

## Summer Research and Preparation for Honors Biology of the Living Earth

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Honors Biology of the Living Earth is a college preparatory core course that uses the three dimensions of learning detailed in the [Next Generation Science Standards \(NGSS\)](#). This course prepares students for advanced/college science courses such as AP Biology.

Success in a life-science course is facilitated by a basic understanding of physical sciences, math, and engineering practices. Additionally, learning will develop through proper use of tools such as the Internet (educational and government sites) and library resources, smart devices, and lab equipment used to obtain and allow students to disseminate information. Please read, study, and review the items in this document and complete the questions at the end. Also note that this assignment will be due on the first day of class.

Review basic chemistry (it is recommended to go to the library/book store and obtain a basic chemistry book and read it). You may also watch the [four part basic chemistry video](#) that teaches some essential chemistry content needed to comprehend biochemistry concepts.

*Define the terms below:*

1. Elements
2. Mass
3. Matter
4. Protons
5. Electrons
6. Neutrons
7. Isotopes
8. Bonding
9. Ionic
10. Covalent bond
11. Hydrogen bond

Become familiar with the elements on the Periodic Table of Elements and know the commonly studied elements found in living organisms. (Carbon – C, Nitrogen – N, Oxygen – O, and Hydrogen – H, Phosphorus – P).

Know the scientific method and what occurs at each level.

- Observation
- Question
- Hypothesis
- Experiment: This level of the scientific methods will allow you to obtain:
  - Data (Draw conclusions based on the data obtained)

- Graph data
- Set up graphs, charts, and spreadsheets from the data

You may review some of the equipment you will encounter in this class:

- Test tubes
- Microscopes (Compound, stereo, binocular, monocular)
- Beakers
- Graduated cylinder
- Pipet
- Dissection scissors
- Fume hood
- Hot plate
- Centrifuge
- Petri dish
- Digital balance
- Flasks
- Triple-beam balance
- Probes (temperature, gas, pH)

Know how to follow experimental procedure and recognize variables:

*Define in your words the following terms and give an example.*

- Dependent variable
- Independent variables
- Control group

Know the common units of measurement for the English and Metric system and one conversion factor for length, mass, & volume.

*Common conversion measurements (conversion factors) to memorize:*

2.54 centimeters/ 1.0 inch

454 grams/1.0 pound (lb.)

3.78 Liters/1.00 gallon

*Common temperatures to know:*

100 °Celsius = boiling point of water at sea level - Metric system

212 °Fahrenheit= boiling point of water at sea level - English system

0° Celsius – Freezing point of water at sea level– Metric system

32 °Fahrenheit. Freezing point of water at sea level – English system.

### Common units to know

12 inches/ 1 foot

5,280 feet/ 1 mile

4 quarts/ 1 gallon

16 ounces/ 1 pound

Review the [metric prefixes, symbols, and numeric value](#):

Be able to utilize basic mathematical principles such as an ability to work with fractions, decimals, percentages and ratios.

### *Sample problem*

A bacterium moves at 10 microns (micrometers) per second. How fast is it travelling in millimeters/second?

$$10 \text{ micrometers}/1 \text{ second} \times 1 \text{ meter}/1,000,000 \text{ micrometers} \times 1,000 \text{ millimeters}/1 \text{ meter} \\ = 0.01 \text{ millimeters}/\text{second}$$

Show your work when solving each problem:

1. Convert 11 kilometers to miles.
2. A student observes a paramecium using a compound light microscope and measures its length at 1.5 micrometers. Convert to nanometers, millimeters, centimeters, & inches.
3. How many pounds is the human brain if the mass is 1.3 kilograms?
4. If 1 quart = 32 fluid ounces, how many fluid ounces are in 2 gallons?
5. 2 gallons are equivalent to how many liters?
6. A paper bag contains four items that are identical except for color (red, green, indigo, and yellow). What are the chances of picking a green item? What are the chances of picking the green item twice in a row?
7. Draw and label the steps of mitosis for an animal and plant cell.

8. Draw and label the structures in an animal and plant cell.
9. What type of charge does a proton carry?
10. What type of charge does an electron carry?
11. What is the main gas found in the air that we breathe?
12. Atoms of the same chemical element that have different atomic mass are known as?