**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. |

**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. |

**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. |

**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) |

**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. |

**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. |

**References**

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| * I have acknowledged any sources used and referenced them in a bibliography. |

**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.** |