

Honors Biology I Summer Assignment

The study of Biology starts with a study of the characteristics of life. These are features common to all organisms that biologists use to determine if an object is living or non-living. There are many different lists of characteristics of living things. Most lists say that all life is organized, made of cells, has the ability to reproduce, has variations, is capable of adapting to the environment, responds to stimuli, grows and develops. You will be doing an experiment this summer to begin investigating two of the characteristics of life. You will investigate the characteristics of growth and development. Growth is defined as an increase in the number of cells in an organism or an increase in the amount of living material in a cell. Development is defined as a change in the form of an organism as it goes through its life cycle from embryo to adult. Students usually find it difficult to distinguish between the two – thus the experiment.

You will be investigating the two characteristics of life mentioned above and using the scientific method to do so. This experiment is mainly observational – in it you will observe the growth and development of a bean seed. But you will also test this hypothesis: If seeds need water to germinate, then seeds given water will germinate faster than those not given water. The data that you collect will be recorded in a bound notebook in word description, tables with measurements, labeled sketches that you make, and in the form of pictures that you will take with a camera. **The notebook containing daily descriptions of observations, measurements in tables, labeled sketches, and the pictures you took will be due on the 1st day of class. The essay described at the end of the assignment is also due the first day of class.**

You will need the following materials to do this assignment: a bound lab notebook, a camera, red beans (the kind your mom buys to cook “red beans and rice” – in a bag not a can! ☺), **clear** plastic cups, and potting soil. Mrs. Raz has samples of these materials in her room for you to view if you are not sure what you need. If you need help or have questions about the assignment, email me at: catherine.raziano@zacharyschools.org

Procedure for the Experiment:

Day 1:

In your notebook, write the date, record the hypothesis, and then sketch a picture of the outside of a red bean. The outside of the bean should have a concave area. Using the information on the attached handouts, label the picture.

Put 10 red beans in a plastic cup. Pour water into the cup until it is about an inch over the surface of the red beans. Leave the beans in the water over night.

Put 10 other red beans in a plastic cup to use as a control – do not add water to these beans.

Take a picture of the beans in the cups with the camera **making sure you are in the picture**.

Day 2:

In your notebook, record the date. Describe the beans in each cup – the experimental group with water and the control group without water - noting any changes in the beans – changes in size, shape, color, texture, etc. Make a sketch of a bean that was soaked over night in the cup as it now looks. Take the skin off of the bean and open it. It should open naturally into two halves. There should be an embryo plant inside the bean. Sketch the opened bean in your notebook and use the attached information

to label the opened bean seed.

Take a picture of the opened bean seed **making sure you are in the picture.**

Get an empty clear plastic cup – you may use the same cup if you empty and clean it – and put potting soil in the cup until it is about an inch from the top of the cup. Place your experimental bean seeds in the cup so that you can see them from the outside. You should place them about an inch below the soil all around the cup. You want them to be up against the plastic sides of the cup so you can watch them through the plastic. You may want to use two or three cups so you can plant all of the beans. Do not plant the one you dissected. Water them so that the soil is moist but not soupy!

Plant some of the control beans in another cup in the same manner – do not add water to the control cup. If you use potting soil – it may contain moisture and/or moisture pellets – this will affect the results. You can dry out the soil or evaporate the moisture in the soil by putting it in a baking pan in the oven at a low temperature – but if there are white moisture pellets in the soil this will not work.

Take a picture of the control and experimental beans in the cups after you plant them **making sure you are in the picture.**

Day 3 until Day 14:

In your notebook, record the date. Describe any changes in the bean seeds in both groups and make sketches of the bean seeds each day. Take a picture of the at least one of the experimental bean seed each day **making sure you are in it.**

As the bean seed develops you will see new structures appear – the new structures are making it change its form and so is evidence that it is developing! The attached handout will show you what to expect and give you information to use to label the developing seed. (You may have to remove the seed from the soil to see it – if you do, do so very carefully and return it to the same position.)

Use a ruler to measure the new structures as they appear. Measure them each day from the first day that they appear and record the measurements in a labeled table your notebook each day. As they increase in size, growth is occurring. (If you have to remove the seed from the soil to measure its parts do, do so very carefully if you damage the parts it may not grow – once parts are above ground measure from the top of the soil.)

If you have no growth after 3 or 4 days, start over OR email me for suggestions – do not come to school and say that your beans did not grow.

This is an experiment to test a hypothesis. **You may have an idea about what should happen to the control and what should happen to the experimental group – but if it doesn't happen it is not wrong and you do not have to start over and over** until what you think should happen happens. You record what does happen. This does not mean that no growth of any beans in either group is acceptable – if you do not have any growth at all in either group you will need to begin again.

Before school starts:

You are to turn in an essay and the bound notebook which contains your written observations, tables of measurements, labeled sketches, and photos. Your essay and notebook are due the 1st day of school.

Your essay should explain how a seed develops into a plant; whether or not the hypothesis you used was supported by the data you collected or not, should list what factors are necessary for seeds to germinate and develop, and should state the difference between growth and development. The explanation of how a seed develops should include – what parts develop 1st and what happens to each part as the seed turns into a plant. It should be written using the terminology that you found in the handouts and should be detailed enough to fully explain what happens from the time the seed is planted until the first leaves – not the cotyledons, the first leaves - appear.

Your essay should also explain the difference between growth and development using observations or data from your experiment. It should define growth and development – but definitions alone are not enough. Your essay should state whether or not the hypothesis used was supported by the data and should use data to show that it was or was not supported. It should include factors you discovered in this experiment or through research are necessary for the seeds to develop or germinate.

The essay is to be typed on unlined paper in paragraph form. Use spell check and check your spelling. You are to write in third person only (this means that you can't use I, we, us our, my, mine, you, or yours). You are to use the scientific terms that you learned doing this experiment and you are to define them as you talk about them in your essay.

There is information about plants and development on my moodle web site under Honors Biology Links- it is in the link titled Plant Development and you will have to scroll down until you find seed development. You are working with a dicot seed. We will talk about monocots later.

Have fun!! This should only take a few minutes each day so enjoy the rest of the summer!!