science

Key Science Terms

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

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

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

Errors: can be….
Random
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, identify anomalies then calculate a mean.
Systematic
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
Any indication that a measuring system gives a false reading when the true value of a measured quantity is zero, e.g. 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, e.g. 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 10cm 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.

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

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

Uncertainty
The interval within which the true value can be expected to lie, with a given level of confidence or probability, e.g. “the temperature is 20 °C ± 2 °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 variables have values that are labels. e.g. names of plants or types of material

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 (e.g. light intensity, flow rate etc).

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.

The dependent variable is the variable of which the value is measured for each and every change in the independent variable. This is always plotted on the y axis.

The independent variable is the variable for which values are changed or selected by the investigator. This is always plotted on the x axis.

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Science Command Words

Balance
Students need to balance a chemical equation

Calculate
Student should use numbers given in the question to work out the answer. They should always show their working, as it may be possible for the examiner to award some marks for the method even if the final answer is wrong.
Students should always give the units – sometimes a mark may be awarded for the correct units, even if the calculation is wrong.

Compare
This requires the candidate to describe the similarities and/or differences between things, not just write about one. If students are asked to "compare x with y", they need to write down something about x and something about y, and should give a comparison.

Complete
Answers should be written in the space provided, e.g. on a diagram, in spaces in a sentence or in a table.

Define
Students need to specify the meaning of something.

Describe
Students should recall some facts, events or process in an accurate way - for example an experiment they have done. They may need to give an account of what something looked like, or what happened, e.g. a trend in some data.

Design
Set out how something will be done.

Determine
Use given data or information to obtain an answer.

Estimate
Give an approximate value.

Evaluate
Students should use information supplied or their own knowledge and understanding to consider the evidence for and against and draw conclusions. This goes further than "compare". For example, they may be given a passage to read and told to "Evaluate the benefits of using system x and system y". This means they will need to write down some of the pros and cons for both systems, AND then state which one is better and why. The student should complete their answer with a conclusion i.e. make a judgement.

Explain
Students should make something clear, or state the reasons for something happening. The points in the answer must be linked coherently and logically. The answer should not be a simple list of reasons.

Give / Name / State / Write
Only a short answer is needed, not an explanation or description.

Identify
Name or otherwise characterise.

Justify
Use evidence from the information given to support you answer.

Plan
Write a method.

Plot
Mark on a graph using data given.

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. Often there may be more than one correct answer as candidates are expected to base their answers on scientific knowledge and/or principles.

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.

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