

Summer assignment for AP Environmental Science

Due on the first day of school.

This course covers parts of all major areas of science (physics, chemistry, biology, and earth science), so this review will get you up to speed on basics that you should know. This will help us go beyond the basics to put together the puzzle of how the natural world works and how all aspects of our lives (economics, politics, health, etc.) are inextricably linked to natural systems.

The questions below should cover topics/terms that you have some familiarity with, although I realize some of it may have been covered back in middle school (particularly the earth science parts).

The following videos should help, but they may not have all the answers; you may need to look some things up or review class notes from previous courses.

Science basics:

- Watch fact v. hypothesis v. theory v. law
<https://www.youtube.com/watch?v=lqk3TKuGNBA>
- Define/understand: fact, scientific hypothesis, scientific theory, scientific law.
 - Is there a direct relationship among/between any of these?
- Be able to design an experiment (problem, hypothesis, background information, materials, methods/experimental design, data tables, graphing data, discussion, conclusion. Know independent/manipulated variable, dependent/responding variable, control, variables held constant, outliers, sources of error).

Physics/chemistry basics:

Water:

- Watch CrashCourse water video
https://www.youtube.com/watch?v=HVT3Y3_gHGg&list=PLWNFsVK9R1MCvvPPAzX9_cV5YnfUKQaPx&index=4
- Define/understand: solid/liquid/gas, covalent/ionic/hydrogen bonds, polar/nonpolar, cohesion/adhesion, capillary action, solvent/solution, hydrophilic/hydrophobic, density, heat capacity

Energy basics:

- Watch SciShow energy video
https://www.youtube.com/watch?v=CW0_S5YpYVo&list=PLWNFsVK9R1MCvvPPAzX9_cV5YnfUKQaPx&index=18
- Define/understand: the two laws of thermodynamics; kinetic/potential energy; nuclear energy
- Describe what is happening: $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- Watch electricity videos <https://www.youtube.com/watch?v=EJeAuQ7pkpc> and <https://www.youtube.com/watch?v=20Vb6hlLQsg&t=152s>
- Define/understand: electricity/electrons, insulator/conductor, current/static electricity, ampere (amp), voltage (volt)
- How is energy generated in a power plant from combustion of fuel?
- How does electricity travel from one place to another?

Atoms/radioactivity basics:

- Watch SciShow video on radioactive decay and dating
https://www.youtube.com/watch?v=fx3BqQ44zDE&index=49&list=PLWNFsVK9R1MCvvPPAzX9_cV5YnfUKQaPx
- What is the basic structure of an atom? What are isotopes?
- What is radioactive decay? What is a half-life?
- How can half-lives be used to find out the ages of ancient samples of living things/organic material?
- Why are tree rings and other methods necessary for corroborating dates?

Earth science basics:

- Watch TED-Ed seasons video
https://www.youtube.com/watch?v=DD_8Jm5pTLk
- Define/understand: axial tilt v. rotation on axis
- How does the angle at which sunlight energy strikes the Earth affect seasonal temperatures?
- Know relative positions of the Sun and the Earth during different seasons to explain the changing seasons.
- Explain the relative seasonal variations at different latitudes.

Biology basics:

- Watch CrashCourse ecosystem video
<https://www.youtube.com/watch?v=v6ubvEJ3KGM>

- Define/understand: ecosystem, gradient, biomass, productivity, autotroph/heterotroph, producers, primary/secondary/tertiary...consumers, herbivores/carnivores/omnivores/detritivores, food chain/web, limiting factors
- Explain at least three ways in which one ecosystem can be connected to another.
- What is the ultimate source of energy for most ecosystems?
- NOTE: there's more information on the video, but we'll go over that in class later in the first semester.

Basic math: You should be relatively confident with dimensional analysis and metric units. Try this:

Farmers in Haiti are being encouraged to plant mango trees to help reduce runoff and increase uptake of water by the soil and the trees. Consider a group of Haitian farmers that decides to plant mango trees. Mango saplings cost \$10 each. Once the trees become mature, each tree will produce \$75 worth of fruit per year. A village of 225 people decides to pool its resources and set up a community mango plantation. Their goal is to generate a per capita income of \$300 per year for everyone in the village.

1. How many mature trees will the village need to meet the goal?
2. Each tree requires 25m² of space. How many hectares must the village set aside for the plantation?