

Honors Biology

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Contents

1	The Scientific Method	2
1.1	Steps to the Scientific Method	2
1.2	Characteristics of a Good Experiment	2
1.3	Variables	2
1.4	Control Group	3
1.5	Hypothesis	3

Chapter 1

The Scientific Method

1.1 Steps to the Scientific Method

1. Make an Observation
2. Ask a question
3. Experiment: test the hypothesis and gather data
4. Analyze the data
5. Draw a conclusion

1.2 Characteristics of a Good Experiment

- Tests one variable at a time: If more than one thing is tested at a time, it won't be clear which variable caused the end result
- Fair and unbiased: Experimenter must not allow his or her opinions to influence the experiment
- Repeated trials: Repeating the trials in the experiment will reduce the effect of experimental errors and give a more accurate conclusion

1.3 Variables

Definition 1 (Variable). A variable is anything in an experiment that can change or vary

- Any factors that can have an effect on the outcome of the experiment

There are three main types of variables:

Definition 2 (Independent Variable). The variable intentionally changed by the scientist

- What is tested or manipulated
- Only change on independent variable at a time

Definition 3 (Dependent Variable (Responding Variable)). Something that is affected by the change in the independent variable

- What is observed and measured (Data collected)

Definition 4 (Controlled Variable). Variables that are not changed, constants

1.4 Control Group

Definition 5 (Control Group). Group that isn't tested, but used for comparison as a reference for what "normal would be like"

Definition 6 (Positive Control). Group that you expect to give a positive result

Definition 7 (Negative Control). Group that you expect to give a negative result

Both ensure the validity of the experiment

1.5 Hypothesis

Definition 8 (Hypothesis). Proposed explanation for a set of observations

- Leads to predictions that can be tested in experiments
- Should be based off past experiments and background research
- Not only a prediction, not a research question, not a theory
- "If... then... because..."