

## TOPIC ONE: Science and the Living Environment

### I. Terms

- A. **observation:** what is seen or measured
- B. **inference:** a conclusion based on observation or evidence
- C. **hypothesis:** a prediction based on available evidence; a good hypothesis states both cause and effect
  - 1. A correct hypothesis can be **tested** and **falsified** (proven incorrect) using an **experiment**.
  - 2. The easiest way to write a correct hypothesis is as an **if-then** statement. (ex: If I give patients this pill, then they will not get sick.)
- D. **theory:** an explanation of natural events that is supported by strong evidence
  - 1. Theories tie together many scientific facts, hypotheses, and laws.
  - 2. **Misconception:** *Theories are things that are opinions or are not proven.* This is an incorrect use of the word *theory* in a scientific context. A scientific theory is **not** a simple guess or conjecture and **is** strongly supported by evidence.
- E. **controlled experiment:** compares the results of an experiment between two (or more) groups
- F. **experimental group:** group being tested or receiving treatment
- G. **control group:** *normal* group; should be identical to experimental group in every way except *one*: it does not receive the new treatment
- H. **placebo:** a sugar pill or other *fake* treatment given to the control group
- I. **independent variable:** the variable that is being tested (ex: new drug, new fertilizer)
  - 1. the **if** part of an **if-then** hypothesis
  - 2. always plotted on the X axis
- J. **dependent variable:** variable that is measured at the end of an experiment; the results
  - 1. the **then** part of an **if-then** hypothesis.
  - 2. always plotted on the Y axis

## II. Graphs and Data Tables

A. **Data tables** are used to organize data which will be plotted in a graph.

1. First column in the table is for the **independent variable**.
2. Second column is another for the **dependent variable**.
3. Each column should be titled and include units of measurement.
4. Data in the table must be arranged in ascending or descending order.

Temperature (°C)	Heart Rate (beats/min)
5	108
10	150
15	180
20	270
25	300

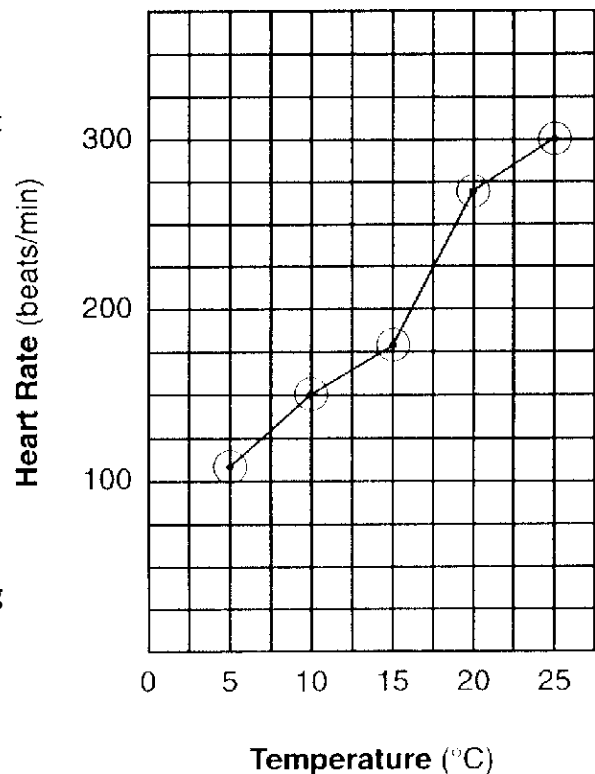
B. Both the x and y axis of the graph must be labeled or titled. These labels are typically the same ones used in the data table. Once again, units of measurement must be written with the title.

C. The **independent variable** is always plotted on the **x-axis**.

D. The **dependent variable** is always plotted on the **y-axis**.

E. The x and y axis must be numbered.

1. **These numbers must increase by a uniform increment** (that is you must count by 1's, 2's, 5's, 10's, etc).
2. **Your numerical scales should take up most of the axes.** Squeezing it all into the bottom corner makes the graph impossible to read and no credit will be given.
3. The **numbers must line up with the grid lines** of the graph, not with spaces between them.
4. **You do not need to start numbering your axis with 0.**



F. To date, all graphs drawn on the LE Regents have been **line graphs**. Any student who draws a bar graph instead of a line graph will be denied credit for this part of the test.

G. All points plotted on your graph must be **surrounded by a circle** (or sometimes a square or triangle, depending on the directions).

### III. Characteristics of a good experiment

- A. Can be repeated the same way and get the same results.
- B. Have large sample size/many test subjects.
- C. Are performed for longer periods of time.
- D. Test only one independent variable. All other characteristics of the tested groups should be the same.
- E. Are peer reviewed – examined by several scientists to determine its accuracy.
- F. Must test the hypothesis and show whether it is wrong or right.
- G. Is objective –the experiment and conclusion are fair and unbiased. Fact and opinion are not mixed.
- H. The experiment follows established ethical and legal standards.

Adapted from *What You Absolutely Must Know to Pass  
the NYS Living Environment/Biology Regents*  
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