

AP Environmental Science is a rigorous course, due to the large amount of material which needs to be covered, a summer assignment is essential. Students performing successfully in the course and on the AP exam are those students who are willing to work steadily and independently throughout the school year.

The Textbook for this course is *Exploring Environmental Science for AP* by G. Tyler Miller and Scott E. Spoolman. Published by National Geographic. This will be an on line text but you will not have access to the on line portion until school begins. You will use the hard copy of the textbook for Part I of the summer assignment.

### The Assignment:

This will be a 2-part summer assignment. Each Part will be graded separately and all parts will be placed in the Performance Based Assessment section of the gradebook. Day 3 of school you will have a test based on this summer assignment – you will be allowed to use the outlines from **Part I** of the assignment to take the test.

### Part I: Outlining Chapters 1 and 2 of Textbook

Due the first day of class. You will need to hand me a printed copy of your outlines. If you do not have a printed you will be able to use the library printer at school to print. Each chapter outline is worth 25 pts. For a total of 50 points. The outline must follow the **alphanumeric format** – a tutorial is included below to refresh your memory on how to do this type of outline. Please take the time to learn the format now, as you will be using it throughout the year. All late submissions will receive a 10-point deduction up to Day 3 of school.

### Directions:

- A. Review the tutorial on making an alphanumeric outline. Outlining a nonfiction text is quite different from other types of note taking. Use the link below. This is the same format taught by our English Department. **This is NOT a summary, or a bulleted list of facts.** Use the process described in the tutorial! Remember with an outline you are NOT writing in full sentences, you are working with topics, subtopics and lists of items or examples related to them. The last page of this assignment has a sample outline from Chapter 4 of the text to help you understand the basics. Pay attention to how the highlighted headings of the textbook are used to organize the outline.

[https://owl.purdue.edu/owl/general\\_writing/the\\_writing\\_process/developing\\_an\\_outline/types\\_of\\_outlines.html](https://owl.purdue.edu/owl/general_writing/the_writing_process/developing_an_outline/types_of_outlines.html)

- B. Outline Chapter 1 of the text according to the alphanumeric outline described in the tutorial. Assignment should be neatly typed and submitted as a hard copy on the first day of school. Keep a copy for yourself to use when you take the test. You may want to review the Chapter 1 AP Review Questions on pages 28-31 but you do not need to submit them.
- C. Outline Chapter 2 of the text according to the alphanumeric outline described in the tutorial. Assignment should be neatly typed and submitted as a hard copy on the first day of school. Keep a copy for yourself to use when you take the test. You may want to review the Chapter 2 AP Review Questions on pages 56-59 but you do not need to submit them.
- D. Each outline will be worth 25 pts. 10 pts for proper outline form and 15 pts for content. Minus 10 points if late up to Day 3 of school. No points awarded after that time.

## **Part 2: Math Review**

Use the attached math worksheet to review math concepts that you will need in this course. Note you will be able to use a calculator both in class and on the APES Exam in May. **This is due the first day of class. 20 points**

## **Final Words For Thought and Summer Suggestions:**

Please feel free to contact me if you have any questions. My email address is [criverso@wyoarea.org](mailto:criverso@wyoarea.org). I may not reply immediately, but will get back to you as soon as I am able. I'm looking forward to beginning our journey through A.P. Environmental Science together this year!

The first law of Ecology: *"Everything is connected to everything else."* (Barry Commoner) Remember this as you begin your study because topics will spiral into each other and when you drop the ball on one unit it will follow you to the next!

## **Here are some ideas to help you enjoy the environment this summer – Let me know which ones you did!**

- Instead of driving, ride a bike or take a walk.
- Get wet in a downpour (not in a thunderstorm).
- Follow a stream to its headwaters.
- Speaking of water, where does yours come from?  
Please don't say the faucet!
- Watch an ant colony.
- Study the waves at the beach.
- Go into the marsh and smell decomposition at work.
- Figure out why dew forms on the grass at night, but not every night.
- Compare star counts at home vs. your vacation spot.
- Play around with Google Earth.
- Grow your favorite vegetable.
- Look at a big tree and determine where all that mass came from.
- Go fishing, go for a hike or go camping.
- Camp out, even if it's in your back yard.
- Change your light bulbs to LEDs
- Compare your car's interior to the greenhouse effect.
- Watch some birds or bats.
- Compare the color and 'blinking' patterns of different fireflies.
- Visit a farm, or at least the farmer's market.
- Tired of the phrase "going green?" Come up with another term.
- Buying organic food vs not buying organic food.  
Does it matter?
- At the pool? Figure out how many gallons of water it takes to fill the pool.

**Sample Outline – this is for Chapter 4 of the Text.**

**The best way to learn from this outline is to open your text to Chapter 4 and take a look at how I organized the main topic/headings. Sometimes you find something later in the chapter that relates back to an earlier passage – you may feel like it makes more sense to you to jump back in your outline and add it there instead of where it was in the Text. This is OKAY the outline should be in a form that is quick and easy for you to reference terminology, processes and examples. IT SHOULD NOT BE PARAGRAPHS AND LONG SENTENCES! It should however be complete. Sometimes adding pictures, charts or graphs is helpful. This is easy with today's technology of taking a picture and pasting it directly into the outline where you want it.**

## **APES Chapter 4 Biodiversity and Evolution**

### **I. Major Types of Life**

#### **A. Based on Cell Structure**

1. **Prokaryotic** – no nucleus (bacteria) all unicellular
2. **Eukaryotic** – nucleus may be unicellular or multicellular
  - a. All species (group of organisms with distinct characteristics that must be able to mate and produce fertile offspring) other than bacteria are built of Euk cells.
    - 7-10 million species but only 2 million ID (half of which are insects)
    - Insects provide ecosystem services of pollination & pest control

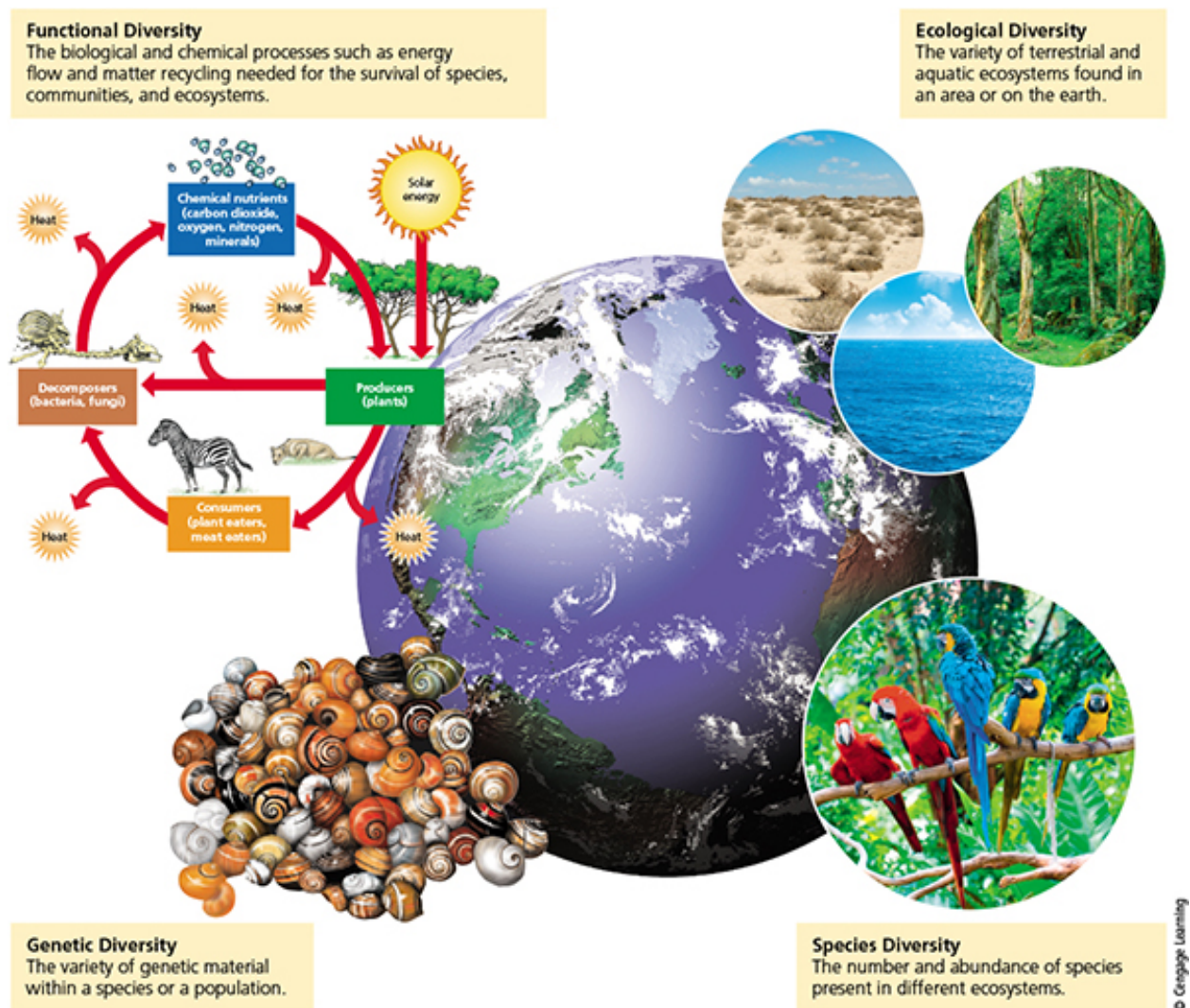
### **II. Biodiversity**

#### **A. Biological diversity or biodiversity (“Earth’s ecological insurance policy”)**

1. The more biological diverse an ecosystem the more functional it will be- the more biomass and the more they will have the ability to adapt to environmental changes. (p97)
2. Sustains **natural capital** (food, medicine, building materials and fuel) (p98)
3. Provides more **ecosystem services**

#### **B. The 4 components of biodiversity:**

1. **Species diversity**: # of different kinds of species in an ecosystem (can use either the Simpson DI or the Shannon Weiner DI. The DI will be higher in the tropics and declines as move away from eq (ecosystem with highest DI is Trop Rainforest)
  - a. Species richness: the actual #
  - b. Species evenness: a measure of the comparative #'s of all species
2. **Genetic diversity**: variety of genes in a population of one species
  - a. Important because higher GD gives better chance of surviving & adapting to changing environments.
3. **Ecosystem diversity**: The earth’s diversity of biological communities/biomes
  - a. Biomes: large ecosystems/regions (yes there are ecosystems within biomes) with distinct climates and prominent species (especially plants – plant life will drive animal life)
    - Core and Edge habitats
    - Ecotone – transitional zone between ecosystems
4. **Functional diversity**:
  - 1.) variety of processes (energy flow, biochemical cycles) needed for survival of life.
  - 2.) Ecological roles of organisms



**III. Roles of Species within Ecosystems:** **Ecological Niche** – a species way of life, everything that affects its survival and reproduction.

**A. Habitat** – simply the **PLACE** the species lives and gets its resources to survive

**B. Generalist** – broad niches – can live in many habitats, eat variety, tolerate wide range of environmental conditions

Examples: racoons, flies, cockroaches, rats, coyotes, and humans

**C. Specialist** – narrow niches – can only live in one type of habitat, eat only one or a few types of food tolerate a narrow range of environmental conditions.

1. More prone to extinction

2. Examples: panda, coastal shorebirds, Koala

**Pros/Cons** = if environmental conditions undergo little change (Trop RF) then **specialists** have an advantage – fewer competitors lots of resources. But under rapidly

changing conditions, a more adaptable **generalist** usually is better off.

**D. Four Major Roles:** (species may play more than one role!)

1. **Native:** normally live and thrive in that ecosystem. Sometime referred to as endemic (very specific area). Example in our area – Black Eyed Susan flower or White-tailed deer
2. **Nonnative:** migrate or brought into (whether on purpose or not) sometimes referred to as invasive, alien, or exotic) Example in our area – spotted lantern fly
3. **Indicator:** species provides early warning signs of change within the ecosystem (“biological smoke alarms”) amphibians are a common one due to their sensitivity to the environment. Birds are also very sensitive (especially to chemical pesticides) and are found virtually everywhere.
4. **Keystone:** remove this species and the ecosystem will be dramatically different. Pollinators are good examples such as bats and honeybees. Also many top predators that keep other populations in check such as wolves, lions, sharks and alligators.

**IV. Evolution:** the process by which the earth’s life forms change genetically over time.

- A. **Natural Selection** – individuals with certain genetic traits are more likely to survive & reproduce – they can then pass these traits along to offspring
- B. Widely accepted **scientific theory:** Evidence based on fossils – total body of fossil evidence is called the **fossil record**.
- C. Based on **Darwin and Wallace** findings/observations (*Origin of Species by Means of Natural Selection*)
- D. MUST involve **genetic diversity or variability!** Happen mainly through **mutations** (could be natural or could be from exposure to radiation or chemicals)
- E. **Adaptations:** If not mutations than adaptations can occur due to environmental conditions selecting a variation of a gene that will then become a adaptive trait which will improve the organism’s ability to survive and/or reproduce. Genetic resistance is a good example – bacteria have developed resistance to antibiotics.
  - Human adaptive traits = opposable thumbs, walking upright, complex brain
- F. **Populations NOT individuals evolve!** The gene variation MUST already be present in the population. What if the reproductive capacity is lost? = lack of ability to adapt and eventually extinction will occur.
- G. Biologist study evolution by using:
  1. **phylogenetic trees** (diagrams how species evolved from common ancestors). Picture on page 104
  2. **Fossil record**
  3. **DNA**
  4. **Homologous structures**
  5. **Embryonic development**

## V. Factors that Affect Biodiversity

- A. **Speciation** – new species forms when groups of same species are separated
- B. **Geographic isolation** – affected by human activity
- C. **Reproductive isolation** – the genetic diversity is affected
- D. **Artificial Selection, Genetic Engineering and Synthetic Biology**
  - 1. Selective breeding to produce desired offspring (used in agriculture for both plants and animals)
  - 2. Manipulating genes – genetic engineering (GMOs)
  - 3. Synthetic Biology – they just created a sperm and egg of a mouse with all the genes they wanted and grew a baby mouse in the lab! YUCK right? Would there be benefits?
- E. **Extinction** (Adapt, migrate or go extinct!)
  - 1. **Endemics** are very vulnerable, usually also specialist
  - 2. Based on the fossil record most species have gone extinct
  - 3. Several periods of mass extinctions have occurred (5) – causes often unknown, some evidence points to the earth beginning the 6<sup>th</sup> mass extinction period but this time **due to human interactions**. ☹



## PART II Math Practice/Review

Watch the following YouTube Dimensional Analysis Reviews: Note the one video mentions that you cannot use a calculator on the Exam – that has now been changed and you will be able to use a calculator.

[https://www.youtube.com/watch?v=d\\_WfCwJW0Og](https://www.youtube.com/watch?v=d_WfCwJW0Og)

<https://www.youtube.com/watch?v=aZ3J60GYo6U>

<https://www.youtube.com/watch?v=1vcfLGWNtLU>

<https://www.youtube.com/watch?v=DZupGEJBxBI>

### **The BEST APES Math Review EVER! (20pts)**

The APES Exam will require you to do mathematical calculations. Although a calculator is able to be used on the exam, it is **mandatory** to show all work for all calculations on the free-response section of the APES exam. This worksheet is designed to help prepare you for the types of calculations you may encounter on this year's APES exam.

**Use a separate piece of paper, and for each problem, show EVERY STEP of your work, and indicate the cancellation of all units....You May Use A Calculator!!**

***Scientific Notation-- All APES students should be able to work comfortably in scientific notation.***

- Place the following numbers into scientific notation:
  1. One billion
  2. Twenty-three thousand
  3. 70 trillion
  4. One one-hundredth
- Do the following calculations in scientific notation:
  5. Five hundred billion times thirty-five thousand
  6. Six thousand divided by 300 billion
  7. One ten thousandth of three million
  8. 6 billion divided by 35 trillion

***Unit Conversions--All APES students should be able to convert from one system of units to another.***

• Use the following conversions to complete the questions. Show all of your work, including the cancelling of units.

1 square mile = 640 acres

1 barrel = 42 gallons

1 metric ton = 2000 pounds

1 kWh = 3400 BTU

1 BTU = amount of energy to raise temp of 1 lb water 1° F

Density of water = 1g/ml = 8 lbs/gallon

1 hectare = 2.5 acres

1 liter = 0.3 gallons

1 kilogram = 2.2 pounds

1 BTU = 250 calories

9. A 100 square mile area of national forest is how many acres? How many hectares?
10. A city that uses ten billion BTUs of energy each month is using how many kilowatt-hours of electricity?
11. Fifty-eight thousand kilograms of solid waste is equivalent to how many metric tons?
12. If one barrel of crude oil provides six million BTUs of energy, how many BTUs of energy will one liter of crude oil provide? How many calories of energy will one gallon of crude oil provide?
13. For crude oil, if 150 pounds of CO<sub>2</sub> is released per million BTUs of energy, how much CO<sub>2</sub> is produced by each barrel of crude oil? (use information from previous problem)

**Percentages—All APES students should be able to work comfortably with percentages.**

14. A natural gas power plant is 60% efficient. If one cubic meter of natural gas provides 1000 BTUs of electricity, how many BUTs of waste heat are produced?
15. If 35% of a natural area is to be developed, leaving 500 acres untouched, how many acres are to be developed?
16. Calculate the percentage growth rate for a country with a population of 6 million: in a year in which it had 100,000 births, 70,000 deaths, 30,000 immigrants and 50,000 emigrants.
17. If the concentration of mercury in a water supply changes from 65 ppm to 7 ppm in a ten-year period, what is the percentage change of the mercury concentration?

**Energy—The APES exam always has questions about energy use. Be prepared!**

• Use the conversions given above to help you with the questions 18-20.

18. How much energy is required to raise the temperature of 1000 gallons of water by 25°F?
19. By how many degrees Fahrenheit can the temperature of one metric ton of water be raised with the addition of 110thousand BTUs of heat?
20. If 500 thousand BTUs of energy are available to raise the temperature of a water boiler from 20°F to 100°F, how many gallons of water can be added to the boiler?

**Complete these 5-Dimensional Analysis Practice Problems for extra credit added to the first quarter! (5 pts)**

1. Dwight was told by his mystic guru that a special medicine would help him gain superhuman strength to fight bears. The instructions say "Take 2 drops per 10 pounds of body weight per day, in 4 doses a day." Dwight weighs 175 lbs. How many drops should he be taking per dose?
2. Michael wants to throw a pizza party so his 15 coworkers will think he's the best boss ever. Each pizza will cost \$19.50 and has 12 slices. He wants each person to be able to have at least 3 slices. He has \$90 to spend after returning a George Foreman grill. Can he afford enough pizza?
3. Kelly has driven by Ryan's house 3 times a day for the past 6 weeks. Every time she drives by, she leaves 2 love letters on his porch. Ryan has thrown out 90% of the letters and a dog ran away with 5% of them. Ryan secretly keeps the rest in his Memories Box. How many letters does he have in his box?
4. Pam just got a shipment of pens and told Erin to hand them out and put in the computer how much the shipment cost. Erin is nervous about this and wants to make sure she gets it right. There are 15 coworkers and they each received 5 pens. There are 8 pens per package, at \$2.65 per package. What was the total cost of the pen shipment?
5. Dwight found a buried treasure with 4,023,743 pennies in it. (He counted twice to make sure.) Each penny weighs 3 grams. Dwight can carry up to 75 lbs. (even though he tells people he can carry much more). His 8 cousins can each carry 75 lbs as well. How many trips will he and his cousins need to make to carry all his money home?