AP Environmental Science Summer Homework – 2017/2018

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Welcome to AP Environmental Science ("APES"). I'm looking forward to a great year together! All assignments must be **handwritten** and are **due the first day of school**. Please email me if you have questions.

1) Purchase the required books and bring them to our first class meeting **– 10 points total**

Living in the Environment by Miller. 2017, 19th Ed.
ISBN-13: 978-1337094153

Barron's AP Environmental Science, February 2015, **6th** Edition.
ISBN-13: 978-1438005522

2) Read Chapters 1 and 2 in Miller textbook. Answer the attached questions (found below). **– 20 points total**

Be prepared for a test on Chapters 1 – 2 in the second week of the school year.

3) Watch the movie "Home, We all Have a Date with the Planet" on Youtube.com at http://www.youtube.com/watch?v=jqxENMKaeCU&list=PL7C14EABDCEDF88D8 and complete the attached worksheet (found below). The movie is done by Yann Arthus-Bertrand and runs 1 hours, 33 minutes. Email the completed worksheet to me before school starts or bring in a hard copy the first day of school. – **20 points total**

4) Complete the attached basic math problems on percentages, metric units, and dimensional analysis. **- 20 points total**

HW Part 2: Miller textbook Chapters 1 and 2 questions.

Ch 1 The Environment and Sustainability

Core Case Study:
1. What is sustainability?

Section 1.1
2. Define environment. Distinguish among environmental science, ecology, and environmentalism. What are three scientific principles of sustainability derived from how the natural world works?

3. Define natural capital. Define natural resources and ecosystem services, and give two examples of each. What is full cost pricing and why is it important?

4. What is a resource? Distinguish between an inexhaustible resource and a renewable resource and give an example of each. What is the sustainable yield of a renewable resource? Distinguish between more developed and less developed countries and give one example each of a high-income, middle-income, and low-income country.

Section 1.2
5. What is the tragedy of the commons? What are two ways to deal with this effect?

6. What is an ecological footprint? Define biocapacity. Use the ecological footprint concept to explain how we are living unsustainably.

Section 1.3
7. Identify six basic causes for the environmental problems that we face. What is exponential growth? What is the rule of 70? What is the current size of the human population?

8. What is poverty and what are three of its harmful environmental and health effects?

9. What is the connection between government subsidies, resource use, and environmental degradation? What are two ways to include the harmful environmental and health costs of goods and services in their market price?

Section 1.4
10. What is an environmentally sustainable society?

Ch 2 Science, Matter, Energy and Systems

Section 2.1

2. What is science. List the steps involved in a scientific process. What are data? Distinguish between a scientific hypothesis and a scientific theory. What is peer review and why is it important? What is a model?

3. What is a scientific law (law of nature)? Explain why we cannot break such laws. What are four limitations of science?

Section 2.2.

4. What is matter? What is acidity? What is pH?

6. Define and distinguish between a physical change and a chemical change (chemical reaction) in matter and give an example of each. What is the law of conservation of matter?

Section 2.3

7. What is energy? Define and distinguish between kinetic energy and potential energy and given an example of each. What is electric power? Define and give two examples of electromagnetic radiation. What is heat (thermal energy)? Explain how heat is transferred from one place to another by radiation, conduction, and convection.

8. What is energy quality? Distinguish between high quality energy and low quality energy and give an example of each. What is the first law of thermodynamics (law of conservation of energy) and why is it important? What is the second law of thermodynamics and why is it important? Explain why the second law means that we can never recycle or reuse high quality energy. What is energy efficiency?

Section 2.4

9. Define and give an example of a system. Distinguish among the inputs, flows (throughputs), and outputs of a system. What is feedback? What is a feedback loop? Distinguish between a positive feedback loop and a negative feedback loop in a system and give an example of each. What is an ecological tipping point?

HW Part 3: Watch the movie "Home"

Find the movie on Youtube.com or use this link: Home and answer the following questions; answers must be handwritten. You may modify this document as necessary to make more space for your writing.

1. What does the term *Homo sapiens* mean?
2. When did life originate on Earth?
3. When did *Homo sapiens* originate?
4. What was our Earth like at its birth?
5. Why was it important for the Earth to be at the right distance from the sun-not too far, not too near?
6. How did the ocean get salty?
7. Where did life first spark into being?
8. What fed off the Earth's heat?
9. What organism were the first that had the capacity to turn to the sun to capture its energy?
10. How did these organisms change the destiny of our planet?
11. What did plant life finally do?
12. What happens when water freezes?
13. What is the engine of life?
14. What are the green organisms that supply _____% of the oxygen?
15. It took more than _____ years for it to make trees.
16. Trees have inherited from _____ the power to capture light's energy.
17. Soils are the factory of _____.
18. What is meant by the phrase that "Every species has a role to play"?
19. Humans settled down after _____ nomadic years.
20. The majority of mankind lives _____.
21. One in _____ people still use only the strength of their bodies.
22. Billion human beings is more than the combined population of all the wealthy nations.
23. are a family's only asset, as long as every extra pair of hands is a necessary contribution to its subsistence.
24. The physical energy and strength with which nature had not endowed them was found in
25. _____ was humans' first great revolution that was developed barely _____ years ago.
26. _____ are the yeast of life.
27. The principal daily concern of all humans is to _____.
28. _____ of humankind tills the soil, over _____ of them by hand.
29. What is the pure energy-the energy of the sun-captured over millions of years by millions of plants more than a hundred million years ago?
30. In the last years, the Earth's population has almost , and over people have moved to the cities.
31. Today, over _____ of the world's _____ inhabitants live in cities.
32. A _____ of oil generates as much energy as _____ in 24 hours.
33. In the United States, only _____ farmers are left.
34. They produce enough grain to feed people. But most of that grain is used to feed or _____.

35. Agriculture accounts for _____% of humanity's water consumption.
36. _____, another gift of the petrochemical revolution, exterminated _____.
37. Toxic pesticides seeped into the _____.
38. _____ of the varieties developed by farmers over _____ of years have been wiped out.
39. The result is that it takes of water to produce one kilogram of potatoes, for one kilo of rice and _____ for one kilo of beef.
40. We know that the end _____ is imminent, but we refuse to believe it.
41. If LA's model were followed by all, the planet wouldn't have vehicles, as it does today, but _____ .
42. Everywhere, machines dig, bore and rip from the Earth the pieces of stars buried in its depths since its creation:
43. As a privilege of power, % of this mineral wealth is consumed by % of the world's population.
44. Before the end of this century excessive will have exhausted nearly all the planet's .
45. Since _____ , the volume of international trade has increased _____ times over.
46. percent of trade goes by sea. million containers are transported every year headed for the world's major hubs of consumption.
47. is one of the biggest construction sites in the world, a country where the impossible becomes possible.
48. Since , fishing catches have increased , from to million metric tons a year.
49. of fishing grounds are exhausted, depleted or in danger of being so. Most large fish have been fished out of existence since they have no time to . Fish is the staple diet of one in five humans.
50. _____ humans live in the world's desert lands, more than the combined population of .
51. Across the planet, one major river in _____ no longer flows into the sea for several months of the year.
52. Water shortages could affect nearly _____ people before _____ .
53. These wetlands are crucial to all life on Earth. They represent _____ percent of the planet.
54. Trees provide a habitat for _____ of the planet's biodiversity-that is to say, of all life on Earth.
55. How long will it take Borneo's vast primary forest to totally disappear?
56. Over _____ people-almost a _____ of the world's population-still depend on charcoal for cooking and heating.
57. On the hills of Haiti, only _____ percent of the forests are left.
58. What is the story of the Rapa Nui, the inhabitants of the Easter Island?
59. In _____ years, the gap between rich and poor has grown wider than ever. Today, of the world's wealth is in the hands of the richest _____ percent of the population.
60. One human being in _____ now lives in a precarious, unhealthy, overpopulated environment, without access to daily necessities, such as water, sanitation or electricity. Hunger is spreading once more. It affects nearly _____ people.
61. It's all about carbon. Under the effect of global warming, the ice cap has lost _____ % of its thickness in _____ years. Its surface area in the summer shrinks year by year. It could

disappear by _____.

62. By _____ , a _____ of the Earth's species could be threatened with extinction.
63. Around the North Pole, the ice cap has lost _____ % of its surface area in _____ years.
64. Greenland's ice contains _____ % of the freshwater of the whole planet. When it melts, sea levels will rise by nearly _____ meters.
65. Sea levels are rising. Water expanding as it gets warmer caused, in the 20th century alone, a rise of _____ centimeters.
66. Coral reefs, for example, are extremely sensitive to the slightest change in water temperature. percent have disappeared.
67. _____ of the _____ biggest cities stand on a coastline or river estuary. As the seas rise, salt will invade the water table, depriving inhabitants of drinking water.
68. Droughts are occurring all over the planet. In Australia, _____ of farmland is already affected.
69. The permafrost is the ground that is constantly frozen.What will happen if it melts?
70. _____ people a day die because of dirty drinking water.
71. _____ people have no access to safe drinking water.
72. Nearly _____ people are going hungry.
73. Over _____ % of grain traded around the world is used for animal feed or bio fuels.
74. _____ % of arable land has suffered long-term damage.
75. Every year, _____ hectares of forest disappear.
76. One mammal in _____ , one bird in _____ , one amphibian in _____ are threatened with extinction.
77. Species are dying out at a rhythm _____ times faster than the natural rate.
78. _____ of fishing grounds are exhausted, depleted or in dangerous decline.
79. The average temperature of the last _____ years have been the highest ever recorded.
80. The ice cap is _____ % thinner than _____ years ago.
81. There may be at least _____ climate refugees by 2050.
82. In Bangladesh, a man thought the unthinkable and founded a bank that lends only to the poor. In barely _____ _____ years, it has changed the lives of _____ people around the world.
83. Gabon is one of the world's leading producers of wood. What is selective logging?
84. _____ % of the energy we consume comes from fossil energy sources. Every week, new coal-fired generating plants are built in _____ alone.
85. _____ , _____ , _____ and _____ are the biggest investors in renewable energy. They have already created over _____ jobs.

86. In _____ hour, the sun gives the Earth the same amount of energy as that consumed by all humanity in _____ year. As long as the Earth exists, the sun's energy will be inexhaustible.
87. What is important is not what is _____, but what _____.
88. We still have _____ the world's _____, _____ of rivers, lakes, and glaciers, and _____ of species.
89. We all have the power to _____.

HW Part 4: AP Env. Science Summer Math Practice.

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

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.

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 → 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? (Hint: divide the "is" # by the "of" #)

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.)*

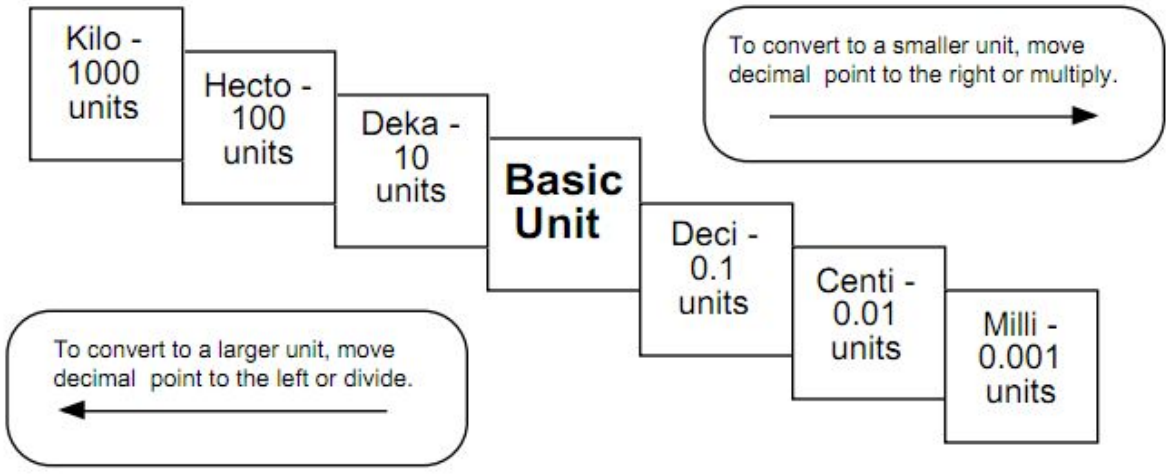
Practice: Remember to show all your work, include units if given, and NO CALCULATORS! All work and answers go on your answer sheet.

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. What percentage is 25 of 162.5?

4. 35 is what percentage of 2800?
5. 14,000 acres of a 40,000 acre forest burned in a forest fire. What percentage of the forest was damaged?
6. You have driven the first 150 miles of a 2000 mile trip. What percentage of the trip have you traveled?
7. 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?
8. 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?
9. 235 acres, or 15%, of a forest is being logged. How large is the forest?
10. 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?
11. 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?

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.

12. 1200 kilograms = ? milligrams
13. 14000 millimeters = ? meters
14. 670 hectometers = ? centimeters
15. 6544 liters = ? milliliters
16. .078 kilometers = ? meters
17. 17 grams = ? kilograms

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.

$$\left[\ \frac{3 \text{ years}}{\ }\right]$$

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.

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

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.

$$\left[\frac{50 \text{ miles}}{1 \text{ hour}}\right]$$

Step 2: Convert miles to feet first.

$$\left[\frac{50 \text{ miles}}{1 \text{ hour}}\right]\left[\frac{5280 \text{ feet}}{1 \text{ mile}}\right]$$

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

$$\left[\frac{50 \text{ miles}}{1 \text{ hour}}\right]\left[\frac{5280 \text{ feet}}{1 \text{ mile}}\right]\left[\frac{1 \text{ hour}}{60 \text{ minutes}}\right]\left[\frac{1 \text{ minute}}{60 \text{ seconds}}\right]$$

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

18. 134 miles = ? inches
19. 8.9×10^5 tons = ? ounces
20. 1.35 kilometers per second = ? miles per hour
21. A city that uses ten billion BTUs of energy each month is using how many kilowatt-hours of energy per year?
22. A 340 million square mile forest is how many hectares?
23. If one barrel of crude oil provides six million BTUs of energy, how many BTUs of energy will one liter of crude oil provide?
24. 24. Fifty eight thousand kilograms of solid waste is equivalent to how many metric tons?