AP Environmental Science Summer Assignment

Welcome to APES. This is a challenging course that demands a lot of time on your part. It is designed by College Board to be the equivalent of a one semester environmental science college course. For your summer assignment you will be practicing the basic math skills required for this course. Each skill contains step-by-step directions for you to follow. This assignment is due **no later than 3:30 pm on the first day of school next year**. You will submit your assignment online through Google Classroom. The directions for joining Google Classroom and submitting your assignment are below. If you have any issues or need help with completing the assignment, please contact me using the email address below prior to the first day of school.

\*\***You may submit the assignment as many times as you would like to get the highest grade possible!!**

Have a great summer!

**PART 1: Creating a Google Account/Signing up for Google Classroom**

* This year we will be using Google Classroom for many assignments. You will need to create a Gmail account if you don’t already have one (remember it needs to be a school appropriate email) that is **separate** from your school account. You will then login into Google Classroom in order to complete your summer assignment for this year. This can be done on any device and there is an app available for both android phones and iPhones.
* Step one: Go to Gmail.com and sign up for an account (if you already have an account, login).
* Step two: At the top right next to your login (letter within the circle), click the google apps button. It is a 3x3 of squares.
* Step three: Click more on the apps page. Then click classroom.
* Step four: On the right side of the page, click the **+** and join a class.
  + If your last name begins with the letters A-M, then enter **6htf45k** as the class code or go to this link <https://classroom.google.com/c/NzUxMjU2ODQ3OTZa?cjc=6htf45k>
  + If your last name begins with the letters N-Z, then enter **277hf5l** as the class code or go to this link <https://classroom.google.com/c/NzUxMjU2ODQ4NjZa?cjc=277hf5l> .
* Now you are in the class and on google classroom. Here you should be able to navigate the class and assignments from the homepage.
* Any issues, please email Mrs. McConnell at [Mcconnell.karlyn.s@muscogee.k12.ga.us](mailto:Mcconnell.karlyn.s@muscogee.k12.ga.us)or [Mace.karlyn.s@muscogee.k12.ga.us](mailto:Mace.karlyn.s@muscogee.k12.ga.us)

Please contact me if you have any questions or problems at all! Have a wonderful summer!!

Ms. McConnell

**Averages**

To find an average, add all the quantities given and divide by the total number of quantities.

Example: Find the average of 10, 20, 35, 45, and 105

Add: 10 + 20 + 35 + 45 + 105 and divide by 5 = 43

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| 1. Find the average of 11, 12, 14, 15, 23, 29 | 1. Find the average of 124, 456, 788, 343 |
| 1. Find the average of 4.56, 0.0078, 23.45 | 1. Find the average of 4.3, 87.93, 3.4, 2.48 |

**Percentages**

Percents show fractions or decimals with a denominator of 100. Always move the decimal TWO places to the right to go from a decimal to a percentage or TWO places to the left to go from a percent to a decimal.

Example: 0.85 = 85% 0.008 = 0.8% 72% = 0.72

Part 1: Finding the Percent of a Given Number

To find the percent of a given number, change the percent to a decimal and MULTIPLY.

Example: 30% of 400

30% = 0.30 400 X .30 = 120.00

Part 2: Finding the Percent of a Number

To find what percentage one number is of another, DIVIDE the first number by the second, then convert the decimal answer to a percentage.

Example: What percentage is 12 of 25?

12/25 = .48

.48 = 48% (12 is 48% of 25)

Part 3: Finding Percentage Increase or Decrease

To find a percentage increase or decrease, first find the percent change, then add or subtract the change to the original number.

Example: Product X has dropped in price 18% from $139. What is the new price?

$139 X 0.18 = $25

$139 - $25 = $114

Part 4: Finding a Total Value

To find a total value, given a percentage of the value, DIVIDE the given number by the given percentage.

Example: If taxes on a new car are 8% and the taxes add up to $1600, how much is the new car?

8% = 0.08

$1600 / 0.08 = $160000 / 8 = $20000 (remember, when the divisor has a decimal, move it to the end to make it a whole number and move the decimal in the dividend the same number of places → 0.08 becomes 8 and 1600 becomes 160000)

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| 1. What is 45% of 900? | 1. What percentage is 25 of 162.5? |
| 1. Thirteen percent of a 12,000 acre forest is being logged. How many acres will be logged? | 1. A water heater tank holds 280 gallons. Two percent of the water is lost as steam. How many gallons will remain to be used? |
| 1. In a small oak tree, the biomass of insects makes up 3000 kilograms. This is 4% of the total biomass of the tree. What is the total biomass of the tree? | 1. 14,000 acres of a 40,000 acre forest burned in a forest fire. What percentage of the forest was damaged? |
| 1. You have driven the first 150 miles of a 2000 mile trip. What percentage of the trip have you traveled? | 1. Home prices have dropped 5% in the past three years. An average home in your area three years ago was $130,000. What’s the average home price now? |
| 1. You have driven the first 300 miles of a 2000 mile trip. What percentage of the trip have you traveled? | 1. Home prices have increased 5% in the past three years. An average home in your area three years ago was $130,000. What’s the average home price now? |
| 1. 35 is what percentage of 2800? | 1. 235 acres, or 15% of a forest is being logged. How large is the forest? |
| 1. The Greenland Ice Sheet contains 2,850,000 cubic kilometers of ice. It is melting at a rate of 0.006% per year. How many cubic kilometers are lost each year? | 1. A teenager consumes 20% of her calories each day in the form of protein. If she is getting 700 calories a day from protein, how many calories is she consuming per day? |

**Metric Units**

Kilo-, centi-, and milli- are the most frequently used prefixes of the metric system. You need to be able to go from one to another without a calculator. You can remember the order of prefixes by using the following sentence: *King Henry Died By Drinking Chocolate Milk*. Since the multiples and divisions of the base units are all factors of ten, you just need to move the decimal to convert from one to another.

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| Kilo-  1000 units | Hecto- 100 units | Deka- 10 units | **BASIC UNIT** | Deci-  0.1 units | Centi-  0.01 units | Mlli-  0.001 units |

Example: 55 centimeters = ? kilometers

First - figure out how many places to move decimal (count the one you are going to, but not the one you are on). You will move the decimal 6 places. So, 55 centimeters = 0.00055 kilometers.

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| 1. 1200 kilograms = ? milligrams | 1. 14000 millimeters = ? meters |
| 1. 670 hectometers = ? centimeters | 1. 6544 liters = ? millileters |
| 1. 0.078 kilometers = ? meters | 1. 17 grams = ? kilograms |

**Scientific Notation**

Scientific notation is a shorthand way to express large or tiny numbers. We will consider anything over 1000 to be a large number. Writing these numbers in scientific notation will help you to do your calculations much quicker and easier and will help prevent mistakes in conversions from one unit to another. Like the metric system, scientific notation is based on factors of 10. A large number written in scientific notation looks like this:

1.23 X 1013

The number before the “X” is called the coefficient. The coefficient must be greater than 1 and less than 10. The number after the “X” is the base number and is always 10. The number in superscript is the exponent.

Part 1: Writing Numbers in Scientific Notation

To write a large number in scientific notation, put a decimal after the first digit. Count the number of digits after the decimal you just wrote in. This will be the exponent. Drop any zeros so that the coefficient contains as few digits as possible.

Example: 573,000,000,000 becomes 5.73 X 1011

Writing tiny numbers in scientific notation is similar. The only difference is the decimal is moved to the left and the exponent is negative. A tiny number written in scientific notation looks like this:

4.26 X 10-9

To write a tiny number in scientific notation, move the decimal after the first digit that is not a zero. Count the number of digits before the decimal you just wrote in. This will be the exponent as a negative. Drop any zeros before or after the decimal.

Example: 0.00000000376 becomes 3.76 X 10-9

Part 2: Adding and Subtracting Numbers in Scientific Notation

To add or subtract two numbers with exponents, the exponents must be the same. You can do this by moving the decimal one way or another to get the exponents the same. Once the exponents are the same, add (if it’s an addition problem) or subtract (if it’s a subtraction problem) the coefficients just as you would any regular math problem. The exponent will stay the same. Make sure your answer has only one digit before the decimal - you may need to change the exponent of the answer once you are finished.

Example: 1.35 X 106 + 3.72 X 105 = ?

Step 1: Make sure both exponents are the same. It’s usually easier to go with the larger exponent so you don’t have to change the exponent in your answer, so let’s make both exponents 6 for this example.

3.72 X 105 → .372 X 106

Step 2: Add the coefficients just as you would regular decimals. So 1.35 + .372 = 1.722

Step 3: Write your answer including the exponent, which is the same as what you started. So your answer would be 1.722 X 106.

Part 3: Multiplying and Dividing Numbers in Scientific Notation

To multiply exponents, multiply the coefficients just as you would regular decimals. Then add the exponents to each other. The exponents DO NOT have to be the same.

Example: 1.35 X 106 X 3.72 X 105 = ?

Step 1: Multiply the coefficients. So 1.35 X 3.72 = 5.022

Step 2: Add the exponents. So 5 + 6 = 11 Step 3: Write your final answer → 5.022 X 1011

To divide exponents, divide the coefficients just as you would regular decimals, then subtract the exponents. In some cases, you may end up with a negative exponent.

Example: 5.635 X 103 / 2.45 X 106 = ?

Step 1: Divide the coefficients. So 5.635 / 3.45 = 2.3

Step 2: Subtract the exponents. So 3-6 = -3

Step 3: Write your final answer → 2.3 X 10-3

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| 1. Write 145,000,000,000 in scientific notation | 1. Write 13 million in scientific notation |
| 1. Write 435 billion in scientific notation | 1. Write 0.000348 in scientific notation |
| 1. Write 135 trillion in scientific notation | 1. Write 24 thousand in scientific notation |
| 31. 3 X 103 + 4 X 103 | 32. 4.67 X 104 + 323 X 103 |
| 33. 7.89 X 10-6 + 2.35 X 103 | 34. 9.85 X 104 - 6.35 X 104 |
| 35. 2.9 X 1011 - 3.7 X 1013 | 36. 1.278 X 1013 - 1.021 X 10-10 |
| 37. Three hundred thousand plus forty-seven thousand | 38. 13 million minus 11 thousand |
| 39. 1.32 X 108 X 2.34 X 104 | 40. 3.78 X 103 X 2.9 X 102 |
| 41. Three million times eighteen thousand | 42. One thousandth of seven thousand |
| 43. Eight ten-thousandths of thirty-five million | 44. 3.45 X 109 / 2.6 X 103 |
| 45. 1.98 X 10-4 / 1.72 X 10-6 | 46. Twelve thousand divided by four thousand |

**Dimensional Analysis**

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. It is sometimes called factor-labeling. The best way to start a factor-labeling problem is by using what you already know. In some cases you may use more steps than a classmate to find the same answer, but it doesn’t matter. Use what you know, even if the problem goes all the way across the page!

In a dimensional analysis problem, start with your given value and unit and then work toward your desired unit by writing equal values side by side. Remember you want to cancel each of the intermediate units. To cancel a unit on the top part of the problem, you have to get the unit on the bottom. Likewise, to cancel a unit that appears on the bottom part of the problem, you have to write it on the top. Once you have the problem written out, multiply across the top and bottom and then divide the top by the bottom.

Example: 3 years = ? seconds

Step 1: Start with the value and unit you are given. There may or may not be a number on the bottom. I find it useful to put a “1” on the bottom if there isn’t another number there to use as a placeholder.

3 years/ 1

Step 2: Start writing in all the values you know, make sure you can cancel top and bottom. Since you have years on top right now, you need to put years on the bottom in the next segment. Keep going, canceling units as you go, until you end up with the unit you want (in this case seconds) on the top.

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| 3 years | 365 days | 24 hours | 60 minutes | 60 seconds |
| 1 | 1 year | 1 day | 1 hour | 1 minute |

Step 3: Multiply all the values across the top. Write in scientific notation if it’s a large number. Write units on your answer.

3 X 365 X 24 X 60 X 60 = 9.46 X 107 seconds

Step 4: Multiply all the values across the bottom. Write in scientific notation if it’s a large number. Write units on your answer if there are any. In this case everything was cancelled so there are no units.

1 X 1 X 1 X 1 = 1

Step 5: Divide the top number by the bottom number. Remember to include units.

9.46 X 107 seconds / 1 = 9.46 X 107 seconds

Step 6: Review your answer to see if it makes sense. 9.46 X 107 is a really big number. Does it makes sense for there to a lot of seconds in a year? Yes! If you had gotten a tiny number, then you would need to go back and check for mistakes.

In lots of APES problems, you will need to convert both the top and bottom unit. Don’t panic! Just convert the top one first and then the bottom.

Example: 50 miles per hour = ? feet per second

Step 1: Start with the value and units you are given. In this case there is a unit on top and on bottom.

50 miles/1 hour

Step 2: Convert miles to feet first.

50 miles/1 hour 5280 feet/1 mile

Step 3: Continue the problem by converting hours to seconds.

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| --- | --- | --- | --- |
| 50 miles | 5280 feet | 1 hour | 1 minute |
| 1 hour | 1 mile | 60 minutes | 60 seconds |

Step 4: Multiply across the top and bottom. Divide the top by the bottom. Be sure to include units on each step. Use scientific notation for large numbers.

50 X 5280 feet X 1 X 1 = 264000 feet

1 X 1 X 60 X 60 seconds = 3600 seconds

264000 feet / 3600 seconds = 73.33 feet/second

**Conversions that you may not be familiar with:**

1 square mile (mi2) = 640 acres 1 metric ton = 1000 kg

1 hectare (Ha) = 2.47 acres 1 ton = 2000 lb

1 kilowatt-hour (kWh) = 3,413 BTUs 1 lb = 16 oz

1 barrel of oil = 160 liters 1 Km = 0.62 mi

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| 47. 134 miles = ? inches |
| 48. 8.9 X 105 tons = ? ounces |
| 49. 1.35 kilometers per second = ? miles per hour |
| 50. A 340 million square mile forest is how many hectares? |
| 51. If one barrel of crude oil provides six million BTUs of energy, how many BTUs of energy will one liter of crude oil provide? |
| 52. Fifty eight thousand kilograms of solid waste is equivalent to how many metric tons? |