

Hello, future Environmental Scientist!

AP Environmental Science (APES) is a college level course that combines the disciplines of biology, chemistry, geology, physics, algebra and statistics to investigate environmental issues affecting your planet. I am excited to facilitate your learning about how the Earth's systems function together and how we humans affect our planet. We will also take a reflective view of our personal consumption habits and learn ways to be responsible global citizens in the face of serious environmental challenges.

In order to help you develop the study strategies you will need in college, this course will expect you to be responsible for understanding, and making connections between, a large amount of material. Throughout the school year I will guide you through projects with specific learning outcomes and it is your "job" to acquire the necessary content knowledge and skills to apply your understanding to novel real-world examples. Some units will be assessed with more traditional quizzes, labs and tests to practice the test-taking skills for the AP exam.

To be successful in this course, you must build upon a strong science & math background. The purpose of this summer work is to help you prepare for APES by reviewing important math concepts and getting familiar with using case studies to practice experimental design, applying relevant knowledge, and data interpretation.

Your summer work will be due to our Google Classroom page the second day of class. You do NOT need to submit anything before we meet on the first day of school. You will have a quiz on this material at the end of the first full week of school.

Please feel free to email me if you have any questions about the course or assignment.

Have a nice summer!

~Dr. Jensen

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Part 1: Bumblebee vs. Fungicide Case Study (12pts)

Complete the interactive case study at the HHMI Biointeractive site (QR code or link below). When you complete the case study, you must select "View Report." You will then be given the option to Print your response (upper right corner). You can either print a hard copy and then submit a picture of it to Google Classroom when school starts OR you can choose to "Print as PDF" and save the digital file to your computer for later submission. ***BEWARE! If you do not "Print" your responses at the end of the case study you will have to re-do it!***



<https://www.biointeractive.org/classroom-resources/interactive-case-study-effects-fungicides-bumble-bee-colonies>

Part 2: Math Review (20pts)

The APES Examination will require you to do mathematical calculations and *calculators are not allowed*. You may find it possible to do them in your head; nonetheless, it is mandatory to *show all work* for all calculations on the free-response section of the APES exam. This part of your summer work is designed to help prepare you for the type of calculations you may encounter on this year's AP exam. For each problem show every step of your work, and indicate the cancellation of all units... **No Calculators!!** You may print and write answers on this sheet (save some paper and only print this part!) OR complete on a separate sheet of paper. Ultimately you will submit images of your work electronically to Google Classroom.

Scientific Notation

Place the following numbers into scientific notation

- | | |
|--------------------------|------------------|
| 1) one billion | 4) three hundred |
| 2) twenty three thousand | 5) 0.00025 |
| 3) 70 trillion | 6) 7,310,00 |

Perform the following calculations using scientific notation. No Calculators!!

- 7) five hundred billion times thirty five thousand
- 8) six thousand divided by 300 billion
- 9) $(3.5 \times 10^{-2})(2.0 \times 10^{-5})$
- 10) $(1.11 \times 10^{-5})(6.0 \times 10^9)$

Metric Conversions

APES students should be comfortable converting between common metric prefixes. Below are common prefixes, and the number of base units each represents. For example, 1 Terawatt = 10^{12} Watts;

- 11) 2.8 mm = _____ m
- 12) 1.3 nm = _____ mm
- 13) 300 mg = _____ g
- 14) 12 mg = _____ ng
- 15) 250 mL = _____ L
- 16) 400 GW = _____ W
- 17) 5×10^4 kg = _____ Mg

prefix	name	base units
n	nano	10^{-9}
μ	micro	10^{-6}
m	milli	10^{-3}
k	kilo	10^3
M	Mega	10^6
G	Giga	10^9
T	Tera	10^{12}

Unit conversions

You will be required to convert from one system of units to another. Show all of your work including the canceling of all units. No Calculators!! Use dimensional analysis or factor label method.

1 mi² = 640 acres 1 acre = 0.405 hectares 1 barrel oil = 42 gallons

1 L = 0.264 gallons 1 metric ton (tonne) = 1 x 10³ kg

1 kilowatt-hour = 3.4 x 10³ BTU (British Thermal Units) = 8.6 x 10⁵ calories

18) A 100 square mile area of national forest is how many acres? How many hectares?

19) A city that uses ten billion BTUs of energy each month is using how many kilowatt-hours of energy?

20) Fifty eight thousand kilograms of solid waste is equivalent to how many metric tons?

21). 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?

Percentages

22) 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 (moved in), and 50,000 emigrants (moved out). Hint: Think about what the new population size will be, then follow the steps [found here](#) (or QR code to the right).



23) If the concentration of mercury in a water supply changes from 65 parts per million (ppm) to 7 ppm in a ten-year period, what is the percentage change of the mercury concentration? How much per year?

24) In 2022 8.9% of students taking the APES exam got a 5, and 27.4% got a 4. Assuming a similar distribution, if there are 75 Jesuit students taking APES this year, approximately how many of you will receive either a 4 or 5 on the AP exam (let's not have a fraction of a person!)?