Composting

11. National Park or Reserve	36. Hazardous Waste
12. Dike, Levee, or Dam	37. E waste
13. A way to reduce car emissions	38. Livestock
14. Primary Producer	39. Biomass
15. Primary Consumer	40. Hybrid Car
16. Secondary Consumer	41. Adaptation of a species that helps it survive in its environment
17. Someone else using a reusable shopping bag	42. A way to reduce the amount of plastic in the ocean.
18. An Effect of Climate Change	43. A way to conserve water
19. A pollinator	44. Soil
20. Erosion	45. A way to reduce food waste
21. An environmental problem	46. Another sustainable farming practice
22. A green roof	47. A Genetically engineered food
23. A home or community garden	48. An insect
24. Water Pollution	49. An example of seed dispersal
25. Air Pollution	50. You doing the math intro part of the summer assignment.