

Practical skills What is the independent variable?	Practical skills What is the dependent variable?
Practical skills What is a control experiment for an enzyme investigation?	Practical skills How many values of the independent variable should a plan include?
Practical skills How does Cambridge separate a quantity and its unit in a table or on an axis?	Practical skills Where do units go in a results table?
Practical skills Give the formula for percentage change.	Practical skills How many decimal places should readings in one column have?

The variable that is observed or measured in an experiment.

The variable that is changed in an experiment by the scientist.

Usually at least five, evenly spaced, each repeated at least three times.

The same set-up with boiled (denatured) enzyme, to show that any change is caused by the active enzyme.

In the column headings only, never in the body of the table.

With a solidus (slash): time / s, temperature / °C.

The same number, matching the precision of the measuring instrument, for example 2.50 g not 2.5 g.

$$\frac{(\text{final value} - \text{starting value})}{\text{starting value}} \times 100$$

Practical skills

Bar chart or histogram: which has bars that touch?

Practical skills

How much of the grid should a graph's scales use?

Practical skills

How should points be plotted on a graph?

Practical skills

What is interpolation?

Practical skills

Name four rules for a biological drawing.

Practical skills

State the formula for magnification.

Practical skills

How do you find the actual size of a specimen from a photograph?

Practical skills **Supplement**

How many micrometres are in 1 mm?

More than half in both directions, with 2 cm representing 1, 2 or 5 units.

A histogram (continuous data). A bar chart (categorical or discrete data) has equal-width bars that do not touch.

Reading a value from a graph between the plotted points.

As small crosses (×) or encircled dots (⊙), accurate to half of the smallest square.

magnification = image size ÷ actual size. It has no unit and is written as, for example, ×3.

Sharp pencil, clear unbroken lines; large, using most of the space; no shading or colour; ruled label lines that touch the feature.

1000 μm. Multiply mm by 1000 to get μm.

Measure the image in mm, then actual size = image size ÷ magnification.

Practical skills

What is an anomalous result?

Practical skills

What should you do with an anomalous result?

Practical skills

Improvement: a lamp heats the water around pondweed.

Practical skills

Limewater: what does it test for and what is the result?

Practical skills

Hydrogencarbonate indicator colours

Practical skills

Litmus colours in acid and alkali

Practical skills

How do you find the pH of a solution with universal indicator?

Practical skills

What is a zero error, and how do you correct for it?

Repeat the test if possible, leave it out of the mean, and ignore it when drawing a best-fit line.

A result that does not fit the pattern of the other results.

Carbon dioxide. It turns from colourless to milky (cloudy white).

Put a heat shield (beaker of water) between lamp and plant, or use a thermostatically controlled water bath.

Red in acid, blue in alkali.

Red: carbon dioxide at the level in air.
Yellow: more carbon dioxide. Purple: less carbon dioxide.

The instrument does not read zero when it should. Subtract the zero reading from every measurement.

Add a few drops, compare the colour with a pH colour chart and read off the pH. Green means pH 7 (neutral).

Practical skills

**Random error or systematic error:
which one is reduced by repeating and
finding a mean?**

Practical skills

**When are two results equal within the
limits of experimental accuracy?**

Practical skills

**What is the difference between
accuracy and precision?**

When they differ by no more than 10% ($\pm 10\%$ at this level).

Random error. A systematic error moves every reading the same way, so repeats do not remove it.

Accurate: close to the true value. Precise: the measured values are close to each other.