**Advanced Placement Environmental Science (AP ENVR)**

**Belleville High School**  
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**Prerequisite knowledge and skills:**

**Assignment II: Study guide**

This assignment serves to prepare you 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. There will be several QUIA quizzes on this material that will be posted.

**Scientific Concepts:**

**Chemistry:** The full name of each of these chemical abbreviations:

1. CO2
2. CO
3. C6H12O6
4. CH4, H2
5. H2O
6. N2
7. NOX
8. NO3-
9. NH3
10. 02
11. 03
12. P
13. P043
14. S
15. S02
16. Cl
17. K
18. NaCl
19. Pb
20. Hg
21. Rn
22. 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 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 Y2-Y1 slope change y=mx+b dX

Run X2-X1 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 = 103 =1,000

Million = 106 =1,000,000 (people in the US)

Billion = 109 =1,000,000,000 (people on Earth)

Trillion = 1012 =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 300xl06or 3xl08
* 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. 9xl06/ 3xl02 = (9/3) x 10(6-2) = 3 x 104

**Prefixes**

m (milli) =1/1000 =10-3

c (cent)=1/100 = 10'-2

k (kilo)=1000=103

M (mega)=1,000,000=106

G (giga)=1,000,000,000=109

T (tera)=1,000,000,000,000 =1012

**Math Problems – Complete the following math problems you may print out this assignment and hand in the first day of school**

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 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)

**Scientific Notation**

Write 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 x 104

2)      9.1 x 102

3)      7.5469 x 104

4)      1.970 x 105

5)      8 x 101

6)      8.556 x 101

7)      1.23456 x 107

8)      5.000 x 103

9)      9.444 x 102

10)   6.08 x 103

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

1)      (6.235 x 10-8)x(6.7 x 102) =

2)      (2.456 x 104)x(1.436 x 1013)=

3)      (2.34 x 10-6)x(3.3 x 104)=

4)      (1.45 x 106)x(2.30 x 10-3)=

5)      (9.81 x 1012)x( 4.02 x 103)

**Significant Figures**

How many significant figures are in the following numbers? What rule(s) did you use to determine the number?

1)      30

2)      66000

3)      0.4

4)      968

5)      9050

6)      0.078

7)      0.007040

8)      1.7 x 106

9)      20006.0

10)   0.007

**Solve the following using the correct number of significant figures:**

1)      ( 3.682445 x 10-1)x(1.13964 x 106)

2)      4.0001 x 6

3)      (1.12 x 105)x(6.05 x 105)

4)      (4.7281 x 102)x( 3.753 x 10-5)

5)      (2 x 101)x(5.664 x 104)

**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

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 km3. 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.

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 degrees Fahrenheit?

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