



2.2

Introducing variables

Variables are things in an experiment that can change or be controlled. There are three types of variables:

- (a) an **independent variable** – what you change; that is, the variable you are testing, which should be the only thing you change in an experiment
- (b) a **dependent variable** – what you measure; that is, the variable that changes depending on the value of the independent variable
- (c) a **controlled variable** – what you keep the same so that you can be sure any change to the dependent variable is caused by changes to the independent variable. If you do not keep these other variables the same, you won't know which variable has affected your results!

For each of the following experiments identify the independent variable, the dependent variable and three controlled variables (although there may be more than three, you only need to identify a selection).

1. Experiment one: You are to investigate the amount of bacteria that grows on four different surfaces.

(a) Independent variable: _____

(b) Dependent variable: _____

(c) Three controlled variables: _____

2. Experiment two: You are to investigate how the number of balls released in a Newton's cradle affects how many balls will swing.

(a) Independent variable: _____

(b) Dependent variable: _____

(c) Three controlled variables: _____

3. Experiment three: You are to investigate what happens when you shine a light through various prisms of different shapes.

(a) Independent variable: _____

(b) Dependent variable: _____

(c) Three controlled variables: _____

Features of a well-designed experiment



2.3

Expanding on variables

It is very important to be specific in a scientific experiment. Once you have identified the variables, you need to give more information on the range of the independent variable, how you plan to measure the dependent variable and how you plan to keep the controlled variables the same.

For example, say you wanted to test whether hot water freezes faster than cold water. You would need to identify the **range** of temperatures of the water and how you are going to **measure** the time it takes the water to freeze. You would also need to identify how you will keep the **controlled variables** the same. The chart below records these details.

Independent variable	Range
The temperature of the water	Cold (from the tap), warm (hot water from the tap), boiling (from an electric jug)
Dependent variable	How it will be measured
How long the water will take to freeze	Check the water every 5 minutes until it is all frozen.
Controlled variable	How will you keep it the same?
1. The amount of water being frozen	Have three identical ice cube trays and fill one tray for each different temperature of water.
2. The temperature of the freezer	Use the same freezer for all the trays.
3. The kind of water being used	Take all the water from the same tap.

Identify the variables in the following experiments, along with the range for the independent variable, the way of measuring the dependent variable and the methods for keeping the controlled variables the same. Follow the example above for your own answers.

1. Experiment one: You are to investigate how well different types of soft drink dissolve seashells (and by extension your teeth!).

Independent variable	Range
Dependent variable	How it will be measured
Controlled variable	How will you keep it the same?

continued...

Features of a well-designed experiment



Expanding on variables (continued)

2. Experiment two: You are to investigate how far a toy car will travel when let go from ramps of different heights.

Independent variable	Range
Dependent variable	How it will be measured
Controlled variable	How will you keep it the same?

3. Experiment three: You are to investigate which surface in your school lab has the most bacteria growing on it by growing samples on a Petri dish.

Independent variable	Range
Dependent variable	How it will be measured
Controlled variable	How will you keep it the same?