

# Scientific Measurements Script

Accurate measurements are essential when performing scientific experiments, this presentation will discuss the accepted methods of measurement used by many scientists.

Chemical experiments can involve many measurements before the experiment is complete. It is important to make accurate and precise measurements when performing experiments. Accuracy is how close a measured value is to the accepted or real value. Precision is the degree of reproducibility of a measured quantity; or how close a series of measurements of the same quantity are to one other. When completing chemical experiments it is important to repeat your experiment many times. If your measurements have low accuracy and low precision the error in the measurement will average out over repeated trials. If your measurements have high precision and low accuracy the error is generally due to the apparatus being used.

Scientific measurements generally adhere to the International System of Units or SI units. This chart outlines the seven standard SI units. The chart is available in this section, and includes interactive descriptions of the units. It is important to always include units in every chemical calculation, measurement and result. Including units will avoid confusion and mistakes. Units are globally recognized and necessary for sharing information between scientists around the world.

Two SI Derived Units that are used extensively in chemistry are volume and density. A derived unit is a combination of other units. Volume is a unit of length raised to the third power, this means that volume is a measure of space. The SI unit of length is the meter, a meter cubed is equivalent to 1000 liters, or one kiloliter. A kiloliter is a large amount, therefore a more convenient measurement, the liter, is the SI accepted unit. One liter is equal to one decimeter cubed.

Density is a ratio of mass to volume of a substance. Density is equal to the mass of an object divided by the amount of volume occupied by that object. A low density object will have a small mass and a large volume. A high density object will have a high mass and a small volume.

There is a large difference in the size of measurements used in scientific research. It is impractical to write small numbers with large units. To keep measurements in a usable scale, scientists use SI prefixes, which are multipliers that change unit values by multiples of ten. This section includes a detailed chart with SI prefixes that are helpful when doing chemical experiments and calculations.

For example, a nanometer is convenient for measurements of objects such as molecules. Micrometers are useful for measuring cells and biological features.

Milliliters and meters are convenient for objects in our everyday lives and kilometers are useful for geographical distances.

This concludes our video on scientific measurements. You should be able to define accuracy, precision, density and volume. You should be able to identify the SI standard units and use SI prefixes to represent a quantity. Work through the examples and problems in this section to become more familiar with units.