

## AP Environmental Science QMHS: Ms Maxwell Summer Assignment

Welcome to AP Environmental Science. The major topics of the class we will be covering this year are as follows:

- Energy Systems and Resources
- The Living World
- Populations
- Land and Water Use
- Energy Resources and Consumption
- Pollution
- Global Change

The summer assignment (find on <https://sites.google.com/a/scimax.org/ap-environmental-science/>) will give you a chance to look into some of these topics and prepare yourself for this course. Over the course of the year we will learn more about the science and social issues associated with each of these topics. If you have any questions about your summer assignment or at any time during this course, feel free to email me at [sabrina.maxwell@student.dodea.edu](mailto:sabrina.maxwell@student.dodea.edu). The summer assignment will be due the first day of school.

### Assignment #1 Send me an email telling me about yourself

### Assignment #2 – Watch the movie “Home” you can rent it or watch on Youtube here

- { <https://www.youtube.com/watch?v=jqxENMKaeCU&feature=youtu.be> } Try to watch on a large screen on HD if you can, because it is a visually stunning movie!). It is a great primer for many of the discussions we will be having in this class this year, and it should give you a sense of the major themes of APES.
- As you watch the video, write (in complete sentences) 20 (or more) facts of significance from the video. The video is 90 minutes long – be sure to space out your facts from the entire video. (Basically, take notes throughout the video and type up a list).
- In addition to the list:
  - o Briefly state the basic message of the film.
  - o Write one or two paragraphs about how this video affected the way you think about the Earth, the human population, and the environment.

### Assignment #3 – Research Paper

- Choose one topic from the list below and research it. Find at least five sources for each topic. Cite your sources in a works cited page correctly formatted.
- Write a 2-3 page paper on your topic. Use APA format. Describe what your environmental topic is. What impact does it have and why?
- Turn in papers by sharing in google docs

### Assignment #4 – Textbook Chapters

- Read the Preface For Students (xiii-xxi)
- Read How to Get the Most from this Book (xxvi-xxii)
- Read chapters 1, 2 and 20
- Take notes on these three chapters on either a Google docs or slides format and share with me through google docs. All submissions should be titled as follows [APES2017\_your name\_assignment title]
- Complete all “Do The Math” inside these three chapters (pgs 7, 11, 38, 44)
- Answer the questions at the end of the three chapters (Ch. 1: 23-24, Ch. 2: 48-49B, Ch. 25: 701-703A). You will type all your answers in one document and share in google docs.
- Complete all Measuring Your Impact (pgs 25, 51, 570)
- Write a brief, one page summary on Science Applied (pgs 52, 572)

### Assignment #5 – Prerequisite Knowledge and Skills

- Review these below (after research topics). Create a vocabulary review sheet, write the formulas and names for the chemical compounds, and complete the math problems. Share these through google docs.

## Environmental Science Research Topics: Environmental Disasters and Issues of Modern Times Species Interactions and Biodiversity

### 1. Amazon Deforestation

The Amazon is 5.7 million square kilometers and the largest continuous rainforest in the entire world. Since 1970, 1/6 of the Amazon has been cleared, mainly for beef, and increasingly for ethanol production.

### 2. Invasive Species – Ship Rats

The Rattus Rattus is native to India, but it has spread to almost everywhere in the world. This rat has directly caused, or contributed to, the extinction of multiple wildlife species including a variety of birds, plants and other small mammals. They're blamed for the incredible decline in seabirds on several islands, including many Hawaiian species.



### 3. Coral Reef Bleaching

Ten percent of the world's reefs have been completely destroyed. In the Philippines, over 70% have been destroyed and only 5% can be said to be in good condition. The Great Barrier Reef may be functionally extinct by 2050. While much of this destruction is due to tourism and poaching, there are also links to global warming and its effects on the ocean – from temperature increases to change in water pH levels.



### Food and Agriculture

#### 4. The Dust Bowl

The 1930s brought severe drought, a grasshopper infestation and high winds. Poor farming practices left no natural anchors to keep the soil in place. As a result, it dried, turned to dust, and blew away eastward and southward in large dark clouds.

### Global Warming and Climate Change

#### 5. Hurricane Katrina and New Orleans

The Atlantic storm that began as a category 1 hurricane as it blew across southern Florida wound up being the country's costliest tragedy. Katrina strengthened quickly over the warm waters of the Gulf of Mexico, then roared into the Louisiana coast with 125 mph sustained winds, causing a storm surge that broke levees that shielded New Orleans from surrounding, higher coastal waters, and leaving 80 percent of the city under water. Multiple factors led to this disaster, including wetland removal, the low altitude of New Orleans, and a potential link to global warming.



#### 6. Polar Bears

Many biologists are concerned over the fate of many polar bear populations in relation to global warming. The biggest danger to the animals is habitat loss. Rising polar temperatures cause sea ice to melt earlier in the year. This shortens their time to hunt seals and fatten up for the coming summer. Multiple other aspects of polar bear life have also been affected.

### Environmental Hazards and Human Health

#### 7. Bhopal: The Union Carbide Gas Leak

Shortly after midnight, a poisonous gas cloud escaped from the Union Carbide India Limited (UCIL) pesticide factory. The cloud contained 15 metric tons of methyl isocyanate (MIC), covering an area of more than 30 square miles. The gas leak killed at least 4,000 local residents instantly and caused health problems such as oedema for at least 50,000 to perhaps 500,000 people.

#### 8. The European BSE crisis “Mad Cow Disease”

Bovine Spongiform Encephalopathy (BSE), is a fatal cow disease. The disease is sometimes called ‘*mad cow disease*’ because it causes cows to act strangely and collapse on the spot. The disease is spread by an infected protein called a *prion*, which there is no treatment for.

### Air Pollution

#### 9. The 1952 London smog disaster

December 1952 brought an episode of heavy smog to London, which lasted until March 1953. An unusual cold in London in the winter of 1952-1953 caused additional coal combustion and many people travelled only by car, which caused the occurrence of a combination of black soot, sticky particles of tar and gaseous sulphur dioxide. At the same time, a temperature inversion had settled over the city. This resulted in the heaviest winter smog episode known to man.

#### 10. The Donora Fluoride Fog

Horror visited the US Steel company-town of Donora on Halloween night, 1948, when a temperature inversion descended on the town. Fumes from US Steel's smelting plants blanketed the town for four days, and crept murderously into the citizens' homes.



#### 11. The Southeast Asian Hazes of 1997 and 2006

These were two widespread air pollution events that affected several countries in Southeast Asia. Particulate matter was released into the air in large amounts due to slash-and-burn farming techniques. This amplified the already polluted air quality in many urban areas.

### Water Pollution

#### 12. The Bangladesh Arsenic Crisis

Bangladesh has had major drinking water problems for many decades. Most people used to drink surface water, which was often contaminated with diseases like cholera and dysentery. International organizations started promoting the drilling of tube wells for drinking water production. It was not known, however, that groundwater in Bangladesh contained significant amounts of toxic arsenic.



#### 13. Deep Water Horizon Oil Spill

Deep Water Horizon is a floating oil platform in the Gulf of Mexico that experienced a sudden surge of methane gas. Due to a series of mechanical faults, the gas was able to exit through the rig, catching fire, and causing an explosion. The resulting ruptured pipe leaked oil for several weeks into the Gulf of Mexico, and is the single worst oil spill by volume in history.

#### 14. Exxon Valdez Oil Spill

The *Exxon Valdez* oil spill occurred in the Prince William Sound, Alaska, on March 24, 1989. It is considered to be one of the most devastating human-caused environmental disasters ever to occur in history. Prince William Sound's remote location (accessible only by helicopter and boat) made government and industry response efforts difficult and severely taxed existing plans for habitat for salmon, sea otters, seals and seabirds.

### Nonrenewable Energy

#### 15. The Gulf War

In August 1990 Iraqi forces invaded Kuwait, starting the Gulf War. In January 1991 as Iraqi forces were pulling out of Kuwait, they committed two environmental disasters. The first was a major oil spill 16 kilometres off the shore of Kuwait by dumping oil from several tankers and opening the valves of an offshore terminal. The second was the setting fire to 650 oil wells in Kuwait.

### 16. The Three Mile Island partial meltdown

At approximately 4:00 a.m. on March 28, 1979 the main feed water pumps in the non-nuclear cooling system of reactor 2 of the Three Mile Island nuclear power plant near Harrisburg, Pennsylvania failed. This caused cooling water to drain away from the reactor resulting in partial melting of the reactor core.

### 17. The Chernobyl meltdown

The single greatest disaster in the history of nuclear power plants occurred in the USSR in 1986. There is a wide radius surrounding the site that is contaminated, even today. The incidence of cancer, mutation, and birth defects in nearby areas is now much higher.

## Waste

### 18. E-Waste

As electronic technology rapidly evolves, obsolete computers, monitors, cell phones, and other devices are piling up. Because of this, e-waste is a growing problem in Lagos, Nigeria, and elsewhere in the developing world. Much of the waste ends up being discarded along rivers and roads. Often it's picked apart by destitute scavengers, who may face dangerous exposure to toxic chemicals in the broken equipment.

## Prerequisite knowledge and skills

You are expected to enter the course with a good understanding of basic scientific and mathematical concepts and skills as well as strong, reading, writing and speaking abilities. Although we will continue to develop these skills throughout the year, your success in the class is also dependent upon what you bring to it at the onset. Over the summer, review the scientific concepts and mathematical calculations below. We will be building upon and referencing them throughout the year. **You should be prepared to take a quiz on these skills and concepts during the first week of school.**

### Prerequisite Basic Scientific Concepts:

You should be familiar with the following terms/concepts from Biology, Chemistry, and Earth Science:

Organic vs. Inorganic	Community	Chromosome
Natural vs. Synthetic	Ecosystem	Gene pool
Kinetic vs. Potential Energy	Producers/Autotrophs	Natural Selection
Radioactive decay	Consumers/Heterotrophs	Biodiversity
Half life	Decomposers	Extinction
Law of Conservation of Matter	Photosynthesis (reactants and products)	Plate Tectonics
1 <sup>st</sup> Law of Thermodynamics	Cellular Respiration (reactants and products)	Weathering
2 <sup>nd</sup> Law of Thermodynamics	Aerobic vs. Anaerobic	Climate Change
Entropy	Adaptation	Rocks vs. Minerals
Organism	Mutation	Climate vs. Weather
Species	Gene Trait	
Population		

**The full name of each of these chemical abbreviations:** CO<sub>2</sub>, CO, C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>, CH<sub>4</sub>, H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, NO<sub>x</sub>, NO<sub>3</sub><sup>-</sup>, NH<sub>3</sub>, O<sub>2</sub>, O<sub>3</sub>, P, PO<sub>4</sub><sup>3-</sup>, S, SO<sub>2</sub>, Cl, K, NaCl, Pb, Hg, Rn, U

## Note about math in APES

Like it or not, you have to do quite a bit of math in APES. There are analytical problems on the AP exam, and one of the FRQ (Free Response Question essay) is all math and calculations. You are not allowed to use a calculator on the AP exam, so I will not be allowing you to use a calculator on my tests either (unless I tell you otherwise). Luckily, the math is not difficult.

You always have to show how you arrive at the answer. Show the setup needed to solve the problem, and include units at each step. Draw lines to show how you cancel out units and numbers. Review the basic math skills below.

### Prerequisite Basic Mathematical Skills

#### Percentage

$$17\% = 17/100 = .17$$

- Remember that "percent" literally means divided by 100 (per = out of, cent = 100).
- Percentage is a measure of the part of the whole. Or part divided by whole.
- 15 million is what percentage of the US population? 15 million / 300 million = 0.05 = 5%
- What is 20% of this \$15 bill so that I can give a good tip? \$15 x .20 = \$15 x 20/100 = \$3

## Rates

$$\frac{\text{Rise}}{\text{Run}} = \frac{Y_2 - Y_1}{X_2 - X_1} \quad \text{slope} = \frac{\text{change}}{\text{time}} \quad y = mx + b \quad \frac{dX}{dt}$$

- All of the above are ways to look at rates. The second equation is the easiest way to calculate a rate, especially from looking at a graph. Rates will often be written using the word "per" followed by a unit of time, such as cases per year, grams per minute or mile per hour. The word per means to divide, so miles per gallon is actually the number miles driven divided by one gallon.
- Rates are calculating how much an amount changes in a given amount of time.

## Scientific Notation

$$\text{Thousand} = 10^3 = 1,000$$

$$\text{Million} = 10^6 = 1,000,000 \text{ (NJ has 8.9 million people)}$$

$$\text{Billion} = 10^9 = 1,000,000,000 \text{ (There are 7.1 billion people on Earth)}$$

$$\text{Trillion} = 10^{12} = 1,000,000,000,000 \text{ (National debt is 16 trillion dollars)}$$

- When using very large numbers, scientific notation is often easiest to manipulate. For example, the US population is 300 million people or  $300 \times 10^6$  or  $3 \times 10^8$
- When adding or subtracting, exponents must be the same. Add the numbers in front of the ten and keep the exponent the same.
- When multiplying or dividing, multiply or divide the number in front of the ten and add the exponents if multiplying or subtract the exponents if dividing

$$\text{Ex. } 9 \times 10^6 / 3 \times 10^2 = (9/3) \times 10^{(6-2)} = 3 \times 10^4$$

## Dimensional Analysis (you will be asked to do a lot of these. Make sure you are comfortable with them)

You should be able to convert any unit into any other unit accurately if given the conversion factor. Online tutorials are available:

<http://www.chem.tamu.edu/class/fyp/mathrev/mr-da.html>

## Prefixes

m (milli)	=1/1000	= $10^{-3}$
c (cent)	=1/100	= $10^{-2}$
k (kilo)	=1000	= $10^3$
M (mega)	=1,000,000	= $10^6$
G (giga)	=1,000,000,000	= $10^9$
T (tera)	=1,000,000,000,000	= $10^{12}$

## Complete the following math problems in your APES lab/notebook

1. What is one million times one thousand? Show your work in scientific notation. Give the answer in scientific notation and in words.
2. A population of deer had 200 individuals. If the population grows by 15% in one year, how many deer will there be the next year?
3. One year I had 40 Environmental Science students and the next year I had 50 Environmental Science students, what percentage did the population of APES students grow by?
4. Electricity costs 6 cents per kilowatt hour. In one month one home uses one megawatt hour of electricity. How much will the electric bill be? (be sure to look at the prefixes chart on the previous page for the conversion of kilo to mega)
5. Your car gets 15 miles to the gallon and your friend's car gets 25 miles to the gallon. You decide to go on a road trip to Richmond, VA, which is 300 miles away. If gas costs \$4 per gallon and you decide to split the gas money, how much money will you save in gas by driving your friend's car?
6. Area of Metuchen is approximately  $7 \text{ km}^2$ . What would be the volume of water that fell on Metuchen during a 2 cm rain event? Give answer in  $\text{m}^3$ .
7. An MP3 takes up about 16 kilobytes of memory per second of music. If you owned a one terabyte hard drive and filled it with only mp3s, how many days' worth of music would you have? (keep track of units: kilobytes to terabytes and seconds to days)
8. A Toyota Camry sold in Japan is advertised as having a gas mileage of 23.4 km/l. What is its equivalence in MPG (miles/gal)? (1 mile=1.61km and 1 gal = 3.79L)