Gymea Technology High School
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Year 12, Chemistry

Task 3: Depth Study

Due Date: 14/03/2025 3pm

Task Distributed: 12/12/2024

Unit: Module 5 and 6

Task Type: Depth Study

Task Weighting: 30%

Outcomes: CH11/12-1, CH11/12-2, CH11/12-3, CH11/12-5, CH11/12-6, CH11/12-7, CH12-13

Task Description

A depth study is any type of investigation/activity that a student completes individually or collaboratively. It allows the further development of one or more concepts found within or inspired by the syllabus. Depth studies provide opportunities for students to pursue their interests in chemistry, acquire a depth of understanding, and take responsibility for their own learning.

In this depth study students will use volumetric analysis to determine the concentration of an unknown substance in solution. Students will use acid- base titrations to determine the concentration of a substance.

Step 1: Choose a Titration (Group work)

As a group of 3-4 choose one situation in which the concentration of a dissolved substance is variable and significant, from the following list; the acidity of vinegar (brand or type).

Step 2: Research the occurrence of a substance in solution. (Individual)

Your research needs to cover causes of the variability, what concentration is acceptable or desirable, and any activities that cause or provide solutions to these issues.

Step 3: Develop a testable hypothesis to determine the concentration of the substance. (Individual)

Different factors may affect these concentrations and your task is to develop a hypothesis about such a factor. Eg, Vinegar A will be more acidic than Vinegar B because…….

Step 4: Develop a method to test your hypothesises. (Group)

The method must be approved by your teacher before proceeding.

Step 5: Carry out the Titration (Group)

Step 6. Final Presentation: Formal Scientific Report. (Individual)

This needs to outline the depth study, including:

- the research question
- background research (maximum 4 pages)
- reference list
- methodology for data collection and tabulated raw data
- data analysis and findings
- discussion (discussion of results, potential sources of error and improvements)
- conclusion

NESA Glossary of Key Words

Understand the verb associated with the task. The verb will provide an understanding of the detail needed to successfully answer the question.

- **Critically** **Analyse**
  Add a degree or level of accuracy depth, knowledge and understanding, logic, questioning, reflection and quality to (analyse/evaluate Critically (analyse/evaluate)
- **Investigate**
  Plan, inquire into and draw conclusions about
- **Explain**
  Relate cause and effect; make the relationships between things evident; provide why and/or how

Check the NESA Glossary of Key Words for further guidance https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/hsc/hsc-student-guide/glossary-keywords

Details of Submission

Your Depth study must be submitted as a Google Document.

Please upload a copy of your assessment to Google Classroom by 3pm.

Teacher Feedback and Student Self-Reflection

- The task will typically be returned to students within 14 of the due date.
- At this time feedback including information on how to improve will be provided through the marking criteria and written comments.
- Students can clarify or seek further feedback by speaker with their teacher or the assessment marker.

Upon return of the task, students will also be expected to complete a self-reflection activity. Self reflection is an important part of the learning process as it provides an opportunity to reflect on our strengths and areas of weakness.

How does this link to my learning?

- A depth study is any type of investigation/activity that a student completes individually or collaboratively. It allows the further development of one or more concepts found within or inspired by the syllabus. Depth studies provide opportunities for students to pursue their interests in chemistry, acquire a depth of understanding, and take responsibility for their own learning.

Assessment Procedures

All students should be fully aware of the School Assessment Procedures for their year group. These were provided at the beginning of the school year and are available off the school website under the Learning Tab for each year group.

CH11/12-1 develops and evaluates questions and hypotheses for scientific investigation	**RESEARCH QUESTION** **Develop and evaluate inquiry questions and hypotheses to identify a concept that can be investigated scientifically, involving primary and/or secondary data**	A clear research question has been stated, that identifies a researchable variable. The question shows extended thinking.	A clear research question has been stated, that identifies a researchable variable. The question shows deep thinking.	A research question has been stated, that may not clearly identify researchable variables. And/ 0r The question shows surface level thinking.	A limited attempt has been made at stating a research question.
		4	3	2	1
CH11/12-2 designs and evaluates investigations in order to obtain primary and secondary data and information	**SAFETY** **Assess risks, consider ethical issues and select appropriate materials and technologies when designing and planning an investigation**	The risks / ethical issues involved in the first-hand investigations have been identified assessed and mitigated	The risks / ethical issues involved in the first-hand investigations have been identified and assessed. No evidence of risk mitigation is present.	The risks / ethical issues involved in the first-hand investigations have been identified. No evidence of risk assessment or mitigation is present.	A limited attempt has been made at identifying the risks involved in a first-hand investigation.
		4	3	2	1
	BACKGROUND RESEARCH **Develops and evaluates knowledge and understanding of substance being investigated**	Detailed and evaluated research into the substance being investigated including the occurrence, cause of variability, what concentration is acceptable/desirable, cause of the variation and/or ways in which variability is controlled.	Detailed research into the substance being investigated including the occurrence, cause of variability, what concentration is acceptable/desirable, cause of the variation and/or ways in which variability is controlled.	Research into the substance being investigated including the occurrence, cause of variability, what concentration is acceptable/desirable, cause of the variation and/or ways in which variability is controlled evident but not detailed.	Some research into the substance being investigated but does not include all relevant information.
		12	8	6	4
	METHODOLOGY **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**	Strong evidence of a valid procedure and reliable collection of data is present. Including justification of the variables and experimental controls used.	Evidence of a valid procedure and reliable collection of data is present. Limited justification of the variables and experimental controls used.	Limited evidence of a valid procedure and reliable collection of data is present	No evidence to demonstrate a valid procedure and reliable collection of data is present
		4	3	2	0

CH11/12-3 conducts investigations to collect valid and reliable primary and secondary data and information	**TABULATED RAW DATA** **Presents raw data in an appropriate format**	All raw data is appropriately displayed in an organised and structured manner with data clearly labelled.	Most raw data is appropriately displayed in an organised and structured manner but data is not clearly labelled.	Some raw data is appropriately displayed in an organised and structured manner but data is not clearly labelled.	Some raw data is appropriately displayed but it is not organised or ;labelled in appropriate format
		4	3	2	1
	REFERENCES **Select and extract information from a wide range of reliable secondary sources and acknowledge them using an accepted referencing style**	5 or more references included, from a wide range of formats, all correctly formatted	Less than 5 references included, from a wide range of formats OR Minor errors in the formatting	Less than 4 references included OR Limited range of formats OR Significant errors in the formatting	Limited number and range of references.
		4	3	2	1
CH11/12-5 analyses and evaluates primary and secondary data and information	**DATA ANALYSIS AND FINDINGS** **Derive trends, patterns and relationships in data and information**	Data/information has been successfully used to derive tends or patterns that are relevant to the posed question.	Data/information has been used to derive tends or patterns that are relevant to the posed question. Small errors present OR areas for improvement identified.	Data/information has not been used to derive tends or patterns that are relevant to the posed question.	
		2	1	0	
	DISCUSSION **Assess error, uncertainty and limitations in data**	The sources of error/uncertainty and limitations in data have been identified and an assessment of the impact of these errors to the posed question is included in the discussion.	The sources of error/uncertainty and limitations in data have been identified. No assessment of the impact of these errors to the posed question is included in the discussion.	The sources of error/uncertainty and limitations in data have not been identified. No assessment of the impact of these errors to the posed question is included in the discussion.	
		2	1	0	
CH11/12-6 solves scientific problems using primary and secondary data, critical thinking skills and scientific processes	**DISCUSSION** **Assess the relevance, accuracy, validity and reliability of primary and secondary data and suggest improvements to investigations**	Detailed assessment of the relevance, accuracy, validity and reliability of primary and/or secondary data included in discussion. AND Suggestions improvements to the investigation/s present.	Assessment of the relevance, accuracy, validity and reliability of primary and/or secondary data included in discussion. Errors for improvement identified. AND Suggestions of improvements to the investigation/s present.	Limited assessment of the (relevance, accuracy, validity and reliability) of primary and/or secondary data included in discussion. OR Limited suggestions improvements to investigations present.	An attempt at either An assessment of the relevance, accuracy, validity and reliability of primary and/or secondary data included in discussion. OR Suggestions improvements to the investigation/s present.
		4	3	2	1

	DISCUSSION Evaluate processes, claims and conclusions by considering the quality of available evidence, and use reasoning to construct scientific arguments. Where appropriate, mathematical models are to be applied to demonstrate the trends and relationships that occur in data.	Constructs well-reasoned scientific arguments, effectively using mathematical techniques to draw conclusions about the concentration of the unknown AND determines whether the hypothesis is supported from the first-hand data	Constructs less well- reasoned scientific arguments, without effectively using mathematical techniques to draw conclusions about the concentration of the unknown OR without determining whether the hypothesis is supported from the first-hand data	Draws some appropriate conclusion from the first-hand data	No conclusion is drawn
		10	6	4	0
	CONCLUSION Discusses the overall results of the experiment in relation to the question being investigated.	A short conclusion that relates and answers the research question is included and discusses the overall results	A short conclusion is included that discusses the overall results but does not relate to the research question	Conclusion does not relate to the research question and has contradictory/new information	No conclusion included
		4	3	2	1
	GROUP WORK Contributes positively in the group.	Actively participates positively and collaboratively in all aspects of group work and	Actively participates and collaboratively in most aspects of group work	Actively participates and collaboratively in some aspects of group work	Does not contribute to group discussion and practical work.
		4	3	2	1