Name _____ Period ___

AP ENVIRONMENTAL SCIENCE 2017-18

Summer Assignment – Math!

APES students have a wide range of math skills coming into the class and certain "basics" will be assumed as we move through the year. Most students find some part of the math challenging (from the scientific notation, to always writing out the set-up of the problem with units, to remembering their multiplication facts!) All of the concepts on this sheet will be used repeatedly over the course of the year, and all will be done without calculators. Really. (The AP exam doesn't allow calculators either, in case you were wondering.) If you have any hesitation on any part of this review, you will need to do some independent work with whatever resources you find most helpful. This will be **due on the first day of class**, Friday, August 11.

Contents : Decimals, Percentages, Metric Units, Scientific Notation, Dimensional Analysis

DIRECTIONS

1. For this assignment, you'll need to **show me all your work done by hand**, even if it's something really simple. This is both to practice without using a calculator, and to practice making it legible enough for me. **Please do all your work on a separate sheet of paper**.
2. In problems involving unit conversions, always show the full initial set-up WITH UNITS. On the APES exam, the set-up with units is required (not your multiplication or division work) so it will be required on all your assignments, labs, quizzes, and tests as well – and worth half of the points.
3. Check your work. Go back through each step to make sure you didn't make any mistakes in your calculations. Also check to see if your answer makes sense. For example, a person probably will not eat 13 million pounds of meat in a year. If you get an answer that seems unlikely, it probably is. Go back and check your work.

WORKING WITH DECIMALS

*During the year, you will only be required to show the set-up for a problem, but for this assignment, I want to see that you can do multiplication and long division, so please **write out all of your work**.*

1. 138.93 x 13 =
2. 42.4 x 6.78 =
3. 92.5 / 5 =
4. 112.85 / 31.5 =

WORKING WITH PERCENTAGES

Still show all of your work.

5. What percentage of 192.5 is 26?
6. Thirteen percent of a 12,000 acre forest is being logged. How many acres will **NOT** be logged?
7. You drive 180 miles per day for five days on a 3000 mile trip. What percentage of the trip have you traveled?
8. You invest $5,000 in stocks and they earn 3% interest per year for 3 years. Had the stock market investment earned 4% per year interest during this time, how much more money would you have had?
9. A water heater tank holds 280 gallons. Twenty percent of the water is lost as steam. How many gallons *remain* to be used?
10. 240 acres, or 15%, of a forest is being logged. How large is the forest? At this rate of 15% being cut each year, assuming no replanting, how long would it take until there is less than 50acres of forest left?

METRIC UNITS

Although in the United States English units are more common and familiar, scientific research is almost exclusively done in metric units and many of our calculations reflect this. The main point here is to show me you know how to figure these, not just to have the right answer. (I want to see your set-up with units cancelling.) Mega=1 million, kilo = 1000, milli = 0.001 and micro = 1 x 10^{-6}

11. 1400 millimeters = ? meters
12. 12000 kilograms = ? grams
13. 100 megawatts = ? kilowatts
14. (note: this is squared) 12 m^2 = ? mm^2

SCIENTIFIC NOTATION

Many calculations in APES deal with large numbers, and keeping track of rows and lines of zeroes is, as you know, risky. Please refamiliarize yourself with how to multiply and divide with scientific notation.
Write the following numbers in scientific notation, and then complete the calculations below.

15. 145,000,000,000
16. 13 million
17. 435 billion
18. .000348

Calculate

19. 1.3 x 10^8 X 2.3 x 10^4
20. one thousandth of seven thousand
21. 3.6 x 10^9 / 9 x 10^3
22. 1.9 x 10^{-4} / 1.9 x 10^{-6}

23. The Greenland Ice Sheet contains 2,850,000 cubic kilometers of ice. It is melting at a rate of .006% per year. How many cubic kilometers are lost the first year? If the surface area of the ocean is 3.6 million square kilometers, how many mm would sea level rise from this amount of ice melting in year 1?

DIMENSIONAL ANALYSIS PLUS

Dimensional analysis is a way to convert a quantity given in one unit to an equal quantity of another unit by lining up all the known values and multiplying. In APES it is often an integral part of a larger word problem, and there are often multiple ways to do the conversions. Just be sure that you see what you have to start with, and what you want to end with, and don't ignore or make up a unit to make it work! (Write out full set-up with units to see places to simplify the math.)

Conversions:

1 km = 0.62 mi
1 square mile = 640 acres
1 hectare (Ha) = 2.5 acres
1 kWh = 3,400 BTUs
1 barrel of oil = 160 liters
1 metric ton = 1000 kg
1 cubic meter = 1000 liters
1 gram water = 1 ml water

24. Fifty kilometers per hour = ? miles per hour
25. A city that uses 28 billion BTUs of energy each month is using how many kilowatt-hours (kWh) of energy?
26. A 3.5 million square mile forest is how many hectares?
27. If one barrel of crude oil provides 1.6 million BTUs of energy, how many BTUs of energy will one liter of crude oil provide?
28. Eighty five thousand kilograms of solid waste is equivalent to how many metric tons?
29. If 4 mm of rain falls in a 200 m^2 field, what volume of rain, in m^3, fell in the field?
30. If 20% of that rain ran off into the city stormwater drains, how many liters would that be? How many kg?
31. Between 1950 and 2000, global meat production increased from 52 billion kilograms to 240 billion kilograms. During this period, the global human population increased from 2.6 billion to 6.0 billion. Calculate the per capita meat production in 1950 and in 2000. (per capita is amount per person)
32. Use your answers from #31, to calculate the change in global per capita meat production during this 50-year period as a percentage of the 1950 value.