

**Method: Test strips**

The test strips have bands of the reagents that change colour when they react with the ion to be measured.

The strips are dipped into the solutions being analysed then compared with a reference colour chart.

▼ A phosphate test strip and colour comparison chart.



**Method: Electronic colourimeter**

A reagent is added to the test solution. The intensity of the colour produced is measured by a light meter that is adjusted to measure a specific wavelength of light.

**Method: Ion selective electrodes**

An electronic probe is put into the test solution. The electrode potential that is produced by the solution between two electrodes is used as a measure of the ion concentration.

**Limitations**

The presence of other ions can lead to inaccurate results.

## Soil analysis

### Soil sampling

If the soil is to be analysed in the lab then a representative sample must be collected. A soil auger will collect a sample of known cross-sectional area and depth. Collecting soil with a trowel produces less representative samples that cannot be compared with other samples as reliably.



▲ A soil auger collects a more standardised sample than a trowel

### Soil temperature

**Method: Using a soil thermometer**

- The thermometer must have a protective metal tube to prevent it breaking.
- Push the thermometer into the soil to a standard depth, for example, 10 cm.
- Protect the thermometer from direct sunlight.
- Leave it until the alcohol liquid stops moving and a constant temperature is shown.
- The temperature is read while the thermometer is still in the soil.

### Soil texture

Soil texture assesses the proportions of the mineral particles in different size categories: sand, silt, and clay.

Two methods are used to measure the proportions of sand, silt, and clay.

*Soil particle sizes*

Component	Particle diameter range /mm
Sand	>0.02 - 2
Silt	0.002 - 0.02
Clay	<0.002

**Method: Soil sieves**

- The stack of sieves is assembled in order of mesh size, with the coarsest mesh at the top.
- A dried, crushed soil sample is placed in the top sieve.
- The sieve stack is shaken by hand, or mechanically, for two minutes (long enough for no more particles to fall through). The particles drop through the sieves until they reach a sieve where the holes are too small to pass through.
- Each portion is weighed and the % composition of the three portions calculated.
- Wet sieving is also possible. The sub-samples collected in each sieve must be dried before weighing.
  - The top sieve (mesh size >2mm) contains pebbles, twigs etc. These are not part of the soil.
  - The second sieve (0.02 – 2mm) contains sand. (Some stacks have an extra sieve to separate coarse and fine sand.)
  - The third sieve (0.002 – 0.02mm) contains silt
  - The base container holds clay.



▲ Soil sieves

**Method: Sedimentation**

- Larger objects are removed from a dried soil sample by using a 2mm sieve, or by hand, for example, pebbles, twigs.
- The soil is crushed to ensure the particles are separated.
- A measuring cylinder is about half filled with soil, then topped up with water.
- The top is sealed then the cylinder is shaken by repeatedly inverting it.
- The suspension is allowed to settle.
- The total depth of the settled soil components is measured after 2 minutes, 2 hours, and 2 days.
- The proportion of the total volume of each textural category can then be calculated.

