

OCR (B) Physics GCSE

Topic 7.2 - What processes are needed
to draw conclusions from data?

Flashcards

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Outline the main steps that need to be taken before conclusions can be drawn from data.



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After the data has been collected, it needs to be changed into a different form, mathematically processed, analysed and evaluated.



What are SI units?



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SI units are internationally agreed units of measurement that are used in scientific experiments.



Give some examples of SI units.



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The metre (m), the joule (J), the kilogram (kg) and the second (s) are all SI units.



What is an order of magnitude?



What is an order of magnitude?

An order of magnitude refers to a number being a power of 10 larger than another number. For example, a metre is two orders of magnitude (10^2 or 100) times larger than a centimetre, and three orders of magnitude (10^3 or 1000) times larger than a millimetre.



Why is it useful to display results in a graph?



Why is it useful to display results in a graph?

It allows us to see trends or patterns in the data visually that might not be as clear in a table form.



What do range bars indicate on a graph?



What do range bars indicate on a graph?

Range bars may be drawn on at each point. They represent the range of results obtained for that particular point (repeat measurements) and indicate the uncertainty as to what the true value is.



What is interpolation?



What is interpolation?

Interpolation is the process of using the line of best fit on a graph to estimate a value that was not tested experimentally. In particular, the value estimated is within the range of values tested.



Define the term extrapolation.



Define the term extrapolation.

The process of using the line of best fit to estimate a value that was not tested. In extrapolation, the line of best fit is extended, because the value being estimated is outside the range of values tested.



Explain what is meant by the ‘gradient’ of the line of best fit.



Explain what is meant by the 'gradient' of the line of best fit.

The gradient refers to the steepness of the line. The larger the gradient, the steeper the line, and therefore the larger the change in the dependent variable (y-axis) for a given change in independent variable (x-axis).



Outline how the mean is calculated.



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The mean is calculated by adding together all of the values, and then dividing by the number of measurements taken.



What is meant by the 'range' of values?



What is meant by the 'range' of values?

The range is the difference between the highest and lowest value- it indicates how varied or spread out the data is.



Explain what is meant by the term
'accuracy'.



Explain what is meant by the term 'accuracy'.

Accuracy refers to how close the results are to the true value. An appropriate experimental set-up and good techniques can improve the accuracy of the data.



What is meant by 'precision' in terms of data?



What is meant by 'precision' in terms of data?

If data is precise, it means the results are close together or very similar. If repeat measurements are all very similar, they are precise and have a small range.



Explain the term 'repeatability'.



Explain the term 'repeatability'.

Repeatability is the ability to repeat the experiment (by the same person, with the same methods and apparatus) and obtain the same results. If repeat measurements are taken and they are very similar, the data is repeatable and precise.



What does 'reproducibility' mean in terms of data?



What does 'reproducibility' mean in terms of data?

If data is reproducible, it means other scientists can do the experiment (with different equipment and methods) and obtain the same results.



What are random errors?



What are random errors?

Random errors are unpredictable variations in the results that cannot be avoided.



What are systematic errors?



What are systematic errors?

Systematic errors are variations in the results by the same amount each time. They are not random, and are often due to equipment problems.



Name one source of random errors and one source of systematic errors.



Name one source of random errors and one source of systematic errors.

- Random error - from human errors, particularly with judgement e.g. stopping a timer.
- Systematic errors - equipment that is not calibrated correctly.



How are outliers in data dealt with?



How are outliers in data dealt with?

Unless there is a clear reason why the outlier should be excluded (e.g. a measurement error), then the outlier should be kept and treated as data.



How does the data affect confidence in the hypothesis?



How does the data affect the confidence in the hypothesis?

If the data agrees with the prediction (which was based on the hypothesis), then confidence in that hypothesis increases, and vice versa. However, an agreement or disagreement does not prove the hypothesis is correct or incorrect. The extent to which confidence increases or decreases depends on the quality of the evidence and whether the results can be reproduced by other scientists.

