You plant a sample of 8 bean seeds (*Phaseolus vulgaris*) in separate pots and give them equal amounts of water and light. After two weeks, 4 of the seeds have germinated and have grown into small seedlings. You measure each plant from the tips of the roots to the top of the tallest stem and record in your data table.

1. What is the question that is being investigated in this lab?

You then plant a sample of 8 bean seeds (*Phaseolus vulgaris*) in new pots and give them equal amounts of water and light, but give only 4 of the seeds nitrogen additive. After 2 weeks, you measure each plant from the tips of the roots to the top of the tallest stem and record in your data table.

1. How has the question of this investigation changed with the addition of this new group of bean seedlings?

The data table from the above investigation follows below:

**Table 1: Plant Height With and Without Nitrogen Additive**

|  |  |  |
| --- | --- | --- |
|  | No Nitrogen Additive | Nitrogen Additive |
| Plant # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Plant Height (cm) | 5 | 7 | 4 | 5 | 12 | 11 | 10 | 13 |
| Average Plant Height (cm) | 5.25 | 11.5 |

1. What should you conclude from the above data? Use data to support your claim.

A teacher had five students write their names on the board, first with their dominant hands and then with their non-dominant hands. The rest of the class observed that the students wrote more slowly and with less precision with the non-dominant hand than with the dominant hand.

1. Develop a testable hypothesis (If…then…because) in response to these observations.
2. Determine a simple procedure in which you would test this hypothesis.
3. Identify the following experimental components:
* Independent variable:
* Dependent variable:
* Experimental group:
* Control group:
* Control variables:

Two soup cans were painted black and two cans were painted white. A quarter liter of 24 °C water was added to each can each morning at 8 a.m. and the temperature of the water in each can was recorded in °C at noon each day for seven days.

**Table 2: Temperature of Black and White Cans Over Seven Days**

|  |  |
| --- | --- |
|  | Temperature (°C) |
|  | Mon | Tues | Wed | Thurs | Fri | Sat | Sun | Average |
| Black | 45 | 37 | 40 | 41 | 32 | 35 | 40 | 39 |
| 45 | 37 | 40 | 40 | 33 | 34 | 39 | 38 |
| White | 41 | 33 | 36 | 37 | 28 | 31 | 36 | 34 |
| 40 | 32 | 33 | 35 | 27 | 31 | 35 | 28 |

1. Describe one strength and weakness of this experiment.
2. What kind of graph would you use if you wanted to show how the temperature of each can changed across all seven days? Justify your answer and sketch a graph below.
3. What kind of graph would you use if you wanted to compare the average temperature of each can? Justify your answer and sketch a graph below.

A group of researchers are studying human salivary amylase (an enzyme that breaks down the starch found in food) to determine how it functions under different temperature conditions. The researcher’s original hypothesis was:

**If temperature increases, then amylase will increase it’s relative reactivity because the molecules are speeding up and bumping into one another more often.**

**Figure 1: Reactivity of Amylase Starch Glucose Over Time**



1. Does the data from their experiment support or fail to support the researcher’s claim? Justify your claim with evidence from the graph.

**All Living Things:**

* Are made of cells
* Reproduce
* Are based on a universal genetic code
* Grow and develop
* Obtain and use materials and energy
* Respond to their environment
* Maintain a stable internal environment
* As a group change over time

**Chlamydia infection** is a common [sexually transmitted infection](https://en.wikipedia.org/wiki/Sexually_transmitted_disease) in humans caused by the single-celled bacterium [*Chlamydia trachomatis*](https://en.wikipedia.org/wiki/Chlamydia_trachomatis). It is one of the most common sexually transmitted infections worldwide; it is estimated that about 1 million individuals in the [United States](https://en.wikipedia.org/wiki/United_States) are infected. *C. trachomatis* is naturally found living only inside human cells. When an infected host cell is starved for various nutrients, this has a negative consequence for *C. trachomatis* since the organism is dependent on the host cell for these nutrients. The starved *C. trachomatis* enter a persistent growth state wherein they stop [cell division](https://en.wikipedia.org/wiki/Cell_division) and become morphologically aberrant by increasing in size. Persistent organisms remain viable as they are capable of returning to a normal growth state once conditions in the host cell improve.

1. Is *C. trachomatis* a living organism? State two pieces of evidence to justify your claim.

The below phrases/terms describe a feedback loop for maintaining blood osmolarity (dissolved solutes are found in the blood). Create a diagram of a homeostatic feedback loop that demonstrates how the body might respond to various stimuli.

|  |  |
| --- | --- |
| Blood osmolarity increases | Hypothalamus detects increase in blood osmolarity; releases antidiuretic hormone |
| Kidneys decrease urine output | Blood osmolarity decreases |
| Blood osmolarity (dissolved solute)300 mOsm/L | Person feels thirsty and drinks water |

What kind of feedback loop is involved with blood osmolarity regulation? Explain.