

# GCSE Science Key Terms Knowledge Organiser

**Variables** These are physical, chemical or biological quantities or characteristics.

**Categoric variables** Categoric variables have values that are labels. Eg names of plants or types of material.

**Continuous variables** 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).

**Control variables** A 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 variables** The dependent variable is the variable of which the value is measured for each and every change in the independent variable.

**Independent variables** The independent variable is the variable for which values are changed or selected by the investigator.

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

**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'

**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%.

## Command Words (Easier to Harder)

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

**Estimate** Assign an approximate value.

**Plot** Mark on a graph using data given.

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

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

**Predict** Give a plausible outcome.

**Plan** Write a method which includes equipment and its resolution, how the equipment will be used to produce valid data and any variables that are being controlled, measured or changed.

**Evaluate** Students should use the information supplied, as well as their knowledge and understanding, to consider evidence for and against and reach a justified conclusion.

**Justify** Use evidence from the information supplied to support an answer.

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

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

**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.

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

**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.

**Repeatable** A measurement is repeatable if the original experimenter repeats the investigation using same method and equipment and obtains the same results.

**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.

**Hypothesis** A proposal intended to explain certain facts or observations.

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

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

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

**Evidence** Data which has been shown to be valid.

**Measurement error** The difference between a measured value and the true value.

**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.