

# GCSE 360Science

## Definitions of some useful scientific words

### Note to teachers or lecturers:

These notes are for your information and guidance only. If you intend give the notes to your students, you are advised to edit them as appropriate.

Students will not be required to quote these definitions in any written paper or in any internal assessment task.

**Accuracy:-** An accurate measurement is one which is close to the true or accepted value. An 'accepted value' comes from the work of many scientists who have measured that value, agreed with it and published the value. We can refer to a textbook, data tables, or the Internet to find these values. *(However, we need to be critical of Internet sources. Internet sources must always be checked for authenticity and bias.)*

**Anomalous data:-** Anomalous readings are readings that fall outside the normal, or expected, range of measurements. If we take a large number of readings, we can be more certain about saying which readings are anomalous (do not fit the pattern) and which are not anomalous. Anomalous readings will show on a graph as a point, or points, standing clearly away from a best fit line.

**Authentic:-** Something is authentic if it is genuine, trustworthy and can be relied upon.

**Average:-** An average (or mean value) is likely to give you an estimate of the 'true' value. If you measure the length of a piece of string four times, and you obtain values of 6.2 cm, 6.1 cm, 6.3 cm and 6.2 cm, the average (or mean) measurement of the length of string is  $(6.2 + 6.1 + 6.3 + 6.2) \div 4 = 6.2\text{cm}$ . It is only an estimate because your measuring instruments might be giving you a false reading in some way, or other variables might have affected what you were trying to measure.

**Bias:-** A published article could be said to be biased if it did not give a balanced viewpoint. For example, a dubious motor car dealer might try to sell you a car, listing in the advertisement all the good points (such as "one owner, regularly maintained, taxed and MOT tested", etc) but failing to mention bad points such as the amount of pollution the car produces, or the fact that the car had done over 120 000 miles, etc.

**Concordant readings :-** Are obtained when any reading is repeated and all the readings are close, or identical. E.g. if you obtained the four measurements given above, (see **Average**) you would say they were concordant. If however, you obtained 6.2, 6.1, 7.1 and 5.3 for example, then these readings are not concordant. The 7.1 cm and 5.3 cm readings would probably be anomalous readings and these two readings should be checked again. Anomalous results should not be included when averaging results. The more concordant your results are the more reliable they are likely to be.

**Control variable:-** A control variable is one that will affect the outcome of the investigation. Control variables must be kept constant otherwise the investigation will not be a fair test. E.g. if you were investigating the effect of light on the rate of photosynthesis of a plant, you must keep the temperature around the plant constant as any change in temperature would affect the results. If you did not keep the temperature constant it would not be a fair test.

**Correlation:-** A correlation is a relationship between the two variables in a given experiment. This is often obtained from a graph. If the gradient (slope) of a graph is positive (i.e. the graph slopes upwards) we can say there is a positive correlation. If the gradient is negative, we can say there is a negative correlation between the variables. If a straight line goes through the origin of a graph (point 0.0) and the gradient is positive, we can say that the variables are directly proportional to each other. Just because two factors correlated well and there is a good line of best fit line does not necessarily mean that one thing is causing the other to increase or decrease.

**Data:-** Is a term normally used for the recording of numerical values. E.g. the data from a practical investigation are all the values of the independent variable and the dependent variable. We usually record data in data tables to make comparison easy.

**Dependent variable:-** The dependent variable is the quantity that changes as a result of changes made to another variable (the independent one). E.g. we could choose to vary the height of a ramp and measure the speed of a trolley as it runs down the ramp, the height of the ramp is the independent variable and the speed of the trolley is the dependent variable.

**Fair test:-** A fair test is a series of experiments or measurements in which only the values of one independent variable and the dependent variable change. A fair test can usually be achieved by keeping all other variables constant, or controlled.

**Independent variable:-** The Independent variable is the one which is varied to see its effect on the dependent variable. (e.g. we might have several different values for the height of a ramp when we determine the speed of a trolley which rolls down it.)

**Precision:-** of a measurement is the accuracy of the a measurement. If the measurement gives the same result each time, it would be precise but there are different degrees of precision, e.g. ordinary mercury thermometers (0-110°C) might only have intervals of 1°C, but a digital thermometer would be more precise, if it measured to the nearest 0.1°C.

**Primary Data:-** These are data obtained when doing practical experiments in science.

**Reliability:-** The results of an investigation may be considered reliable if readings are repeated, and concordant data is obtained. The more concordant your results are the more reliable they are likely to be.

**Secondary data:-** Is not obtained by doing practical experiments in science. Instead, such data comes from another source e.g. a book, data tables, a computer program, the Internet, etc. *(Note that information obtained from the Internet must always be checked for authenticity and bias).*

**Uncertainty:-** Repeated readings may differ from each other. The closer they agree, the less the uncertainty. No measurement is perfect. All measurements have some uncertainty. Some scientists call these uncertainties “errors” but they do not mean that you have made a mistake. All measurements have some uncertainty.

**Validity:-** Tries to answer the question “Am I really measuring what I am trying to measure?” Validity refers to the technique and apparatus used for collecting the data. In a valid experiment all variables are kept constant apart from those being investigated. Normally only one variable is investigated at a time. Validity can be improved by reducing any uncertainties (or errors). Validity is not really about errors caused by human beings when taking readings.