((()))

DESIGNING EXPERIMENTS

Identifying Variables

Variables are any of the factors that could change in a scientific investigation. A controlled scientific investigation is designed so that only one factor is changed or manipulated. However, one or more factors may be measured during an experiment. All other factors remain constant throughout the study. Suppose you wanted to conduct an experiment to see how temperature affects the time it takes rust to form on steel wool. Your hypothesis for this experiment might be "If steel wool dipped in vinegar is placed in different temperatures, then the steel wool will rust at different rates, because temperature affects the rate of chemical reactions."

- The **independent variable** is the factor that you wish to test and that you manipulate or change so that you identify its effects. When you use the "If . . . , then . . . , because . . ." form to write your hypothesis, the independent variable is found after the word *if*. In the example above, you are intentionally changing the the temperature. Therefore, the temperature is the independent variable.
- The **dependent variable** is the factor that you measure to gather results. It is expressed in your hypothesis after the word *then*. In the example above, you are measuring the rate of rust formation. Therefore, the rate of rust formation is the dependent variable

Identify the independent variable and the dependent variable in each investigation.

1. Problem: How does the angle of light affect the temperature of a surface?

Independent variable:

Dependent variable:

2. Problem: How does an increase in the Pacific sea otter population affect the abalone population off the coast of California?

Independent variable:

Dependent variable:

Copyright © by McDougal Littell, a division of Houghton Mifflin Company

3. Problem: How does the amount of smoking affect emphysema rates?

Independent variable:

Dependent variable:

4. Problem: How does air pressure affect the boiling point of water?

Independent variable:

Dependent variable:

Name	Period	Date
5. Problem: How does the length of of the air?	f time it takes for a sponge to di	ry depend on the humidity
Independent variable:		
Dependent variable:		
6. Problem: How does the rate at wh water's temperature?	ich sugar dissolves in water dep	pend on the
Independent variable:		
Dependent variable:		
Challenge Read and critique the follo	owing investigation.	
A group of students chose to investig tree movement and wind strength. Th tree branches moved, and a wind gaug that their data supported their hypothe movement, then the wind speed will b molecules in air around."	ate the relationship between the ey used rulers to measure the di ge to measure the wind speed. T esis, which was "If tree branche be higher, because the leaves pu	e amount of istance that They concluded es have more ish more
Identify the independent variable and	the dependent variable.	
Independent variable:		
Dependent variable:		
What, if anything, is wrong with this	investigation? Explain.	

Designing Experiments