

BIOLOGY STUDY GUIDE
CHAPTER 2 – THE SCIENCE OF BIOLOGY

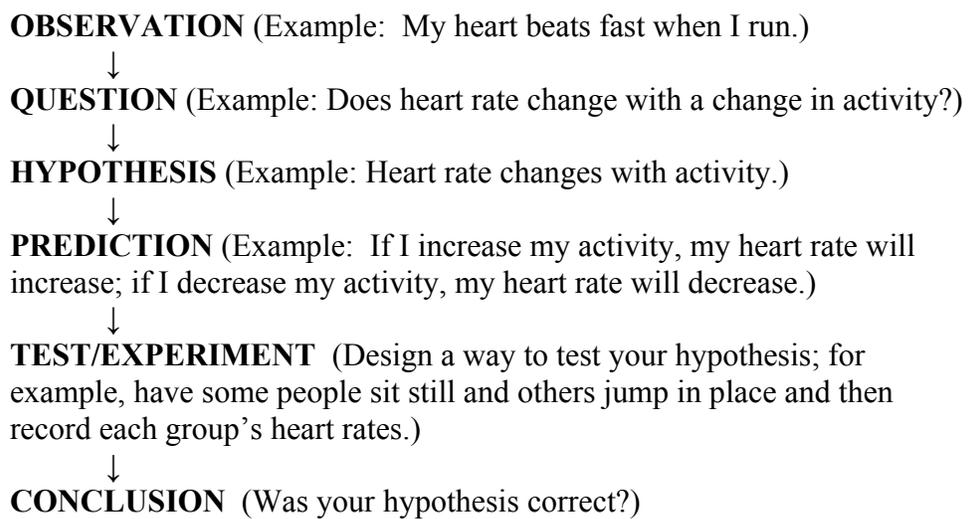
- **Inquiry** = a process of investigation; asking questions about observations and then actively looking for answers
- **Observation** = the use of the senses (vision, scent, hearing) to gather and record information about structures or processes
- **Data** = recorded observations; pieces of information
 - o **Quantitative data** = any data that contains numbers (example: The ant is 3 centimeters long.)
 - o **Qualitative data** = subjective data (uses descriptions, not numbers; example: The ant is black in color.)

- **What is discovery science?**
 - o Science that describes structures or processes as accurately as possible through careful observation and data collection.

- Inferences in Science:
 - o **Inference** = a logical conclusion based on observations
 - Usually, you make an inference by relating your current observations to what you already know
 - An inference helps narrow a broad question to a more specific clear one

- Generalizations in Science:
 - o **Generalization** = a general conclusion reached when scientists put together many specific observations

- **Hypothesis Based Science (also known as the scientific method):**



- **What is a hypothesis?**
 - A hypothesis is a testable statement. It is a suggested answer to a scientific question.
 - *If a hypothesis is proven to be correct over and over again after multiple experiments, it becomes a **theory**.*

- **What is a controlled experiment?**
 - Used when you want to test the effect of one condition.
 - Using the example above (about heart rate and activity):
 - **Variable** = condition that can differ within the experiment
 - **Controlled experiment** = tests the effect of a single variable
 - Take two groups, both exactly the same (same age, same weight, same height, same medical history) except that you have one group sit still and one group jump in place. With this experiment, you are testing the effect of a single variable (activity) on heart rate.

- **Organizing data/Interpreting results from experiments:**
 - Example of organizing data: graphing quantitative data
 - The graph will show patterns that were not obvious when the data were first collected.

- **Scientific evidence** = a large collection of data/results acquired from observations and experiments
 - *Evidence is convincing/strong/believable only when the experiments have been repeated MANY times and the same results/data have been obtained every time the experiments were performed.*

- More about hypothesis:
 - A hypothesis must be testable.
 - A hypothesis must be falsifiable. (There must be an experiment in place that could reveal if the hypothesis is false.)
 - Even hypotheses that have stood up to repeated testing may later be changed or even completely rejected.

- **Scientific models:**
 - Physical, mental, or mathematical representations of how people understand an idea (examples: drawings, graphs, 3D objects, equations, etc.)
 - **Analogy** = a type of model; an analogy is a comparison that shows the likeness/similarity between two things.

- **The goal of technology:** to apply scientific understanding for some specific purpose.