# M1.1 – Use an appropriate number of significant figures

### Tutorials

Learners may be tested on their ability to:

* report calculations to an appropriate number of significant figures given raw data quoted to varying numbers of significant figures
* understand that calculated results can only be reported to the limits of the least accurate measurement.

### Significant figures

When you report your answers it is important to use the correct number of significant figures. The number of significant figures derives from the resolution of the measuring apparatus, which places an upper limit on the level of accuracy achievable with that apparatus (a piece of apparatus with very good resolution could of course be highly inaccurate if it is poorly calibrated). Calculated results can only be reported to the limits of the lowest resolution measurement

For example, if there are 3 inputs in a particular calculation with 2, 3 and 4 significant figures respectively then the answer can only meaningfully be reported as correct to 2 significant figures.

Reporting answers to a certain number of significant figures may involve rounding. Remember - when the next number is 4 or below you round down, when the number is 5 or above you round up.

Rounding

1 - 4 🡪 Round *down*

5+ 🡪 Round *up*

You need to be careful when you are rounding numbers. Common mistakes include forgetting to include zeros as significant figures. For example, 4.99 rounded to 2 significant figures is 5.0 not just 5.

Round to 2 significant figures:

4.99 🡪 5.**0** ☺

4.99 🡪 5 X

Another “zero” mistake is to report zeros at the start of the number as significant figures. Remember, any zeros that come at the front of the number are not significant figures. For example, reporting 0.0256 to two significant figures will give you 0.026.

Report to two significant figures:

0.0256 🡪 0.026

You must also remember to always round numbers in a single step, not sequentially. For example for an answer with two significant figures you don’t round 2.4478 first to 2.45 and then to 2.5. You need to round the number in a single step giving 2.4 to two significant figures.

Round to 2 significant figures:

2.4478 🡪 2.45 🡪 2.5 X

2.4478 🡪 2.4 ☺

Significant figures are important in all sorts of biological contexts, when reporting experimental data and for any calculation. Always remember to check whether the question asks you to report your answer to a certain number of significant figures, and if not, remember to use the lowest level of resolution in the data.

**Document updates**

v1.0 April 2017 Original version.

v1.1 June 2019 Changed how the word accuracy was used in order to be in line with the ‘Language of measurement’