APES Summer Assignment 2017-2018

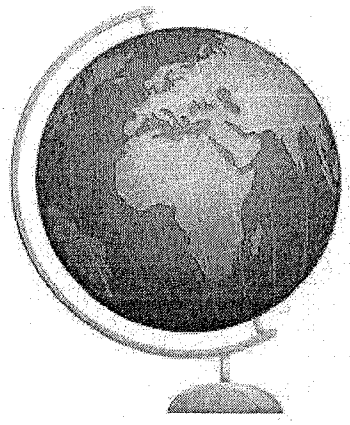
Welcome future APES students!!! *The AP Environmental Science* course is designed to be the equivalent of a one-semester, introductory college course in environmental science. This class demands that you spend time studying each and every day. Science is unlike other subjects. It requires careful reading and rereading, doing problems, labs, activities, thinking, and writing. While the work is demanding the rewards are great. Understanding nature is something few people have accomplished. By taking this course you are on your way to a deeper understanding of how you can help make the transition to a more environmentally sustainable society based on *sound science*.

Because this is a college level course, we have a large amount of material to cover before the AP test in May. 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. Remember to enjoy your summer!!! Work on this a little at a time to complete before the first day of school.

Section 1: 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.
- DO NOT hike alone, take a friend, a cell phone, water, snacks, and a flashlight 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. Be creative! We will share these during the first week of school.
- Write a 1-page reflection on your observations as you hiked and what you noticed while not having any man-made noise. Minimum 500 words, double-spaced.
- Please email your photos to ebicek@psd202.org or sscanlan@psd202.org to include in a power point.



Section 2: 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.

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

Answer the following questions:

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

3. Draw a picture of a pH scale. Which side is basic? Which side is acidic? Include the following substances on your pH scale: blood, rain, freshwater, ocean water

Section 3: 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.

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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			

On the AP Environmental Science exam, you will be required to use basic math skills without the use of a calculator. Sounds crazy, right? It may be crazy, but it's also TRUE. So as you work through this packet, do it without the aid of a calculator. It will be so hard not to cheat, but believe me, getting dust off of your brain now will save you throughout the year in class because…no calculators allowed in class either.

Basic Math Calculations:

Practice: Remember to show all your work, include units if given, and NO CALCULATORS! **All work and answers go on your answer sheet.**
Complete the following mathematical functions. You must show ALL work!

1. 10023 + 562 =
2. 567.23 + 765.231 =
3. 987 – 342 =
4. 5048 – 3799 =
5. 45 x 61 =
6. 350 x 1.5 =
7. 550 ÷ 2 =
8. 426 ÷ 4 =
9. 3465 ÷ 2.2 =

Scientific Notation:

Scientific notation is a shorthand way to express large or tiny numbers. Since you will need to do calculations throughout the year WITHOUT A CALCULATOR, we will consider anything over 1000 to be a large number. Writing these numbers in scientific notation will help you 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:

$$1.23 \times 10^{11}$$

The number before the x (1.23) 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 (11) is the exponent.

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: 123,000,000,000

Step 1: Place a decimal after the first digit. 1.23000000000

Step 2: Count the digits after the decimal…there are 11.

Step 3: Drop the zeros and write in the exponent. 1.23×10^{11}

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

$$4.26 \times 10^{-8}$$

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: .0000000426

Step 1: 00000004.26

Step 2: Count the digits before the decimal…there are 8.

Step 3: Drop the zeros and write in the exponent as a negative. 4.26×10^{-8}

Practice: Remember to show all your work, include units if given, and NO CALCULATORS! **All work and answers go on your answer sheet.**
Convert the following numbers into scientific notation or from scientific notation to regular notation.

10. 16,502
11. 0.0067 =
12. 0.015 =
13. 600 =
14. 3950 =
15. 0.22 =
16. 6.96×10^{3}
17. 3.46×10^{-5}
18. 2.54×10^{4}
19. 9.1×10^{-2}
20. 5.0×10^{-3}
21. 9.444×10^{2}

Adding or subtracting numbers using 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 addition problem (review the previous section about decimals if you need to). 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.

Example: $1.35 \times 10^{6} + 3.72 \times 10^{5} = ?$

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 problem.

$$3.72 \times 10^{5} \rightarrow .372 \times 10^{6}$$

Step 2: Add the coefficients just as you would regular decimals. Remember to line up the decimals.

$$\begin{array}{r} 1.35 \\ +\ .372 \\ \hline 1.722 \end{array}$$

Step 3: Write your answer including the exponent, which is the same as what you started with.

$$1.722 \times 10^{6}$$

Multiplying or 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: $1.35 \times 10^{6} \quad X \quad 3.72 \times 10^{5} = ?$

Step 1: Multiply the coefficients.

$$\begin{array}{r} 1.35 \\ \times\ 3.72 \\ \hline 270 \\ 9450 \\ 40500 \\ \hline 50220 \end{array} \rightarrow 5.022$$

Step 2: Add the exponents.

$$5 + 6 = 11$$

Step 3: Write your final answer.

$$5.022 \times 10^{11}$$

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: $5.635 \times 10^{3} \;/\; 2.45 \times 10^{6} = ?$

Step 1: Divide the coefficients.

$$5.635 / 3.45 = 2.3$$

Step 2: Subtract the exponents.

$$3 - 6 = -3$$

Step 3: Write your final answer.

$$2.3 \times 10^{-3}$$

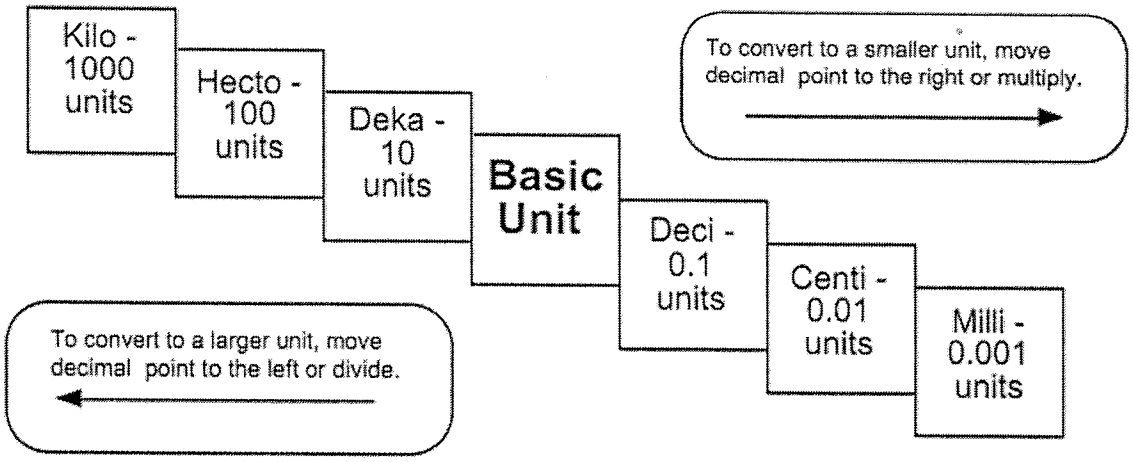
Practice: Remember to show all your work, include units if given, and NO CALCULATORS! **All work and answers go on your answer sheet.**

Calculate the following using only scientific notation:

22. $3.0 \times 10^{9} + 1.4 \times 10^{6} =$
23. $1.5 \times 10^{4} + 2.5 \times 10^{3} =$
24. $8.5 \times 10^{7} - 4.5 \times 10^{7} =$
25. $9.2 \times 10^{9} - 1.5 \times 10^{6} =$
26. $3.0 \times 10^{5} \times 3.3 \times 10^{4} =$
27. $5.2 \times 10^{18} \times 8.7 \times 10^{22} =$
28. $9.0 \times 10^{8} \div 4.5 \times 10^{3} =$
29. $5.2 \times 10^{18} \div 8.7 \times 10^{22} =$

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.**

30. Convert 1200 kilograms to milligrams.
31. Convert 14000 millimeters to meters.
32. Convert 670 hectometers to centimeters.
33. Convert 6544 liters to milliliters.
34. Convert 0.078 kilometers to meters.
35. 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.)*

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

36. What is 45% of 900?
37. Thirteen percent of a 12,000 acre forest is being logged. How many acres will be logged?
38. A water heater tank holds 280 gallons. Two percent of the water is lost as steam. How many gallons remain to be used?
39. What percentage is 25 of 162.5?
40. 35 is what percentage of 2800?
41. 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?
44. 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?
45. 235 acres, or 15%, of a forest is being logged. How large is the forest?
46. 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?
47. 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.

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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.

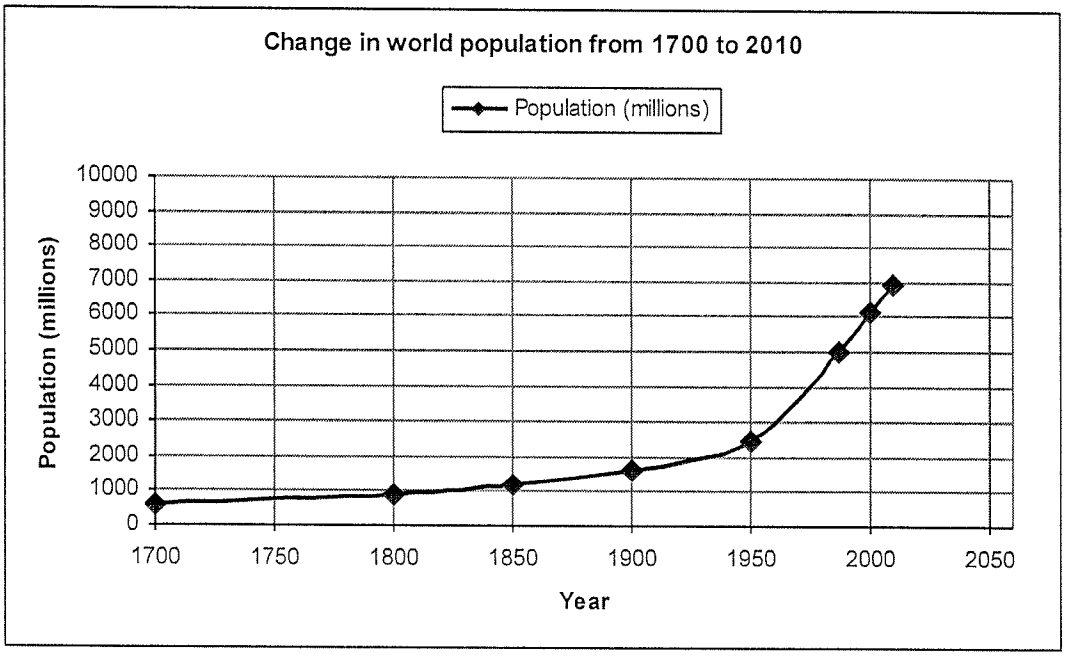
Conversions:
1 square mile = 640 acres
1 hectare (Ha) = 2.47 acres
1 kw-hr = 3,413 BTUs
1 barrel of oil = 159 liters
1 metric ton = 1000 kg
1 ton = 2000 pounds

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

48. 134 miles = ? inches
49. 8.9×10^5 tons = ? ounces
50. 1.35 kilometers per second = ? miles per hour
51. A city that uses ten billion BTUs of energy each month is using how many kilowatt-hours of energy?
52. A 340 million square mile forest is how many hectares?
53. If one barrel of crude oil provides six million BTUs of energy, how many BTUs of energy will one liter of crude oil provide?
54. Fifty eight thousand kilograms of solid waste is equivalent to how many metric tons?

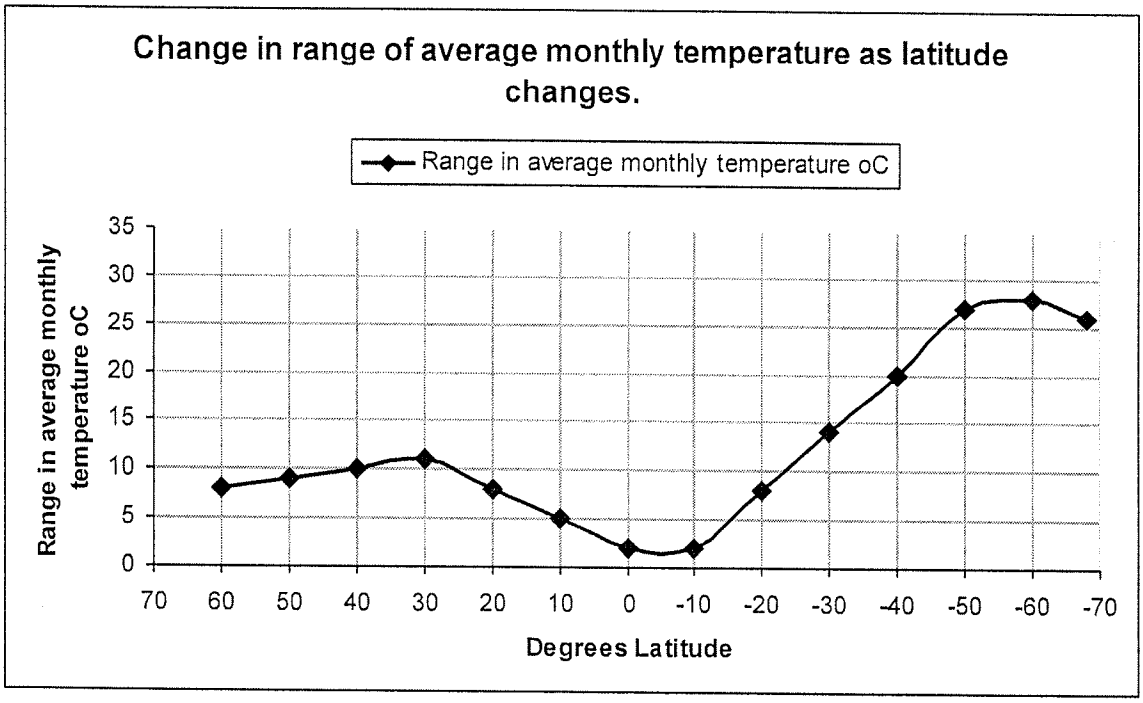
Interpreting Data:

APES students must be able to read and interpret the information presented in a variety of ways, including graphs and tables. Once you understand how graphs are constructed, it is easier to get information from the graphs in your textbook as well as to interpret the results you obtain from experiments. Use the information presented in the graphs to answer the questions that follow them.



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

55. Describe what the graph shows. (Describing means to look at the overall picture presented or trend in the data. What's happening? Interpret the graph; don't just repeat the title.)
56. What was the world's population in 1900? 2010?
57. Assuming that the population trend continues, predict the world population in 2025. Do you think this is likely to occur? Defend your answer.



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

58. Describe what the graph shows.
59. At what latitude does the least variation occur?
60. Miami is at approximately 26° N latitude. From the information on the graph, what is the range in mean monthly temperature there?
61. Moorestown is at approximately 40° N latitude. From the information on the graph, what is the range in mean monthly temperature there?
62. Sydney, Australia is at approximately 33° S latitude (-33° on the graph). From the information on the graph, what is the range in mean monthly temperature there?
63. Which hemisphere, the northern or the southern, has the greatest range in monthly temperatures? Why does this occur?