



Task Number	2	Task Name	Depth Study
Course	11 Chemistry	Faculty	Science
Teacher	Mrs Hodgman	Head Teacher	Mr Yates
Issue date	4 th June 2024	Due date	Monday 29th July at 3:15 pm
Focus (Topic)	Rates of Reaction	Task Weighting	40%

Outcomes

A student:

CH11-1 develops and evaluates questions and hypotheses for scientific investigation

- develop and evaluate inquiry questions and hypotheses to identify a concept that can be investigated scientifically, involving primary and secondary data
- modify questions and hypotheses to reflect new evidence

CH11-2 designs and evaluates investigations in order to obtain primary and secondary data and information

- assess risks, consider ethical issues and select appropriate materials and technologies when designing and planning an investigation
- justify and evaluate the use of variables and experimental controls to ensure that a valid procedure is developed that allows for the reliable collection of data
- evaluate and modify an investigation in response to new evidence

CH11-5 analyses and evaluates primary and secondary data and information

- derive trends, patterns and relationships in data and information
- assess error, uncertainty and limitations in data
- assess the relevance, accuracy, validity and reliability of primary and secondary data and suggest improvements to investigations

CH11-7 communicates scientific understanding using suitable language and terminology for a specific audience or purpose

- select and use suitable forms of digital, visual, written and/or oral communication
- select and apply appropriate scientific notations, nomenclature and scientific language to communicate in a variety of contexts
- construct evidence-based arguments and engage in peer feedback to evaluate an argument or conclusion

CH11-10 explores the many different types of chemical reactions, in particular the reactivity of metals, and the factors that affect the rate of chemical reactions.

Task description

You are to perform an investigation to answer the given key inquiry question. This will involve research from secondary sources to process information about what is known in relation to the key inquiry question. You will also need to design a first-hand investigation to gather your own data in relation to the question. You will then be required to present this information in a scientific report.

You will be given class time in Term 2 Weeks 8-10 and Term 3 Week 1 to do your research, design your investigation and, if able to do so, perform your experiment. No marks will be lost if the experiment cannot be performed.

Further details can be found on the next page.

Key inquiry Question: What affects the rate of chemical reaction?

The task:

1. Using a case study (for example the production of ammonia, production of sulfuric acid, production of nitric acid or hydrolysis of aspirin), explain how the reaction rate is affected by the following factors:
 - Temperature
 - Surface area of reactant(s)
 - Concentration of reactant(s)
 - Catalysts
2. Using the same case study, research the importance of reaction rate in industrial chemistry. What other factors need to be considered when trying to optimise reaction rate in industry.
3. Design an experiment to test **at least two** of these factors on the rate of a reaction (it does not have to be the same reaction as in the case study above).

In order to produce quality work, you will need to:

- **Keep a practical workbook.**
- **Perform research** from secondary sources on a case study to explain how the rate of reaction is affected by the factors above.
- **Develop** a hypothesis.
- **Design an experiment(s)** to test your hypothesis. Discuss with your teacher to find out if your experiment(s) are appropriate.
- Ask your teacher to check your experimental design before you start.
- **Write a scientific report** based on your own experimental findings about the inquiry question using the scaffold provided. NB If you perform more than one experiment, you will need to include a separate method for each experiment, as well as an overall conclusion.
- **Compile** a reference list of ALL the websites, books etc. that you use.

Have your teacher check your draft report before completing your final copy.

For assessment you are required to give to your teacher

1. A completed scientific report

Keeping a Practical workbook:

Your practical workbook should be a chronological record of what you did. It should include things such as:

- How you decided on the factors for investigation and the experiment to be conducted, including some of the ideas which you may have dismissed
- Raw data and experimental results
- Plans, ideas, and thoughts
- Persistence

Your teacher will ask to see your practical workbook each week during the depth study unit. This is to get you used to using a practical workbook. This process will be repeated in Year 12 and may form part of the assessment task then.

Task Submission:

Your written report can be submitted either on Google Classroom via the assessment link or a printed copy can be handed to your teacher by Monday 29th July at 3:15 pm.

Depth Study Scaffold

Inquiry Question:

Abstract: This is a **short** summary of what you did and what you found out.

Quality point – have you outlined to the reader what you did and what you found out in your experiment?

Introduction: Record your internet/library research findings on the key inquiry question regarding the case study you have used to examine rates of reaction. Make sure that you give a reference list of the sources used at the end of your report. Make sure you record details of the resources you use in your practical workbook as you go.

Quality point – have you summarised what is already known about your topic based on your internet/library research?

Aim: What aspects of reaction rate are you testing in your experiment?

Quality point – have you clearly identified what you are trying to achieve?

Hypothesis: Based on what you know, what do you expect to find in this experiment?

Quality point – have you made an educated prediction, based on your internet/library research?

Method: What are the steps needed to complete the experiment? Write this in paragraph form. Include diagrams where possible.

Quality point – have you explained how you did the experiment? Could the reader repeat the experiment using your procedure?

Justify and Explain Method:

Justify the method used: Why did you do it this way rather than a different way? What are some alternatives to your method? How does your method ensure you have collected accurate, reliable, and valid data? Did you have to modify your method as you performed the investigation? If so, how, and why?

Quality point – have you clearly justified the use of your method as opposed to alternative methods?

Results: What were your results/observations? Use tables graphs etc.

Quality point – are your results clearly set out so that the reader knows exactly what you have measured/observed. Have you presented your results in tables, graphs etc.?

Discussion: Discuss your findings. What do the results mean?

Quality point – Have you explained what your results mean and how they relate to your introduction?

Conclusion and recommendations: Was the inquiry question answered? What would you recommend for future research?

Quality point – have you clearly stated what you found out from the experiment? Was your hypothesis correct and was your aim achieved?

Reference list: A list of all the books, websites etc. that you used, following the prescribed format.

Quality point – have you listed all the resources you used using the format provided?

Marking Criteria

Section of Task	Marks
<p>Background Research: (Found in the Introduction) CH11-5, CH11-7, CH11-10</p> <p>A relevant case study is used to explain how rate of reaction is affected by all four factors. This is communicated, succinctly and logically using correct and precise scientific terms. All elements of an explanation are present.</p>	9 – 10
<p>A relevant case study is used to explain how rate of reaction is affected by three of the factors. This is communicated, succinctly and logically using correct and precise scientific terms. OR All four are explained succinctly and logically using correct scientific terms. Explanation misses one element.</p>	7 – 8
<p>A relevant case study is used to explain how rate of reaction is affected by two of the factors. This is communicated, succinctly and logically using correct and precise scientific terms. OR All four are explained succinctly and logically using basic scientific terms. Multiple elements of an explanation are missing.</p>	4 – 6
<p>A relevant case study is used to explain how rate of reaction is affected by one of the factors. This is communicated, succinctly and logically using correct and precise scientific terms. OR All four are explained using limited scientific terms. Few elements of an explanation present.</p>	0 – 3
<p>Scientific Investigation (Aim, Hypothesis, Method/justification, Results, Discussion Conclusion) CH11-1, CH11-2, CH11-5, CH11-7, CH11-7</p> <p>The student demonstrates outstanding understanding of how to design and report on a valid and reliable investigation to answer an aim. The report makes use of appropriate sub-headings and information is communicated succinctly and logically using correct and precise scientific terms. All results are correctly presented in tables and graphs where appropriate.</p>	18 – 20
<p>The student demonstrates high-level understanding of how to design and report on an investigation to answer an aim, but there may be minor errors affecting the validity and reliability. The report makes use of appropriate sub-headings and information is communicated logically using correct scientific terms. All results are presented in tables and graphs where appropriate, but the tables and/or graphs may have minor errors.</p>	14 – 17
<p>The student demonstrates a sound understanding of how to design and report on an investigation to answer an aim, but the method has significant errors in its validity and reliability. The report makes use of some, but not all sub-headings, and information is communicated logically using basic scientific terms. Some results are presented in tables and graphs where appropriate, but the tables and/or graphs may have minor errors.</p>	8 – 14
<p>The student demonstrates a basic understanding of how to design and report on an investigation to answer an aim, but the method will not result in the collection of valid and reliable data. The report makes use of a limited number of sub-headings, and information is communicated using limited scientific terms. Results are poorly presented; either not the form in tables and graphs, or the tables and/or graphs have major errors.</p>	0 - 7
<p>Reference List: Ch11-5</p> <p>Five or more reliable sources are referenced.</p> <p>Three to four reliable sources are referenced OR Five or more references, but not all are reliable.</p> <p>One to two reliable sources are referenced OR more than 4 sources are used, but none are reliable.</p>	4 2 – 3 1
<p>Sources are referenced using the correct format.</p> <p>Sources are referenced using the correct format but with a few errors.</p> <p>Sources are referenced with significant errors or using an incorrect format</p>	6 4 – 5 1 – 3
Total:	/ 40

Teacher Comment: