**Honors Biology Summer Assignment**

Mrs. Ouellette

Room 243



Honors Biology is a challenging course that will help you to gain a better appreciation for living organisms and the world around you. It will also help strengthen your skills of observation, planning, and analysis as you learn to conduct more inquiry-based labs. This summer assignment is designed to spark your curiosity about living things as you learn about their major unifying characteristics.

**IMPORTANT**

* **Please read through this packet very carefully prior to leaving for the summer.** If you have any questions please come see me in room 243 before the end of the school year! If questions pop up over the summer, e-mail me.
* **Your assignment is DUE on the first day of school and will be the first project/lab grade you receive in the class.**

For your summer assignment, you will be choosing one of the following investigations/projects to carry out in which you will explore one of the major characteristics of living things. You must choose one of the following assignments.

**CHARACTERISTIC #1: Living organisms are made up of units called cells**

Create a model of three types of animal cells (skeletal muscle, macrophage, osteocyte, red blood cell, neuron, etc.) You may use whatever materials you have available to you, except for food. (Sorry, food tends to decompose, fall apart, and attract insects!) Your model must be accurate and internal structures must be labeled. Be sure to do plenty of research before planning how you will construct your models and what materials you will be using.

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| **Required Evidence to Submit** | **Completed** |
| Photo-documentation of you building your models  \*Your FACE must be in the photos so that I know you did the work! |  |
| Your labeled models |  |
| A 300-400-word discussion in which you compare and contrast the types of cells in terms of their structure and function |  |

**CHARACTERISTIC #2: Living things reproduce**

Go to the grocery store or nursery and buy at least 3 different types of flowering plants. Make sure you know what type of plants you are working with (scientific and common names please)! Bring the plants home and DISSECT them! Create a detailed, colored illustration of the reproductive structures found within each type of flowers. Go online and look up what the different parts that you drew are called and label your illustration. Now go online and learn how to propagate plants from cuttings and DO IT! Make careful observations of your newly propagated plants as they take root. Here are a few sites that may help:

* <http://www.planetnatural.com/plant-propagation/>
* <http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/help-for-the-home-gardener/advice-tips-resources/visual-guides/propagating-plants-by-cuttings.aspx>

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| **Required Evidence to Submit** | **Completed** |
| Photo-documentation of you with your flowers and propagated plants  \*Your FACE must be in the photos so that I know you did the work! |  |
| Colored, labeled, illustrations of your flowers |  |
| A 300-400-word discussion in which you compare and contrast the processes of sexual and asexual reproduction in plants  \*Be sure to incorporate your observations from the flowers and propagation |  |

**CHARACTERISTIC #3: Living things are based on a universal genetic code**

Visit the University of Utah Health Sciences webpage, “Learn Genetics”, and complete the DNA extraction virtual lab (<http://learn.genetics.utah.edu/content/labs/extraction/>). Now, try it yourself! Click on the link at the bottom of the page: “How to extract DNA from anything living”. Follow the directions and perform a DNA extraction on a type of produce of your choice. Record your observations throughout the process of extraction. If you encounter problems, try reading over the “Frequently Asked Questions” page. Once you have perfected your extraction technique, design an investigation to answer one of the following questions:

* Do different types of produce have more DNA than others?
* How does the type or brand of soap or detergent impact DNA extraction?
* Do Fungi have DNA?
* Ask a question of your own!

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| **Required Evidence to Submit** | **Completed** |
| Photo-documentation of you extracting DNA for your investigation  \*Your FACE must be in the photos so that I know you did the work! |  |
| A 300-400-word analysis in which you discuss the function of DNA in living things, the scientific relevance of DNA extraction, and the results of your investigation. |  |

**CHARACTERISTIC #4: Living things grow and develop**

Select a plant or animal to observe as it carries out its life cycle. The time period for observation will vary depending on what type of organism you choose. Insect Lore is a great website where you can purchase live insects to observe as they carry out their life cycle! (<http://www.insectlore.com/>) If you don’t think you can handle insects, get some seeds going! Make sure you plant them in a way you can observe them as they germinate. Take pictures each day of your developing organism and keep a journal in which you record at least 2 quantitative and 2 qualitative observations each day.

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| **Required Evidence to Submit** | **Completed** |
| Photo-documentation of your investigation  \*Your FACE must be in the photos so that I know you did the work! |  |
| A graph displaying your quantitative data |  |
| A 300-400-word analysis of your data in which you discuss both quantitative and qualitative trends and how they illustrate this characteristic of living things |  |

**CHARACTERISTIC #5: Living things obtain and use materials and energy**

Start a small compost heap and observe for a period of at least 14 days. Visit the site each day and take pictures from several positions. You will also need to make 4 quantitative and 4 qualitative observations per day. Record the presence/activity of any living organisms you see on/in/around the log each day.

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| **Required Evidence to Submit** | **Completed** |
| Photo-documentation of your investigation  \*Your FACE must be in the photos so that I know you did the work! |  |
| A graph displaying your quantitative data |  |
| A 300-400-word analysis of your data in which you discuss both quantitative and qualitative trends and how they illustrate this characteristic of living things |  |

**CHARACTERISTIC #6: Living things respond to their environment**

Design a controlled experiment in which you investigate a plant or animal’s response to any of the following variables: light, water, nutrients, substrate, temperature, etc. You will need to determine the question you are asking and your hypothesis before you begin. You will need at least one experimental group (although you can have more than one) and one control group. Remember, it is important to only change ONE variable at a time, otherwise you cannot conclusively make any statements about your data. Collect at least 2 pieces of quantitative and 2 pieces of qualitative data while conducting your investigation.

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| **Required Evidence to Submit** | **Completed** |
| Photo-documentation of you conducting your investigation  \*Your FACE must be in the photos so that I know you did the work! |  |
| A poster-board on which you include   * Your question and hypothesis * A step-by-step procedure section (with pictures/diagrams) * A “data” section in which you display both a table and graph * A 200-300 word conclusion in which you:   + Analyze the data you collected   + Determine whether your hypothesis is supported or not   + Evaluate if you can answer the question you asked   + Propose improvements to the procedure |  |

**CHARACTERISTIC #7: Living things maintain a stable internal environment**

Go on at least a 20-minute run. Before heading out, have someone help you record your heart rate, respiration rate, external temperature, and internal temperature. Make at least 2 qualitative observations as well. Immediately after you return from your run, have someone help you to record the same data. Compare your pre and post results.

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| **Required Evidence to Submit** | **Completed** |
| Photo-documentation of you before/after your run |  |
| A graph displaying your quantitative data |  |
| A 300-400-word analysis of your data in which you discuss both quantitative and qualitative trends and how they illustrate this characteristic of living things |  |

**CHARACTERISTIC #8: As a group, living things change over time**

Read “Your Inner Fish”, by Neil Shubin and write a 300-word summary in which you cite at last 4 pieces of evidence that support evolutionary change. For each piece of evidence evaluate BOTH strengths and weaknesses.

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| **Required Evidence to Submit** | **Completed** |
| Photo-documentation of you with your book  \*Your FACE must be in the photos so that I know you did the work! |  |
| A 300-400-word summary of at least 4 pieces of evidence that support evolutionary change and an evaluation of their strengths and weaknesses |  |