APES Summer Assignment

Ms. Gandhi
mcoolbaugh@pthsd.net

Welcome future APES students! This is an advanced science course that combines the disciplines of biology, chemistry, geology and physics to investigate global environmental issues. We will discover how the Earth's systems function together and how humans have affected our planet. We will also examine our personal consumption and learn ways to be responsible global citizens in the face of serious environmental issues.

Because this is a college level course, you will be responsible for learning a large amount of material on your own. I will help you as we go, but it will be your responsibility to take notes, study and learn your vocabulary. We also work on the assumption that you have a general science background that includes biology, chemistry, and algebra. The purpose of this summer assignment is to help you prepare for the APES content by getting organized, reviewing some background information, and getting familiar with some basic concepts of environmental science. I've added a bit of fun too. Enjoy your summer!

Section 1: Electronic Setup

In this course we will be using technology to help you learn basic content and to communicate as scientists do in the 21st century. Complete each of the following two tasks to ensure that you are ready to begin on the first day of class.

1. For the summer, we will be using a temporary Google Classroom. The code is **qzz525e**. Please enroll and find the first assignment. You will need to let me know the following information:
    a. Your name
    b. Any special hobbies or interests you have.
    c. Why have you chosen to take APES?
    d. Any concerns you may have for next year.

Section 2: Take a Hike!

Sustainability of our environment is the key concept in APES. Go outside this summer! Camp, ride your bike, go to the beach, swim in a lake, hike in the mountains, explore a forest. Experience nature then tell us about it.

- Spend a minimum of **2 hours somewhere hiking in nature without any man-made noise! No music, phone calls etc.**
- ***Don't hike alone, take a cell phone, and water with you.***
- **Take a picture of you with a sign showing where you are at the beginning of your hike and a picture of you at the point you turn around to go back. You may also photograph anything interesting that you come across. Be creative!!! We will share these on the first day of class.**
- **Write a brief reflection on your observations as you hiked and what you noticed while not having any man-made noise.**
- *Please submit this report and your pictures through Google Classroom by 11:59 PM prior to the first day of school.*
- We will enjoy a slideshow of everyone's photos during the first few days of school.

APES Summer Assignment

For the next few sections, please create a separate document to use as your answer sheet. Please label sections/question numbers clearly!!! There is a space in the Google Classroom for you to upload your answer sheet.

Section 3: Chemistry Review

Chemistry is a big part of environmental science. Chemistry is a prerequisite before registering for the course. In order to review some of the basic chemistry concepts, you will need to complete the following on a clean sheet of paper. This may be typed or handwritten.

1. For each of the following, write out the chemical name that goes with the symbol.

CO_2	CO	$C_6H_{12}O_6$	CH_4	H_2
N_2	NO_2	NO_3	NH_3	NH_4
O_2	O_3	P	PO_4^{3-}	S
SO_2	SO_3	H_2SO_4	NaCl	Pb
U	Rn	Hg	Cl	H_2O

2. Write at least a paragraph that explains the following:

   a. What is the pH scale? What does it measure?

   b. How do the numbers on the pH scale compare? Example – is a pH of 4 twice as strong as a pH of 2? Hint – the pH scale is not linear!

   c. What are the average pH ratings of the following common substances in the environment?
      i. Blood
      ii. Rain
      iii. Freshwater (lake or river)
      iv. Ocean water

Section 4: Environmental Legislation

Create a chart similar to the one on the next page and fill in the missing information pertaining to important legislation. We will study many different environmental policies throughout the year, so this will get you started. Make sure you type it and save the document so you can add to it as we cover additional policies. This will be a great study tool for tests and the final AP exam. You can change the formatting to fit your preferences (example—make it landscape if that is easier for you).

Environmental Legislation Information

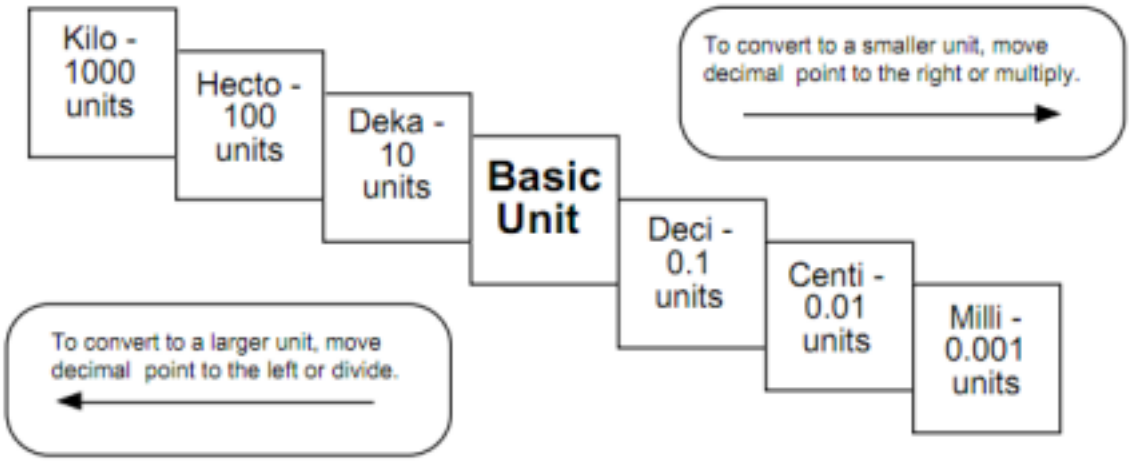
Legislation Name	Is this a US or World Treaty, Law or Act?	Date Enacted (Year)	Description of the Legislation (Give the purpose, important founding organizations or people, any major points that you find)
Agenda 21			
Clean Air Act			
Clean Water Acts			
Comprehensive Environmental Response, Compensation Liability Act			
Consumer Product Safety Act			
Convention on International Trade in Endangered Species			
Emergency Planning & Community Right-To-Know Act			
Endangered Species Act			
Energy Policy Act			
Federal Food, Drug, and Cosmetic Act			
Federal Insecticide, Fungicide and			

Rodenticide Act			
Federal Water Pollution Control Act			
Fish and Wildlife Conservation Act			
Food Quality Protection Act			
Law of the Sea Convention			
Marine Mammal Protection Act			
London Dumping Convention			
Helsinki Convention			
Marine Plastic Pollution Research and Control Act			
Montreal Protocol			
National Energy Act			
National Environmental Policy Act			
National Park Act			
National Wildlife Refuge System Act			
Nuclear Waste Policy Act			
Occupational Safety and Health Act			
Ocean Dumping Ban Act			

Section 5: Math and measurement review

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 the 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.



Example: 55 centimeters = ? kilometers

Step 1: Figure out how many places to move the decimal. King Henry Died By Drinking… – that's six places. (Count the one you are going to, but not the one you are on.)
Step 2: Move the decimal five places to the left since you are going from smaller to larger.

55 centimeters = .00055 kilometers

Example: 19.5 kilograms = ? milligrams

Step 1: Figure out how many places to move the decimal. … Henry Died By Drinking Chocolate Milk – that's six places. (Remember to count the one you are going to, but not the one you are on.) Step 2: Move the decimal six places to the right since you are going from larger to smaller. In this case you need to add zeros.

19.5 kilograms = 19,500,000 milligrams

Practice: Remember to show all your work, include units if given, and NO CALCULATORS! **All work and answers go on your answer sheet.**

1. Convert 1200 kilograms to milligrams.
2. Convert 14000 millimeters to meters.
3. Convert 670 hectometers to centimeters.
4. Convert 6544 liters to milliliters.
5. Convert 0.078 kilometers to meters.

6. Convert 17 grams to kilograms.

Percentages:

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

Examples: .85 = 85%. .008 = .8%

Part I: 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
Step 1: 30% = .30
Step 2: 400
x .30
12000
Step 3: Count the digits behind the decimal in the problem and add decimal to the answer.
12000 → 120.00 → 120

Part II: Finding the Percentage 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?
Step 1: 12/25 = .48
Step 2: .48 = 48% (12 is 48% of 25)

Part III: 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: Kindles have dropped in price 18% from $139. What is the new price of a Kindle?
Step 1: $139 x .18 = $25
Step 2: $139 - $25 = $114

Part IV: 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? *Step 1:* 8% = .08

Step 2: $1600 / .08 = $160,000 / 8 = $20,000 *(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. .08 becomes 8, 1600 becomes 160000.)*

Practice: Remember to show all your work, include units if given, and NO CALCULATORS! **All work and answers go on your answer sheet.**

1. What is 45% of 900?

2. Thirteen percent of a 12,000 acre forest is being logged. How many acres will be logged?

3. A water heater tank holds 280 gallons. Two percent of the water is lost as steam. How many gallons remain to be used?

4. What percentage is 25 of 162.5?

5. 35 is what percentage of 2800?

6. 14,000 acres of a 40,000 acre forest burned in a forest fire. What percentage of the forest was damaged? 42. You have driven the first 150 miles of a 2000 mile trip. What percentage of the trip have you traveled? 43. Home prices have dropped 5% in the past three years. An average home in Indianapolis three years ago was $130,000. What's the average home price now?

7. 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 each year?

8. 235 acres, or 15%, of a forest is being logged. How large is the forest?

9. 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?

10. 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?

Dimensional Analysis:

Introduction

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 in 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. $\frac{3}{\text{years}}$

Step 2: Start writing in all the values you know, making 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.

$$\frac{3 \text{ years}}{} \times \frac{365 \text{ days}}{1 \text{ year}} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{60 \text{ minutes}}{1 \text{ hour}} \times \frac{60 \text{ seconds}}{1 \text{ minute}}$$

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

$$3 \times 365 \times 24 \times 60 \times 60 = 9.46 \times 10^7 \text{ seconds}$$

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.

$$1 \times 1 \times 1 \times 1 = 1$$

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

$$9.46 \times 10^7 \text{ seconds} / 1 = 9.46 \times 10^7 \text{ seconds}$$

Step 6: Review your answer to see if it makes sense. 9.46 x 10^7 is a really big number. Does it make sense for there to be a lot of seconds in three years? 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.

$$\frac{50 \text{ miles}}{1 \text{ hour}}$$

Step 2: Convert miles to feet first.

$$\frac{50 \text{ miles}}{1 \text{ hour}} \times \frac{5280 \text{ feet}}{1 \text{ mile}}$$

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

$$\frac{50 \text{ miles}}{1 \text{ hour}} \times \frac{5280 \text{ feet}}{1 \text{ mile}} \times \frac{1 \text{ hour}}{60 \text{ minutes}} \times \frac{1 \text{ minute}}{60 \text{ seconds}}$$

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.

$$50 \times 5280 \text{ feet} \times 1 \times 1 = 264000 \text{ feet}$$
$$1 \times 1 \times 60 \times 60 \text{ seconds} = 3600 \text{ seconds}$$
$$264000 \text{ feet} / 3600 \text{ seconds} = 73.33 \text{ feet/second}$$

Practice: Remember to show all your work, include units if given, and NO CALCULATORS! **All work and answers go on your answer sheet.** Use scientific notation when appropriate.

Conversions:
1 square mile = 640 acres
1 hectare (Ha) = 2.47 acres
1 kw-hr = 3,413 BTUs
1 barrel of oil = 159 liters
1 metric ton = 1000 kg
1 ton = 2000 pounds

Practice: Remember to show all your work, include units if given, and NO CALCULATORS! **All work and answers go on your answer sheet.**

1. 134 miles = ? inches

2. 8.9×10^5 tons = ? ounces

3. 1.35 kilometers per second = ? miles per hour

4. A city that uses ten billion BTUs of energy each month is using how many kilowatt-hours of energy?

5. If one barrel of crude oil provides six million BTUs of energy, how many BTUs of energy will one liter of crude oil provide?

6. Fifty eight thousand kilograms of solid waste is equivalent to how many metric tons?

7. A 340 million square mile forest is how many hectares?