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Writing Up an Investigation Guided Notes - Teacher Edition

Once you have collected your data from your experiment you then must **report** on your findings. This is called an investigation write up and has three parts.

1. **Processing** your data.
2. **Interpreting** your data.
3. **Evaluating** your investigation.

Processing your data

Conducting repeated tests for each value for the independent variable gives you a **range** of data that you can use to calculate **averages** to display as a graph. This helps you to identify trends and **patterns**.

Calculating the average or mean.

This value can be calculated by **adding** all the measurements for a value of the independent variable together and then **dividing** by the number of repeats.

Example 1:

Mean reaction speed 136 + 187 + 152s = 475 / 3 = 158.33 seconds.

Calculate the average reaction speeds in the table below. The first line has been done for you.

Temperature of Acid (° C)	**Time for magnesium ribbon to disappear (s)**			
	Test 1	*Test 2*	*Test 3*	*Average*
20	136	187	152	158
30	143	133	150	**142**
40	105	158	127	**130**
50	97	113	99	**103**

Graphing

Numerical data is usually presented as a graph of **averages**. This enables a **trend** to be seen. If the data for the independent variable has been arranged in **groups** e.g., eye colors of students, then a **bar graph** can be used. If both the independent and dependent variables have **numerical** data, then a **line graph** is most appropriate.

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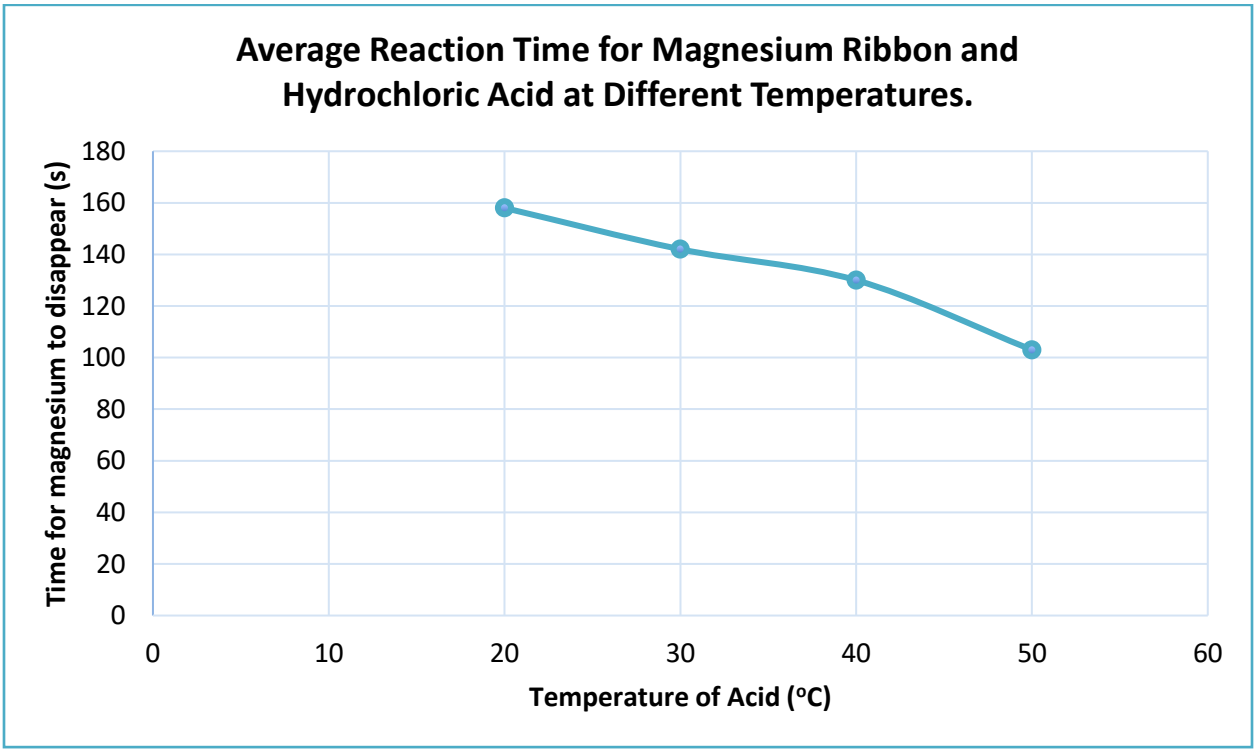
Guidelines for Line Graphs

1. Use ruled axes and graph paper.
2. Place the independent variable on the horizontal axis and the dependent variable on the vertical axis.
3. Label each axis with the variable name and unit (if appropriate).
4. Select a suitable scale for each axis and then mark it evenly along each axis. Note: the scale for each does not need to be identical.
5. Plot the data in pencil using small dots or crosses.
6. Draw a smooth line through the points if the data shows a curve, or a line of best fit if the trend is a straight line.
7. Add an appropriate title.

Example 2:

The data above is shown in the graph below.



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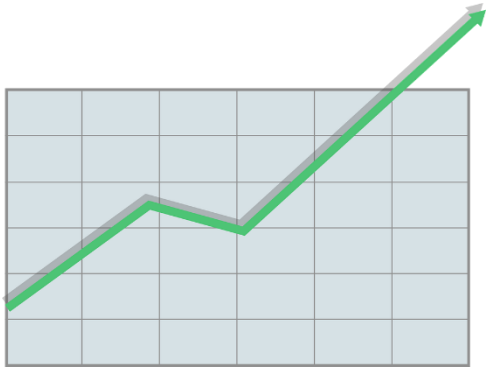
Interpreting your data



Next, you will need to describe any **patterns** or trends that can be seen in your data. This can be done by deciding if the dependent variable **increases** or **decreases** as the independent variable is changed. If you have your independent variable grouped, then you may look at which is the most **popular** group e.g., which eye-color is the most common in your class?

From here you can interpret what your trend means and form a **conclusion**.

Conclusions:

A conclusion is a **summary** of the inferences that have been made based on what you have **observed** in your data. It must:

- Relate back to the **hypothesis** for your investigation.
- Include the **independent** and **dependent** variables.

Example 3:

For the data table and graph used in examples 1 and 2, the conclusion would be:

These results support the hypothesis that increasing the temperature of the acid decreases the reaction time between magnesium and hydrochloric acid.

Evaluating your investigation

The final step to your investigation is to discuss the limitations and **reliability** of your experiment. This may include:

1. Results that did not fit in with all the others (**outliers**) or prove your hypothesis.

   E.g., Test two for 20^{o}C did not fit with the data and the time taken to dissolve was much longer. This may have been because this piece of magnesium was much longer than the other pieces used.

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2. Any problems or **difficulties** that you encountered when collecting data or sources of **error** that you found difficult to control and ways that you attempted to control them.

   E.g., Adjusting the temperature of the acid to the exact degree each time was difficult. So, we ended up adjusting the temperature and then removing excess volume with a pipette, so it was more precise.

3. Changes that you made to your **method**.

   E.g., originally, we had decided to conduct all three tests for each temperature at once, but discovered it was too hard to judge when each strip had finished dissolved as they all finished close to each other. Instead, we needed to do one strip at a time to ensure we could accurately identify when each dissolved.

4. **Improvements** that you could make to your investigation if you were to do it again.

   E.g., next time we could measure the dimensions of the magnesium strips to make sure they are similar in size as we found larger strips took longer to dissolve than smaller ones.