**(DCP) Data Collection and Processing: - Relevant? Maybe use the current rubric**

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| **Levels/Marks** | **Aspect 1** | **Aspect 2** | **Aspect 3** |
| **Recording RAW**  **data** | **Processing RAW data** | **Presenting processed**  **data** |
| **Complete/2** | Records appropriate quantitative and associated qualitative raw data, including units and uncertainties where relevant. | Processes the quantitative raw data correctly. | Presents processed data appropriately and, where relevant, includes errors and uncertainties. |
| **Partial/1** | Records appropriate quantitative and associated qualitative raw data, but with some mistakes or omissions. | Processes quantitative raw data, but with some mistakes and/or omissions. | Presents processed data appropriately, but with some mistakes and/or omissions. |
| **Not at all/0** | Does not record any appropriate quantitative raw data **or** raw data is incomprehensible. | No processing of quantitative raw data is carried out **or** major mistakes are made in processing. | Presents processed data inappropriately **or** incomprehensibly. |

**Aspect 1: Recording RAW data**

You need to make a neat data table that is properly labeled, has units, uncertainties, and consistent precision. Uncertainty for an average with many trials is half the range of the trials, or for a measuring instrument, half the smallest thing it can measure. (i.e. if the smallest division on a meter stick is a millimeter, then the uncertainty is half a millimeter.)

**Aspect 2: Processing RAW data**

Average multiple trials. Make a graph with a best fit line if appropriate. The x axis should be the independent (manipulated) variable, and the y axis should be the dependent (measured) variable. Put a best fit line with a calculated slope through the points only if it seems to suggest a line. Title your graph, and label your axes with units.

**Aspect 3: Presenting processed data**

If the uncertainty is too small for error bars, indicate this, otherwise include error bars. Use the first and last points’ error bars (unless one is an obvious outlier) to determine the minimum and maximum slope. Calculate the result from the slope (if you need to) and express it as a best guess plus or minus an uncertainty. The uncertainty is (high-low)/2 of the values you determine from the min and max slope.

Here is an example:

To measure the spring constant of a spring, some students took a spring and stretched it to different amounts, and measured the restoring force using a force scale. They measured the stretch distance in centimeters using a ruler that had millimeters (0.1 cm) as the smallest division, so the uncertainty for the independent variable was 0.05 cm, and the force scale was a piece of crap with divisions every 0.2 N, so the force uncertainty was 0.1 N. They made this very nice data table. What a nice data table it is! It is neat, labeled with uncertainty and units, and the precision is consistent. What a nice nice data table!

|  |  |
| --- | --- |
| Stretch Distance  *x/cm*  ±0.05 cm | Restoring Force  *F/N*  ±0.1 N |
| 2.0 | 0.4 |
| 4.0 | 0.8 |
| 6.0 | 1.2 |
| 8.0 | 1.8 |
| 10.0 | 2.2 |
| 12.0 | 2.6 |

Here is the lovely graph they made:



Since the slope of this graph was the spring constant in N/cm, they determined the value of the spring constant to be 0.22 N/cm or **22 N/m**, and the uncertainty of this to be (0.24 – 0.20)/2 = 0.02 N/cm or **2** N/m

so they said that the value of **k = 22 ± 2 N/m**

Snip snap snout, this tale’s told out