

AP Environmental Science 2024  
Summer Work



Welcome to APES!

Environmental Science can be an exciting course of study for a variety of reasons. Over the course of the year, we will examine the science behind the relationship our species has with the planet. It is an interdisciplinary science that will explore a variety of components that exist within various environmental systems. We will follow the nine-unit AP Environmental Science course structure provided by the College Board to prepare you for the AP Environmental Science exam in May. Throughout this course we will investigate topics related to climate, pollution, biodiversity, and land use.

AP Environmental Science will rely heavily on the textbook throughout the entirety of the course. I would encourage everyone to obtain a copy. The textbook will be available upon your arrival in the fall and can be purchased through The Armory.

***Text: Environmental Science for the AP® Course***  
*Fourth Edition/ ©2023 Andrew Friedland; Rick Relyea*

The summer work outlined below is designed to help prepare you for success and allow you to get off to a great start in APES once we begin the 2023-24 academic year. One of the goals of the summer work is to refresh some of the important prerequisite concepts in math and chemistry. Since we do not have the class time to review these important foundational skills that have been developed in your previous math and chemistry work, it is important that you invest the time this summer to get yourself prepared. ***This summer work will be due on the first day of class and is expected to be completed in a neat and organized manner.*** There are five assignments that impact different areas of the AP Environmental Science curriculum and will evaluate your readiness for the rigors of this course.

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**Assignment #1: Math Practice**

## Summer Math Practice

Each of the following problems illustrates a level of math skill necessary for this course.

One-step Conversion:

1. If 1 kWh is equivalent to 3.6 MJ, how many MJ are in 325 kWh?

Multi-step Conversion:

2. Given that 1,030 Btu = 1 ft<sup>3</sup> and 1 ccf = 100 ft<sup>3</sup>, how many ccf of gas is in 12,020 Btu? (ccf = cubic feet of gas)

Simple Efficiency:

3. A certain engine transforms 7,000 J of chemical energy into 2,000 J of mechanical energy. What is its efficiency?

$$E = \frac{\text{Energy Produced}}{\text{Energy Consumed}} \times 100$$

Complex Energy Efficiency:

4. If a solar panel operates at 23% efficiency, how much light energy is needed to produce 800 J of electrical energy?

Multi-step Energy Generation:

5. A home in the northern US requires 150 MBtu of heat for the winter. If the heat is supplied by a furnace with 80% efficiency, how much would it cost to heat their home, given that gas costs \$0.80/ccf in their region?  $1030 \text{ Btu} = 1 \text{ ft}^3$ ;  $100 \text{ ft}^3 = 1 \text{ ccf}$

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## Assignment #2: Chemistry Review

# Chemistry Review

**PART I:** Match the following terms.

- |                        |   |
|------------------------|---|
| _____ 1. Compound      | A. the force that results from the action of gravity on mass  |
| _____ 2. Matter        | B. particles containing more than one atom  |
| _____ 3. Atom          | C. a measure of the amount of matter an object contains   |
| _____ 4. Isotope       | D. number of total protons and neutrons in an element   |
| _____ 5. Molecules     | E. anything that occupies space and takes up mass   |
| _____ 6. Atomic Number | F. molecules that contain more than one element   |
| _____ 7. Mass          | G. smallest particle that can contain the chemical properties of that element                               |
| _____ 8. Weight        | H. atoms of the same element that have different numbers of neutrons, and therefore different atomic masses |
| _____ 9. Element       | I. a substance composed of atoms that cannot be broken down into smaller, simpler compounds                 |
| _____ 10. Mass Number  | J. number of protons in the nucleus of an atom  |

**PART II:** Short Answer

1. What is the definition of radioactive decay?
  
  
  
  
  
  
  
  
  
  
2. What happens to the original element?

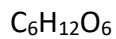
3. What is the First Law of Thermodynamics?

4. Compare and contrast the first and second laws of thermodynamics.

### **PART III: Organic and Inorganic Compounds**

**INORGANIC COMPOUNDS** are compounds that do not contain carbon or do contain carbon, but only carbon bound to elements other than hydrogen. **ORGANIC COMPOUNDS** are compounds that have carbon-carbon and carbon-hydrogen bonds.

5. Circle the **ORGANIC** compounds below?



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**Assignment #3: Half-Life Practice**

## Summer Half-Life Practice

1. Carbon-14 has a half-life of 5,730 years. The sample weighs 210 grams.
  - a. After four half-lives, how many grams of carbon-14 remain?
  
  
  
  
  
  
  
  
  
  
  - b. After four half-lives, how many years have passed?
  
2. Carbon-14 has a half-life of 5,730 years. The sample weighs 120 grams.
  - a. How many years would it take for three-quarters of the original amount of carbon-14 in the sample to become stable?
  
  
  
  
  
  
  
  
  
  
  - b. After five half-lives, how many grams of carbon-14 would remain?
  
3. The half-life of Radon (Rn-222) is 3.82 days. How much (what fraction) of a sample remains after 11.46 days?



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**Assignment #4: Environmental Legislation**

## Summer Legislation Practice

**DIRECTIONS:** Write a brief description for each of the ten pieces of environmental legislation that are required for the AP Environmental Science exam.

6. Clean Air Act (CAA)

7. Clean Water Act (CWA)

8. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

9. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund")



10. Montreal Protocol

11. Kyoto Protocol

12. Endangered Species Act (ESA)

13. Safe Drinking Water Act (SDWA)

14. Delaney Clause-of Food, Drug, and Cosmetic Act

15. Resource Conservation and Recovery Act (RCRA)

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Assignment #5: FRQ Task Verbs

## Summer FRQ Task Verb Practice

The following directives are commonly used in FRQs. Understanding what these directives mean and writing full and concise responses according to those directives will increase the chances of earning points on FRQs. Match the directive to the best possible example.

\_\_\_\_\_ Identify      \_\_\_\_\_ Describe      \_\_\_\_\_ Justify      \_\_\_\_\_ Calculate  
\_\_\_\_\_ Explain      \_\_\_\_\_ Make a Claim      \_\_\_\_\_ Propose a Solution

- A. A possible way to minimize particulates in the atmosphere would be to install scrubbers on coal-burning facilities. A scrubber uses either static electricity or a mist of water to capture particulates before they are released into the atmosphere.
- B. One primary consumer shown in the marine food web is zooplankton.
- C. I disagree with the scientists. The graph shows a decline in the use of nuclear energy, refuting the scientists' statement.
- D. Soil is created when pioneer species such as lichens exude acid that chemically break down rock. The lichens die, and the dead organic material holds water and nutrients that support grasses, the next plants in succession.
- E. A scrubber on a smokestack is a device that can use water or static electricity to reduce mercury in the atmosphere during combustion.
- F. 
$$\frac{(180 \text{ million} - 30 \text{ million})}{30 \text{ million}} \times 100 = 500\%$$
- G. Eutrophication occurred because the data shows that oxygen levels dropped from 8 ppm to 4 ppm in the pond adjacent to the feedlot.