**Investigating the rate of reaction between Sodium Thiosulfate and Dilute Hydrochloric Acid**

**LIMITED CONTROL**

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| Variables* I have identified different **variables** that I could investigate.
* I have selected **one variable** to investigate and given **reasons** why I have chosen this variable.

Hypothesis and Quantitative Prediction* I have explained the science behind the investigation. (Remember to use diagrams where you can and make sure you reference where you have got the information from.)
* I have used these scientific ideas from my research to write a **testable hypothesis.**
* I have used these scientific ideas to write a **prediction.** (Where appropriate this should be a quantitative prediction).
* I have stated what my **independent** and **dependent** variable are.
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**Preliminary Work**

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| To decide final method/apparatus* I have detailed the steps I took to help me decide my final method for the investigation. (Include all the different ways you tried to set the investigation up including any results)
* I have explained why the final method should give **precise** and **valid** results.

**Precise –** means there is close agreement between repeated results**Valid** – a measurement is valid if it measures what it is supposed to be measuring (depends on technique and equipment)To decide range/what measurements* I have tested the smallest and largest value for the independent variable to check whether there is a significant difference between.
* I have tested to make sure that the measurement of the dependent variable is manageable with these values of the independent variable.
* I have explained how I used preliminary work to decide on the measurements I will take to ensure data of high quality.
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**Plan/Method**

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| * I have drawn a diagram of my apparatus (or taken a photo and labelled it )
* I have written a clear plan of how I am going to carry out the investigation. (**Numbered instructions** are better than continuous text).
* I have explained why I am going to repeat my readings and how many times.
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**Controlling Variables**

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| * I have explained how I will control the variables I’m not testing to make it a fair test.
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**Risk Assessment**

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| * I have identified all significant risks and explained how I will minimise all these risks using the student safety sheets to help and remembering to consider all of the equipment and the chemicals being used.
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**Table of Results**

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| * I have recorded all my results (including repeats) in a table.
* I have putting headings and units at the top of the columns.
* I have explained why I am/am not satisfied that I have got sufficient results.
* Where I repeated the results I have checked to see if any of them are outliers.
* Under the table I have explained how I decided whether results were outliers. (Or if there were none said why I think there are none).
* Where I repeated the results I have calculated the mean (leaving out any outliers)

Note : Some graphs may be drawn as part of data control |

**HIGH CONTROL**

1. **Final Graph**

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| * I have drawn a graph with the correct axes, clearly labelled
* I have given the graph a title
* I have plotted my data as a scatter graph **or** plotted the averages
* I have indicated the spread of data with range bars (where appropriate)
* I have drawn a line of best fit (where appropriate)
* I have calculated the gradient of the straight line (only if it is to be used or is relevant)
* I have given clear keys for multiple sets of data (where appropriate)
* I have given a mathematical consideration of the results (where appropriate)
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 **(Ea) Evaluation - how good was my method?**

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| * I have commented on the problems and limitations of the method used including:

 1) Comments on how accurate the apparatus used to make measurements was.1. Problems with the method.
2. How wide the range was.
3. How many different readings I took
4. How well were other variables controlled
* **Either - If I was to do the Investigation again…**

I have suggested what could be done to overcome these problems and why they would be an improvement or I have suggested a different way to collect the data.* **Or – If I was totally happy with how the investigation went…**

I have explained why no further improvement could be achieved (and why I think there is data of sufficient quality to make a conclusion) |

**(Eb) Evaluation of primary data**

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| Outliers* I have noted any outliers in my table of results and justified why I think they are outliers.
* I have explained why I think any outliers occurred.

Repeats* I have talked about the number of times I repeated each result and whether this was enough.
* I have discussed the variability (shown by the size of my range bars) in my repeats and used this to show how accurate and repeatable my results are.
* I have tried to explain any variability in my repeat experiments.

Pattern of results* I have explained how close my average points lie to the line of best fit and used this as another way of assessing accuracy.
* I have noted any results that do not lie close to the line of best fit
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| **Conclusion of primary data*** I have described what my graph shows. (patterns/trends)
* I have stated the conclusion to my experiment. (Science later)
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**Ra) Secondary data**

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| **Conclusion of secondary data*** I have collected relevant secondary data from several sources and **fully** referenced it.
* I have described the pattern of results in the relevant secondary data.

 * I have stated the conclusions of the secondary data. (Science explanations later)
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| **Comparing the Primary data and the Secondary Data*** I have identified **similarities** and **differences** between the primary and secondary data and commented on the importance of these.
* I have identified any data missing from either the primary or secondary data that would be useful.
* I have described and explained the how well the two conclusions agree/disagree.
* I have assessed the levels of confidence that can be placed on the available data and explained the reasons for making these assessments.
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**Rb) Reviewing my hypothesis**

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| * I have explained how well the hypothesis (and quantitative prediction) accounts for the trends and correlations in the data and/or how the hypothesis should be modified to account for the data.
* I have **explained** the Science behind the hypothesis and why this either supports the hypothesis or the hypothesis needs modifying.
* I have compared the results and the conclusion from both the primary and secondary data with my quantitative prediction.
* I have given details of what extra data could be collected to increase the confidence in the hypothesis.
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**References**

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| * I have acknowledged any sources used and referenced them in a bibliography.
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**Spelling, punctuation and grammar**

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| * I have checked that my report is written clearly, that I have used the right **science terminology** and checked my **spelling and grammar.**
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