

June, 2019

Dear AP Environmental Science Student,

I am glad that you are interested in the Advanced Placement Environmental Science class for the upcoming school year. AP Environmental Science is a full year course, designed for highly motivated students who have successfully completed both biology and chemistry. In addition, students should have completed physics or be enrolled in it, concurrently. Because AP Environmental Science is comparable to a college undergraduate course in environmental science, much is expected from the student in terms of time, energy and independent work. Students should be prepared to spend an average of eight hours per week outside of class in preparation, involving reading the text and outside sources and written assignments. Students are expected to complete individual lab reports, keep a lab notebook and to write abstracts on articles from scientific periodicals. These written assignments, along with tests and quizzes, will be used to determine each marking period grade.


As established by College Board, the AP Environmental Science curriculum is rigorous and demanding. There will be several lab experiments completed throughout the year. The textbook used is *Exploring Environmental Science for AP*, G. Tyler Miller, Jr. and Scott E. Spoolman, a book used extensively nationwide.

A summer assignment containing three parts based on important environmental events as well as a math review will be assigned at the end of the current school year. Students are responsible for this work, which is due on the **first day** of school in September. This assignment will be followed by a quiz shortly after the school year is underway.

In May of each year, the AP exams are administered. Since college credit may be earned by successful completion of the exam, we encourage students to participate. College credit is determined by the grade earned on the exam and the policy of the college concerning AP exams.

If you have any questions or concerns, please contact me.

Thank you,



Mrs. Sarah Sherwin

sarahsherwin@hvrsd.org

AP Environmental Science Math Prep

Math Prep will be graded for correctness (58 points)

This year in APES you will hear the two words most dreaded by high school students...NO CALCULATORS! That's right, you cannot use a calculator on the AP Environmental Science exam. Since the regular tests you will take are meant to help prepare you for the APES exam, you will not be able to use calculators on regular tests all year either. The good news is that most calculations on the tests and exams are written to be fairly easy calculations and to come out in whole numbers or to only a few decimal places. The challenge is in setting up the problems correctly and knowing enough basic math to solve the problems. With practice, you will be a math expert by the time the exam rolls around. So bid your calculator a fond farewell, tuck it away so you won't be tempted, and start sharpening your math skills!

Contents

Decimals
Averages
Percentages
Metric Units

- Later in the year, we will also practice scientific notation and dimensional analysis

Reminders

1. Write out all your work, even if it's something really simple. This is required on the APES exam so it will be required on all your assignments, labs, quizzes, and tests as well.
2. Include units in each step. Your answers always need units and it's easier to keep track of them if you write them in every step.
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.

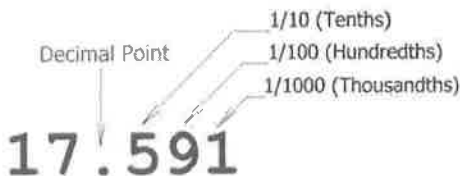
Directions

Read each section below for review. Look over the examples and use them for help on the practice problems. When you get to the practice problems, write out all your work and be sure to include units on each step. Check your work.

Decimals

Part I: The basics

Decimals are used to show fractional numbers. The first number behind the decimal is the tenths place, the next is the hundredths place, the next is the thousandths place. Anything beyond that should be changed into scientific notation (which is addressed in another section.)



Part II: Adding or Subtracting Decimals

To add or subtract decimals, make sure you line up the decimals and then fill in any extra spots with zeros. Add or subtract just like usual. Be sure to put a decimal in the answer that is lined up with the ones in the problem.

$$\begin{array}{r} 123.0000 \\ 0.0079 \\ +43.5000 \\ \hline 166.5079 \end{array}$$

$$\begin{array}{r} 27.583 \\ - 0.200 \\ \hline 27.383 \end{array}$$

Part III: Multiplying Decimals

Line up the numbers just as you would if there were no decimals. DO NOT line up the decimals. Write the decimals in the numbers but then ignore them while you are solving the multiplication problem just as you would if there were no decimals at all. After you have your answer, count up all the numbers behind the decimal point(s). Count the same number of places over in your answer and write in the decimal.

$$3.77 \times 2.8 = ?$$

$$\begin{array}{r} 3.77 \text{ (2 decimal places)} \\ \times 2.8 \text{ (1 decimal place)} \\ \hline 3016 \\ +754 \\ \hline 10.556 \text{ (3 decimal places)} \end{array}$$

Part IV: Dividing Decimals

Scenario One: If the divisor (the number after the / or before the $\overline{)$, does not have a decimal, set up the problems just like a regular division problem. Solve the problem just like a regular division problem. When you have your answer, put a decimal in the same place as the decimal in the dividend (the number before the / or under the $\overline{)$.

$$\begin{array}{r} 424.9 \\ 38 \overline{) 16146.2} \\ \underline{152} \\ 94 \\ \underline{76} \\ 186 \\ \underline{152} \\ 342 \\ \underline{342} \\ 0 \end{array}$$

Scenario Two: If the divisor does have a decimal, make it a whole number before you start. Move the decimal to the end of the number, then move the decimal in the dividend the same number of places.

$$3.8 \overline{) 1614.62}$$

Then solve the problem just like a regular division problem. Put the decimal above the decimal in the dividend. (See Scenario One problem).

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

1. $1.678 + 2.456 =$
2. $344.598 + 276.9 =$
3. $1229.078 + .0567 =$
4. $45.937 - 13.43 =$
5. $199.007 - 124.553 =$
6. $90.3 - 32.679 =$
7. $28.4 \times 9.78 =$
8. $324.45 \times 98.4 =$
9. $1256.93 \times 12.38 =$
10. $64.5 / 5 =$
11. $114.54 / 34.5 =$
12. $3300.584 / 34.67 =$

Averages

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

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

Step 1: Add all the quantities. $10 + 20 + 35 + 45 + 105 = 215$

Step 2: Divide the total by the number of given quantities. $215 / 5 = 43$

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

13. Find the average of the following numbers: 11, 12, 13, 14, 15, 23, and 29
14. Find the average of the following numbers: 124, 456, 788, and 343
15. Find the average of the following numbers: 4.56, .0078, 23.45, and .9872

Percentages

Introduction:

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.

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.*

$12000 \rightarrow 120.00 \rightarrow 120$

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 \times .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.

16. What is 45% of 900?
17. Thirteen percent of a 12,000 acre forest is being logged. How many acres will be logged?
18. A water heater tank holds 280 gallons. Two percent of the water is lost as steam. How many gallons remain to be used?
19. What percentage is 25 of 162.5?
20. 35 is what percentage of 2800?
21. 14,000 acres of a 40,000 acre forest burned in a forest fire. What percentage of the forest was damaged?

22. You have driven the first 150 miles of a 2000 mile trip. What percentage of the trip have you traveled?
23. 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?
24. 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?
25. 235 acres, or 15%, of a forest is being logged. How large is the forest?
26. 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?
27. 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?

Data for plotting graphs

Answer any associated questions on the back of your graph(s). Graph paper can be printed from Schoology (under Files/Links), or use a program like Excel, Open Office or Create-A-Graph.

Graphing Practice Problem: Ethylene is a plant hormone that causes fruit to mature. The data above concerns the amount of time it takes for fruit to mature from the time of the first application of ethylene by spraying a field of trees.

Amount of ethylene in ml/m ²	Wine sap Apples: Days to Maturity	Golden Apples: Days to Maturity	Gala Apples: Days to Maturity
10	14	14	15
15	12	12	13
20	11	9	10
25	10	7	9
30	8	7	8
35	8	7	7

- Make a line graph of the data.
- What is the dependent variable?
- What is the independent variable?

Graphing Practice Problem #2: A clam farmer has been keeping records concerning the water temperature and the number of clams developing from fertilized eggs. The data is recorded below.

Water Temperature in °C	Number of developing clams
15	75
20	90
25	120
30	140
35	75
40	40
45	15
50	0

- Make a line graph of the data.
- What is the dependent variable?
- What is the independent variable?
- What is the optimum (best) temperature for clam development?

Graphing Practice Problem #3: The thickness of the annual rings indicate what type of environmental situation was occurring at the time of its development. A thin ring, usually indicates a rough period of development. Lack of water, forest fires, or a major insect infestation. On the other hand, a thick ring indicates just the opposite.

Age of the tree in years	Average thickness of the annual rings in cm. Forest A	Average thickness of the annual rings in cm. Forest B

10	2.0	2.2
20	2.2	2.5
30	3.5	3.6
35	3.0	3.8
50	4.5	4.0
60	4.3	4.5

- A. Make a line graph of the data.
- B. What is the dependent variable?
- C. What is the independent variable?
- D. What was the average thickness of the annual rings of 40 year old trees in Forest A?
- E. Based on this data, what can you conclude about Forest A and Forest B? Graphing Practice Problem #4:

pH of water	Number of tadpoles
8.0	45
7.5	69
7.0	78
6.5	88
6.0	43
5.5	23

- A. Make a line graph of the data.
- B. What is the dependent variable?
- C. What is the independent variable?
- D. What is the average pH in this experiment?
- E. What is the average number of tadpoles per sample?
- F. What is the optimum water pH for tadpole development?
- G. Between what two pH readings is there the greatest change in tadpole number?
- H. How many tadpoles would we expect to find in water with a pH reading of 5.0?

24.

Answer: _____

25.

Answer: _____

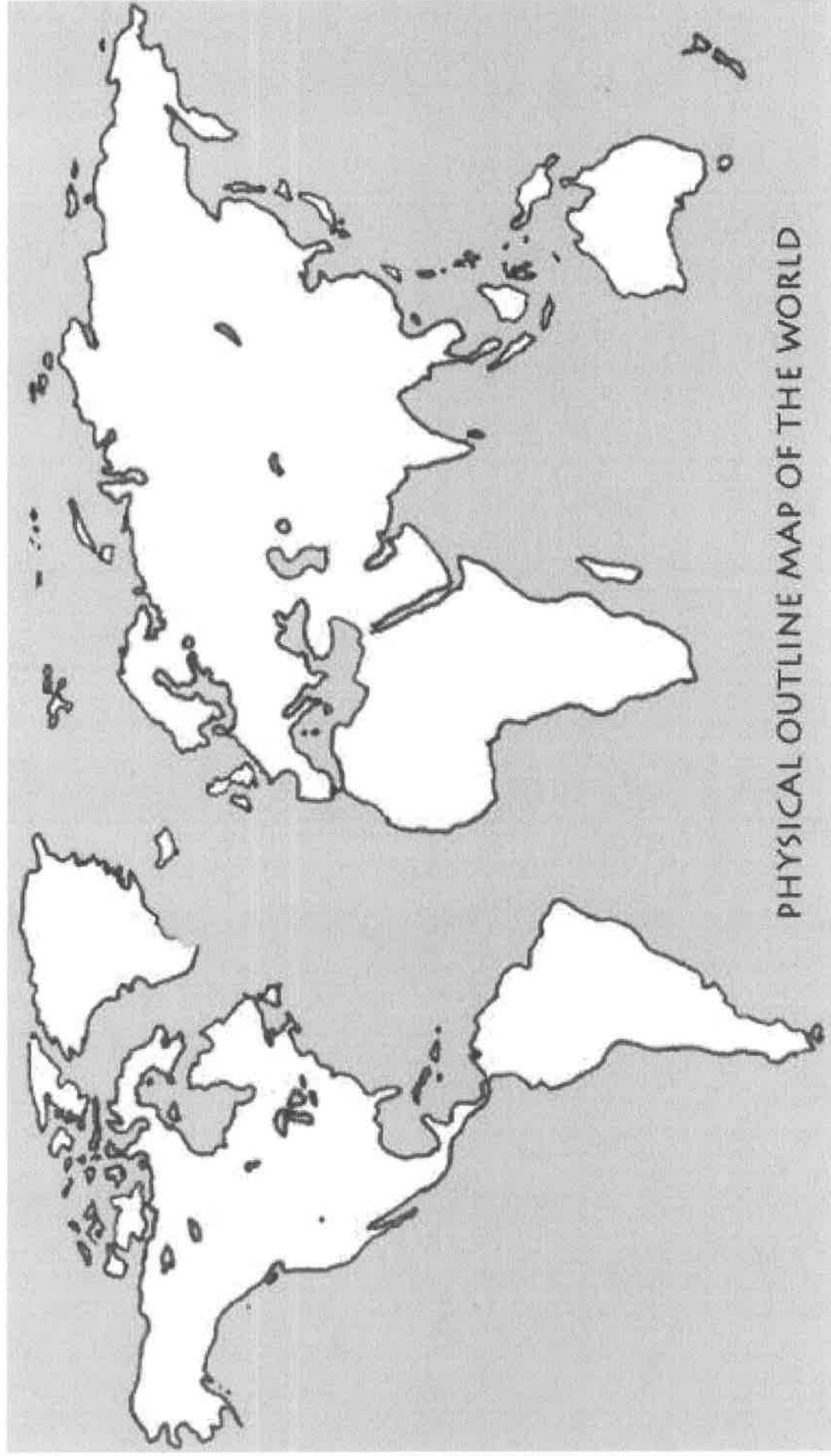
26.

Answer: _____

27.

Answer: _____

On the world map, please write in the name of the world's 7 continents and 5 oceans. Then, refer to the case study document and correctly place the name of each case study and where it occurred onto the map. Map Completion is worth 20 points



For each of the following environmental case studies, fill in the corresponding chart and make sure to also place the location that the case study occurred on the map provided. Please put your answers in Blue or (-2).

Chart completion is worth 22 points of your summer assignment grade.

Ecological Case Studies *some of these have affected an entire area, so please shade the entire area on the map.

	Who (or what) was involved?	What AND How it happened?	Where did/does this occur?	When did it occur? Is it still a problem?	What did we learn from this case study/ what have we changed?
Invasion of Cane Toads into Australia					
Invasion of Zebra Mussels into the Great Lakes					
The decline of Honey Bees					
Bats and White Nose Syndrome					
Invasion of the Emerald Ash Borer					

Water Case Studies

	Who (or what) was involved?	What AND How it happened?	Where did/does this occur?	When did it occur? Is it still a problem?
Ogallala Aquifer				
California Water Project				
Aral Sea				
The Three Gorges Dam				
The Colorado River				
Flint, MI				

Oil Spills

	Who (or what) was involved?	What AND How it happened?	Where did/does this occur?	When did it occur? Is it still a problem?
BP Oil Spill				
Exxon Valdez Oil Spill				
The Persian Gulf War Oil Spill				

Nuclear Power Plants

	Who (or what) was involved?	What AND How it happened?	Where did/does this occur?	When did it occur? Is it still a problem?
Three Mile Island				
Chernobyl				
Fukushima				

Air Case Studies

	Who (or what) was involved?	What AND How it happened?	Where did/does this occur?	When did it occur? Is it still a problem?
Bhopal disaster				

Toxic Waste

	Who (or what) was involved?	What AND How it happened?	Where did/does this occur?	When did it occur? Is it still a problem?
Love Canal, NY				

Soil Erosion

	Who (or what) was involved?	What AND How it happened?	Where did/does this occur?	When did it occur? Is it still a problem?
Dust Bowl, US				

