

## Subject specific vocabulary (Science)

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The following subject specific vocabulary provides definitions of key terms used in our GCSE Science specifications.

Wherever possible we have used the definitions derived from a booklet created in a joint project of the Association for Science Education and the Nuffield Foundation, *The Language of Measurement: Terminology used in school science investigation*, ISBN 978 0 86357 424 5, Association for Science Education (ASE), 2010.

### Accuracy

A measurement result is considered accurate if it is judged to be close to the true value.

### Calibration

Marking a scale on a measuring instrument. This involves establishing the relationship between indications of a measuring instrument and standard or reference quantity values, which must be applied. For example, placing a thermometer in melting ice to see whether it reads zero, in order to check if it has been calibrated correctly.

### Data

Information, either qualitative or quantitative, that has been collected.

### Error

See also uncertainty.

### Measurement error

The difference between a measured value and the true value.

### Anomalies

These are values in a set of results which are judged not to be part of the variation caused by random uncertainty.

### Random error

These cause readings to be spread about the true value, due to results varying in an unpredictable way from one measurement to the next. Random errors are present when any measurement is made, and cannot be corrected. The effect of random errors can be reduced by making more measurements and calculating a new mean.

### Systematic error

These cause readings to differ from the true value by a consistent amount each time a measurement is made. Sources of systematic error can include the environment, methods of observation or instruments used. Systematic errors cannot be dealt with by simple repeats. If a systematic error is suspected, the data collection should be repeated using a different technique or a different set of equipment, and the results compared.

## Zero error

Any indication that a measuring system gives a false reading when the true value of a measured quantity is zero, eg the needle on an ammeter failing to return to zero when no current flows. A zero error may result in a systematic uncertainty.

## Evidence

Data which has been shown to be valid.

## Fair test

A fair test is one in which only the independent variable has been allowed to affect the dependent variable.

## Hypothesis

A proposal intended to explain certain facts or observations.

## Interval

The quantity between readings, eg a set of 11 readings equally spaced over a distance of 1 metre would give an interval of 10 centimetres.

## Precision

Precise measurements are ones in which there is very little spread about the mean value. Precision depends only on the extent of random errors – it gives no indication of how close results are to the true value.

## Prediction

A prediction is a statement suggesting what will happen in the future, based on observation, experience or a hypothesis.

## Range

The maximum and minimum values of the independent or dependent variables; important in ensuring that any pattern is detected. For example a range of distances may be quoted as either: 'From 10 cm to 50 cm' or 'From 50 cm to 10 cm'.

## Repeatable

A measurement is repeatable if the original experimenter repeats the investigation using same method and equipment and obtains the same results. Previously known as reliable.

## Reproducible

A measurement is reproducible if the investigation is repeated by another person, or by using different equipment or techniques, and the same results are obtained. Previously known as reliable.

## Resolution

This is the smallest change in the quantity being measured (input) of a measuring instrument that gives a perceptible change in the reading.

## Sketch graph

A line graph, not necessarily on a grid, that shows the general shape of the relationship between two variables. It will not have any points plotted and although the axes should be labelled they may not be scaled.

## True value

This is the value that would be obtained in an ideal measurement.

## Uncertainty

The interval within which the true value can be expected to lie, with a given level of confidence or probability, eg 'the temperature is  $20\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ , at a level of confidence of 95%'.

## Validity

Suitability of the investigative procedure to answer the question being asked. For example, an investigation to find out if the rate of a chemical reaction depended upon the concentration of one of the reactants would not be a valid procedure if the temperature of the reactants was not controlled.

## Valid conclusion

A conclusion supported by valid data, obtained from an appropriate experimental design and based on sound reasoning.

## Variables

These are physical, chemical or biological quantities or characteristics.

### Categoric

Categoric variables have values that are labels, eg names of plants or types of material.

### Continuous

Continuous variables can have values (called a quantity) that can be given a magnitude either by counting (as in the case of the number of shrimp) or by measurement (eg light intensity, flow rate etc). Previously known as discrete variable.

### Control

Control variable is one which may, in addition to the independent variable, affect the outcome of the investigation and therefore has to be kept constant or at least monitored.

### Dependent

Dependent variable is the variable of which the value is measured for each and every change in the independent variable.

### Independent

Independent variable is the variable for which values are changed or selected by the investigator.



## Command words (Science)

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Command words are the words and phrases used in exams that tell students how they should answer a question.

The following command words are taken from Ofqual's official list of command words and their meanings that are relevant to this subject. In addition, where necessary, we have included our own command words and their meanings to complement Ofqual's list.

Command words marked \* are new for teaching from 2016.

### Calculate

Students should use numbers given in the question to work out the answer.

### Choose\*

Select from a range of alternatives.

### Compare

This requires the student to describe the similarities and/or differences between things, not just write about one.

### Complete

Answers should be written in the space provided, for example, on a diagram, in spaces in a sentence or in a table.

### Define\*

Specify the meaning of something.

### Describe

Students may be asked to recall some facts, events or process in an accurate way.

### Design\*

Set out how something will be done.

### Determine\*

Use given data or information to obtain an answer.

### Draw

To produce, or add to, a diagram.

### Estimate

Assign an approximate value.

## Evaluate

Students should use the information supplied as well as their knowledge and understanding to consider evidence for and against.

## Explain

Students should make something clear, or state the reasons for something happening.

## Give

Only a short answer is required, not an explanation or a description.

## Identify\*

Name or otherwise characterise.

## Justify

Use evidence from the information supplied to support an answer.

## Label

Provide appropriate names on a diagram.

## Measure\*

Find an item of data for a given quantity.

## Name

Only a short answer is required, not an explanation or a description. Often it can be answered with a single word, phrase or sentence.

## Plan\*

Write a method.

## Plot\*

Mark on a graph using data given.

## Predict\*

Give a plausible outcome.

## Show\*

Provide structured evidence to reach a conclusion.

## Sketch\*

Draw approximately.

## Suggest

This term is used in questions where students need to apply their knowledge and understanding to a new situation.

## Use

The answer must be based on the information given in the question. Unless the information given in the question is used, no marks can be given. In some cases students might be asked to use their own knowledge and understanding.

## Work out\*

Students should use numbers given in the question to work out the answer.

## Write

Only a short answer is required, not an explanation or a description.