Welcome to Honors Biology!

We are excited to start the new school year studying biology. The following assignments encompass some basic understandings to the study of biology that will help you as we go through the year. These are concepts that provide a basic foundation to the work we will do. Some of the work may be review; there may be some things that you have to research and find answers.

Expectations
You are to complete this over the summer. It would be best to complete this closer to the beginning of the school year so that you can recall and use the information in class. **Please complete this as a Google Doc before class on the first day of school. You will submit your assignment through OnCourse during our first class period.** There will be a 50% deduction in points for work that is submitted late. The assignment is worth 20 points.

We will review the material on the second day of class and you will **take a quiz on Parts B & C on the third day of class**. Parts A & D are concepts and practices we will work on throughout the year.

For class, you will need a writing implement and a composition notebook for lab and discussion notes and a folder or binder to keep any returned papers and handouts.

Of course, you are expected to have your Chromebook with you every day. It should be charged. It is also helpful to have headphones available everyday because there will be times when you will be watching short videos in class.

If you have any questions over the summer, please email either Ms. Napoleon (kerrynapoleon@hvrsd.org) or Ms. Ribecca (stefanieribecca@hvrsd.org).

Have a great summer!

Ms. Napoleon and Ms. Ribecca

Name:

Honors Biology Summer Assignment

Please answer all questions in red.

Part A: Organization of Life

Directions: Watch the following video. Complete the questions that follow.

1. Based on what you watched in the video, provide at least one example of each level of organization in a human:

Level of Organization	**Provide an example of each level of organization in a human:**
Organism	**Human**
Organ System	**A.**
Organ	**B.**
Tissue	**C.**
Cell	**D.**

2. If we look at the levels of organization, we can see that these levels of organization continue upward from organism. In order, from smallest to largest, they are: **organism→ population→ community→ ecosystem→ biome→ biosphere**.
In a paragraph, describe the relationships among these levels (in boldface print). You should include in your answer, a definition of what each one is as well as examples. You should be referring to both biotic and abiotic features where appropriate.

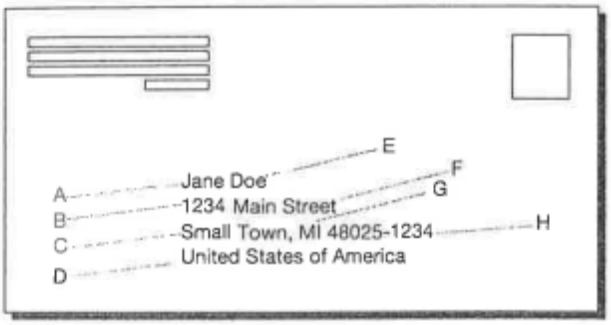
3. Biology encompasses all levels of biological organization, but scientists can specialize in studying a certain level. Which specific level(s) might a scientist might focus on if investigating genetic links to certain types of cancer?

Part B: Classification

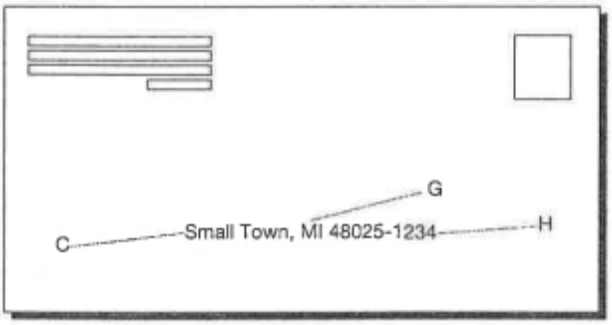
Directions: As scientists seek to make sense of the natural world, one thing they do is organize information. In this activity, you will learn how classification systems are used in biology.

To do this, we are starting with a model that you see in everyday life, that of mailing a letter. With over 326 million people in the USA, you can address an envelope and within a few days it will be delivered to that one person to whom it is addressed. How can that happen?

Model 1 – Addressing an Envelope



Addressed Envelope 1



Addressed Envelope 2

1. According to the envelope in Model 1, who is supposed to receive the letter?

2. Which of the addressed envelopes in Model 1 will be more successful at reaching its destination? Justify your choice.

3. In Addressed Envelope 1, which four letters out of A--H correspond to the most specific part of the address?

4. In Addressed Envelope 1, which four letters out of A--H correspond to the most general part of the address?

5. In 1983, the US Post Office introduced a zip code plus 4 (H). Thinking about what you have learned about addresses, why would this additional information be added to address labels?

Model 2--Taxonomy

	Envelope (Jane Doe)	**Taxa**	**Lion** (*Panthera leo*)	**Tiger** (*Panthera tigris*)	**House Cat** (*Felis catus*)
Country			Animalia	Animalia	Animalia
State and zip			Chordata	Chordata	Chordata
Town			Mammalia	Mammalia	Mammalia
Street name			Carnivora	Carnivora	Carnivora
House no.			Felidae	Felidae	Felidae
Last name					
First name					

6. Using the envelope outline from Model 1, classify the full address by writing the appropriate information in the "Envelope" column in Model 2.

Important: Carolus Linnaeus (1707--1778) is known as the father of modern taxonomy. Taxonomy is the science of finding, describing and categorizing organisms with the ultimate goal to name the species. In traditional Linnaean taxonomy, the seven major taxonomic groups are (in order from least specific to most specific) Kingdom, Phylum, Class, Order, Family, Genus and Species. Modern taxonomy categorizes the six kingdoms into three domains.

7. Use the Linnaean taxonomic groupings to complete the third column of the table above.

Which two of the three cats listed in Model 2 are most closely related? Explain your answer.

8. At which taxonomic level do the two cats you identified in the previous question separate?

9. What is the most specific taxonomic grouping in which all three cats are the same?

10. What is different about the way the genus and species names are written compared to the other taxa?

11. The genus and species names are collectively referred to as the scientific name. It is written in a form known as binomial nomenclature, a two-term Latin naming system. There are three rules for writing a scientific name using this system. Analyze the information in Model 2 to complete the rules below:
    a. **Rule 1:** The scientific name is always written in ____ parts, which the genus name written _____and the species name _____.
    b. **Rule 2:** The scientific name is always written in _____. If it is handwritten it is written in cursive or underlined.
    c. **Rule 3:** The first letter of the genus name is a _____letter.

12. This system is used all over the world. Why do you think Latin is used instead of a more modern language?

13. Using this system, would it be possible for two different species to have the same name?

14. In Linnaeus's time, classification was based on the appearance of organisms. Think about the appearance of organisms such as tadpoles and frogs, sharks and dolphins, and penguins and eagles. What are the limitations of classifying organisms by only their appearance?

Model 3--Domains and Kingdoms

Domain	Kingdom	Cell Organization	Types of Cells	Energy Source
Eukarya	Animalia	Multicellular	Eukaryotic	Heterotrophic, ingestion
	Plantae	Multicellular (most forms)	Eukaryotic	Autotrophic
	Fungi	Multicellular (most forms)	Eukaryotic	Heterotrophic, absorption
	Protista	Multicellular (most forms) Multicellular (some colonial)	Eukaryotic	Autotrophic or Heterotrophic, ingestion or absorption
Archaea	Archaebacteria	Unicellular	Prokaryotic	Autotrophic or Heterotrophic, absorption
Bacteria	Eubacteria	Unicellular	Prokaryotic	Autotrophic or Heterotrophic, absorption

15. Look carefully at Model 3 and compare the kingdom arrangement to the domain arrangement. Which group is larger, domain or kingdom? Justify your answer and use information from the model in your explanation.

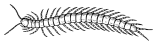
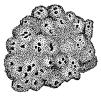
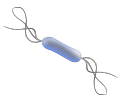
16. Refer to the Domains in the chart in Model 3.
    a. How many domains are shown?
    b. Which domain includes eukaryotic organisms?
    c. Which domains includes prokaryotic organisms?

17. Refer to the Kingdoms in the chart in Model 3.
    a. How many kingdoms are shown?
    b. Which kingdoms contain eukaryotic organisms?
    c. Which kingdoms contain prokaryotic organisms?
    d. Which kingdoms contain only unicellular organisms?

18. In which domain would you place the kingdom, Archebacteria?

19. In Model 3, organisms are described as **autotrophic** or **heterotrophic** in the way they get nutrition. What do these terms mean?

20. Complete the table:

Organism	**Cell Organization** (unicellular or multicellular)	**Type of Cells** (prokaryotic or eukaryotic)	**Energy Source** (autotrophic or heterotrophic)	**Kingdom**
Mushrooms 				
Amoeba 				
Flower 				
Frog 				
Millipede 				
Sponge 				
Bacteria 				

Part C: Cell Structure & Function

Directions: Understanding cells, their structures and functions, is key to understanding life. Cells function as systems and the parts of cells can function together in different life processes. In this section, you will explore the different types of cells and how different parts of cells contribute to the function of the cell, and also to the functioning of multicellular organisms, like plants and animals.

To start this section, watch the following two videos about cells and cell structures:

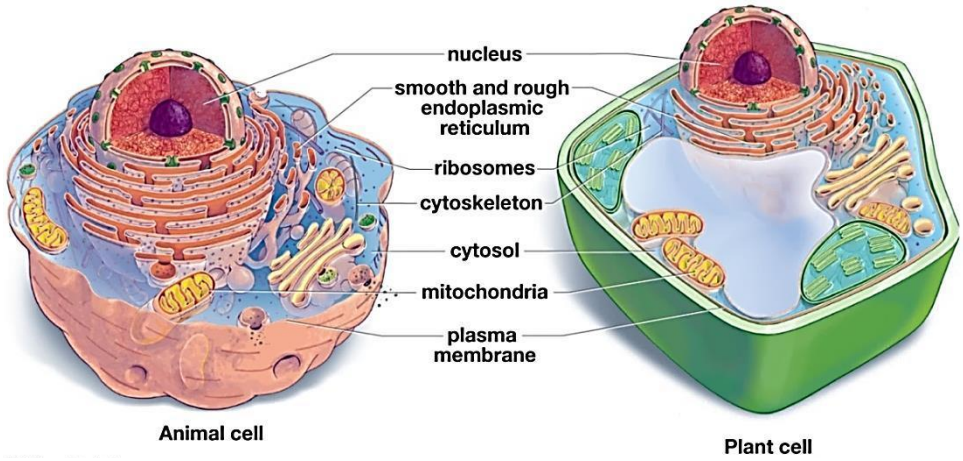
- Overview of Cell Structure Video
- Introduction to Cells Video

Then complete the questions. The goal is not to memorize several unrelated structures but rather, to gain an understanding of the complexity of cells, what they do and how the parts work together.

I. Cell Structure and Function

All living organisms are made up of one or more cells. A cell is the smallest unit that can carry out the activities of life.

These figures show some of the organelles and other parts of animal and plant cells.

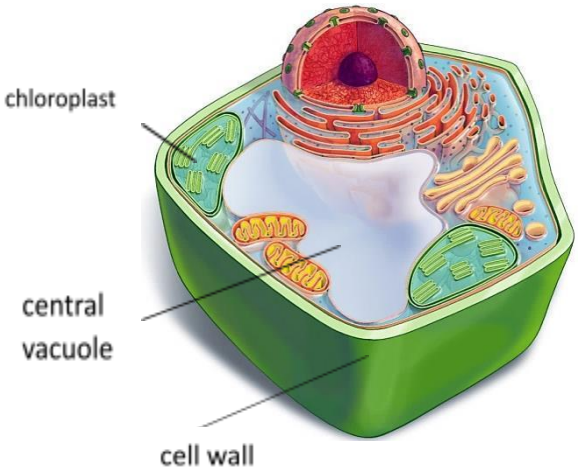


(Figure from Krogh, Biology – A Guide to the Natural World)

1. Complete the following table:

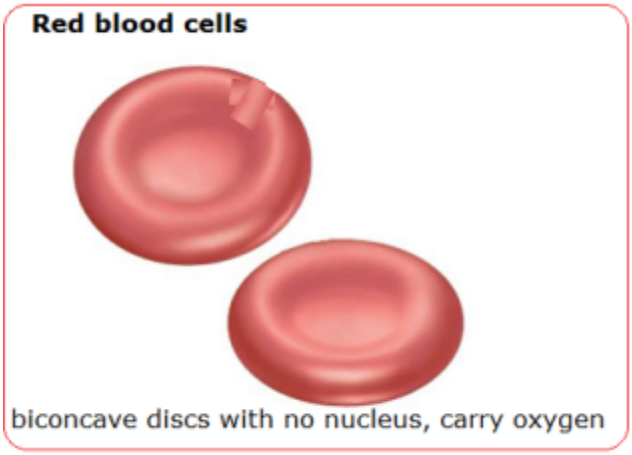
Activity of Life	**Choose 1 part of an animal cell and explain how it can help the cell to carry out one aspect of the listed activities of life.**
Inheritance of traits	
Metabolism (converting food to usable energy)	

2. Plant cells have several structures that are not found in animal cells – chloroplasts, cell walls and central vacuoles. Choose two of these structures and explain why each is useful for plant cells, but not needed for animal cells.



Many cells in our bodies do not look like the "typical" animal cell shown on page 1. Differences in cell structure include different shapes and different amounts of specific types of organelles. These differences in structures are related to differences in the function of different types of cells, as illustrated by the examples below.

3. Red blood cells have a specialized structure compared to other blood cells. The structure of a cell is related to its function. What is the function of red blood cells? How does its structure help it do this function?



4. Cells in our bodies make proteins such as:

- protein enzymes that digest our food
- proteins that help our blood to clot
- protein hormones (e.g. insulin).

If you think of a cell as a factory that makes proteins and ships them out, which parts of the cell accomplish each of the necessary functions? Complete the table below:

Factory Function	What part of the cell accomplishes this function?
Management -- sends out instructions (DNA -- > RNA)	
Workbench -- makes products (proteins)	
Processing and Distribution -- prepares products to leave factory/cell	
Structure and Transport -- moves proteins around in factory/cell	
Security Fence with Gates -- controls what comes into and leaves the factory/cell	
Powerhouse -- provides energy in a form the factory/cell can use (ATP)	
Cleanup crew -- disposes of old and worn out products and equipment; prepares them for recycling	

D. Science Practices

Scientists and engineers use a set of practices to explore and investigate the natural world to understand why things happen. These practices include:

1. **Asking questions (scientists) and defining problems (engineers)**
2. **Developing and using models**
3. **Planning and carrying out investigations**
4. **Analyzing and interpreting data**
5. **Using mathematics and computational thinking**
6. **Constructing explanations (scientists) and designing solutions (engineers)**
7. **Engaging in argument from evidence**
8. **Obtaining, evaluating and communicating information**

The practices help to define how scientists and engineers approach their work. We will be using these practices throughout the school year. In addition, when thinking about analyzing data and planning and carrying out investigations, scientists make observations and inferences. Observations are made by humans using our senses; humans are getting information from a primary source. An inference, on the other hand, makes a judgement based on one or more observations. An inference may rely on an assumption known to be true and allows a scientist to use the observations to make conclusions.

Part 1: Read the following passage and answer the questions that follow:

On July 20, 1976, the Viking I lander touched down on the dusty red surface of Mars. A few months later, the Viking II lander arrived on another Martian plain. The primary mission of these two robot spacecraft was to determine if there was life on Mars.

Conditions on Mars were thought to be far too harsh for large life forms. There is no liquid water on Mars and the atmosphere is very thin. During the course of a day, the temperature on Mars may range from 10^{o}C to -80^{o}C. The large changes in temperature produce strong winds and planet-wide dust storms. Because of these conditions, scientists decided to look for microorganisms rather than large life forms.

The Viking spacecraft performed a number of experiments. In one experiment, samples of soil were taken from different locations. The soil samples were put into a nutrient broth that supported the growth of microorganisms on Earth. The amount of carbon dioxide in the broths was tested over a period of time. Scientists were excited to discover that Martian soil produced carbon dioxide in the nutrient broth. However, the amount of carbon dioxide produced in the Martian soil was much smaller than the amount that would be produced by living things on Earth. Thus, the results of the Viking spacecraft experiments are not conclusive. Scientists are still not sure if life exists on Mars.

In the years since the Viking landers, as of 16 October 2017, two scientific rovers were on the surface of Mars beaming signals back to Earth (Opportunity of the Mars Exploration Rover mission and Curiosity of the Mars Science Laboratory mission), with six orbiters surveying the planet: Mars Odyssey, Mars Express, Mars Reconnaissance Orbiter, Mars Orbiter Mission, MAVEN, and the Trace Gas Orbiter, which have contributed massive amounts of information about Mars.veral experiments. There is a commitment to understanding Mars and to continue to look for signs of life. Recently, probes have detected carbon-containing compounds as well as shifting levels of methane, a carbon-based gas, in the atmosphere. There is also evidence that liquid water may have been on the planet and layers of ice exist now.

1. Looking at the experiments from the Viking landers, what assumptions did scientists make?

2. Why did scientists obtain soil samples from different places and from different parts of the Martian soil?

3. Why can’t scientists be sure if life exists or existed on Mars?

4. What questions are scientists trying to answer?

5. Why is the amount of carbon dioxide being tested?

Part 2: Now that you have seen some of the assumptions and limitations associated with experimentation, try your hand at analyzing experimental data. Remember that you must be objective, regardless of what you are hypothesizing to be true.

A scientist wished to determine if a new type of antibiotic, called antibiotic F, was effective against a particular type of microorganism that caused pneumonia. The scientist believed that patients treated with Antibiotic F would follow a similar pattern in regards to their temperature as those taking the placebo, but they would recover quicker. To test the hypothesis, the scientist found 100 volunteers in a large hospital, all suffering from the same type of pneumonia. The scientist gave 50 of the volunteers the new antibiotic for 10 days. The other 50 volunteers were given a placebo which was a sugar pill for 10 days.

The scientists measured the effectiveness of the antibiotic by measuring each volunteer's temperature. Higher than normal body temperature indicated the presence of the disease-causing microorganisms. When a volunteer's temperature remained normal (37^{o}C) for three days in a row, he or she was considered to be free of the disease-causing microorganism.

1. What was the scientist's hypothesis?

2. Identify the control group.

3. Identify the experimental group?

4. What is the independent variable?

5. What is the dependent variable?

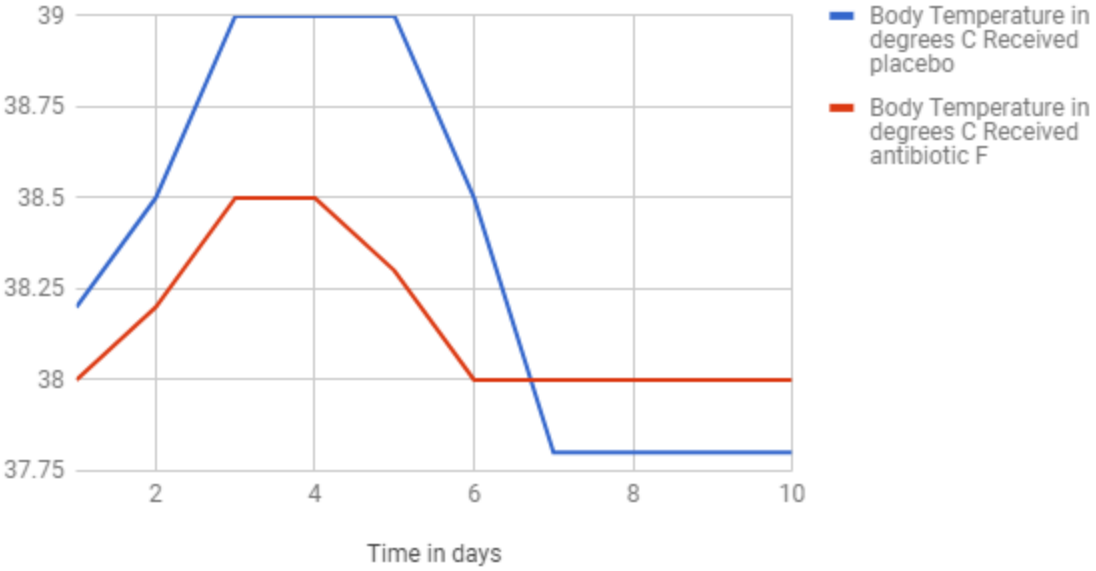
6. ***Refer to the graphs that follow for the next 4 questions. The vertical axis (Y-axis) for each graph shows average the body temperature of the two groups of volunteers in °C***
   Which graph indicates that the antibiotic was not effective against the disease-causing microorganism? Justify your answer.

7. Which graph supports the scientist's original answer? Describe the evidence.

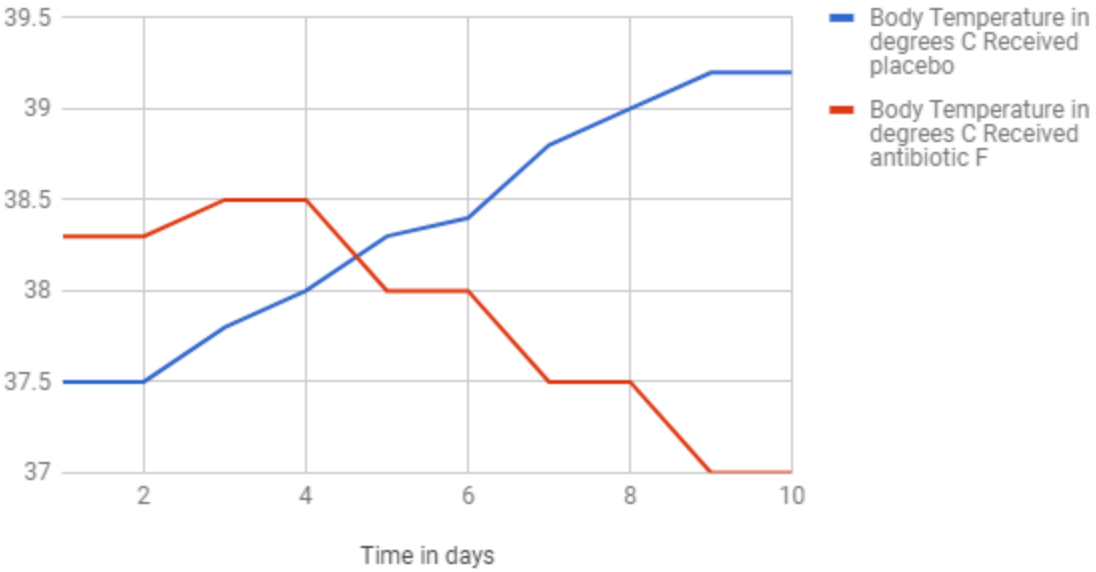
8. Why were 50 volunteers given a sugar pill?

9. Can you think of any other dependent variables that could have been observed and measured?

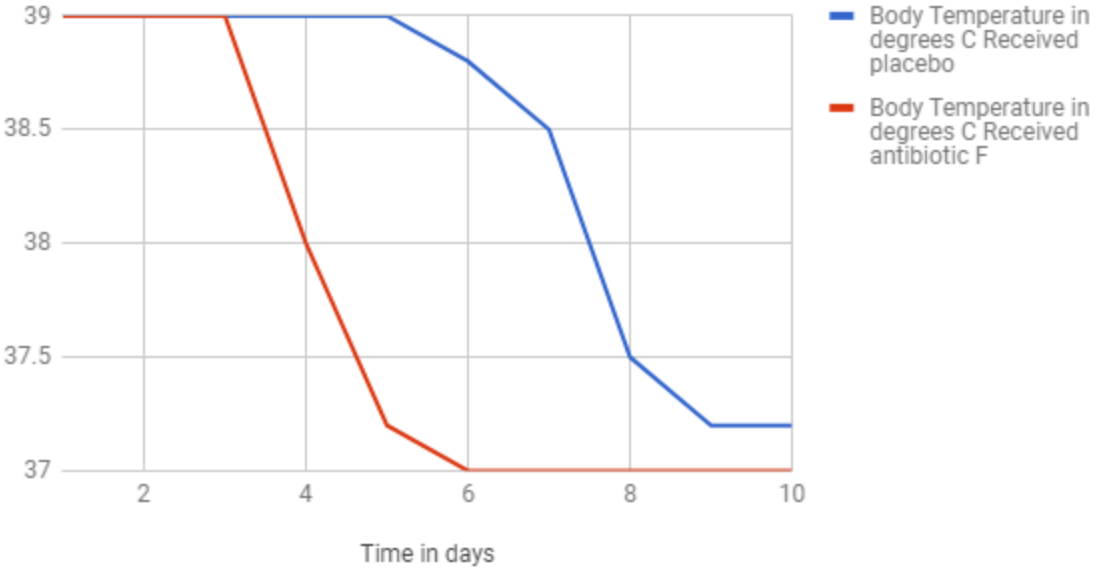
Graph I Comparison of body temperature of volunteers with placebo and those with Antibiotic F



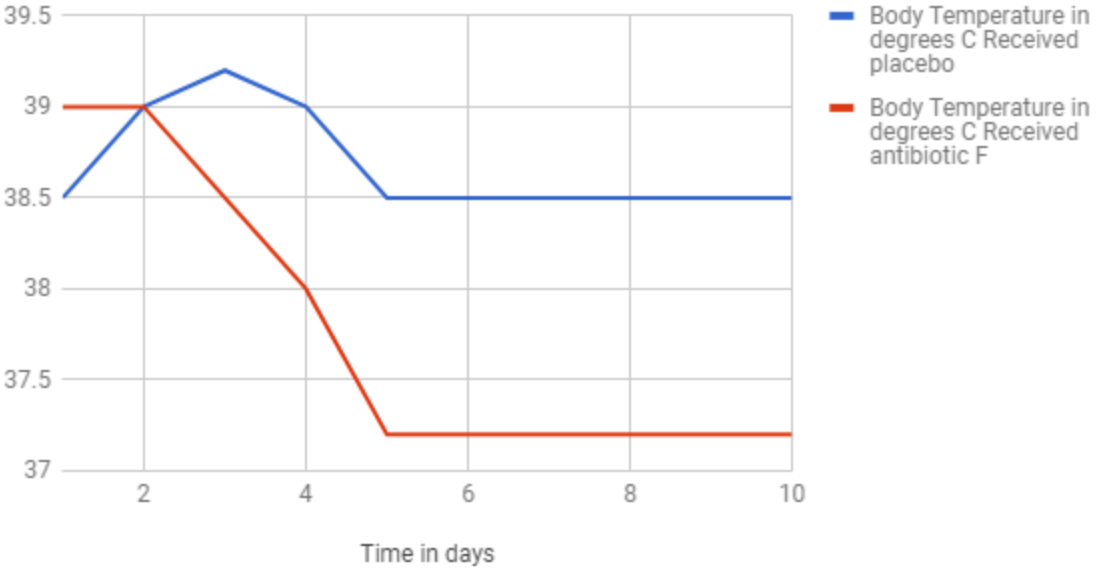
Graph II Comparison of body temperature of volunteers with placebo and those with Antibiotic F



Graph III Comparison of body temperature of volunteers with placebo and those with Antibiotic F



Graph IV Comparison of body temperature of volunteers with placebo with those with Antibiotic F



References

Mars rover's new discoveries hailed as 'breakthroughs in astrobiology'. (n.d.). Retrieved from https://www.nbcnews.com/mach/science/mars-rover-curiosity-s-new-findings-hailed-brkthroughs-astrobiology-ncna880786

NASA's Mars Exploration Program. (2014, June 03). Retrieved from https://mars.nasa.gov/