



ORANGE HIGH SCHOOL

ASSESSMENT TASK NOTIFICATION

Subject	Chemistry
Year	12 HSC
Task	Number 1 - First-Hand Investigation and Research
Weighting	35%
Teacher	Mr. Ruwona
Head Teacher	Ms. Huggett
Date given	Tuesday the 14 th of November 2023 – Week 6A Term 4
Date and school week	Friday the 16 th of February 2024 – Week 3A Term 1 Part A: Report due to be submitted via Google Classroom by 09:00 am Part B: Poster or PowerPoint presentation submitted via Google Classroom by 09:00 am (must then be presented in class on the day of submission)

Assessment Outline

PART 1 – Report

- To complete this task, you are required to research, plan, perform and conduct a first-hand investigation into a real-world example of equilibrium
- Students will be required to evaluate the *validity* and *reliability of sources* used in the secondary source investigation
- The report must be submitted electronically via Google Classroom by 09:00 pm (Friday 16/02/24)

PART 2 – Poster/Presentation

- Students will need to develop a poster or presentation which displays their information for presentation to an audience (Year 12 class)
- The poster or presentation must be electronically submitted via Google Classroom by 09:00 am (must then be presented in class on the day of submission – on Friday 16/02/24)

Non-completion of Task:

If you know you are going to be away on the day that the task is due, you must make alternative arrangements with your classroom teacher. If you are away on the day of the examination, you must catch up with your classroom teacher on the first day you return to make alternate arrangements to catch up on this task.

Plagiarism:

Plagiarism, the use of the work of others without acknowledgement will incur serious penalties and may result in zero award. Any cheating will also incur penalties.

Failure to follow the above procedures may result in a zero award.

The policies and procedures that are outlined on the ROSA booklet will be followed regarding the non-completion of assessment tasks.

Outcomes Assessed

Working Scientific Skills:

- CH12 – 1** Develops and evaluates questions and hypotheses for scientific investigation
- CH12 – 2** Designs and evaluates investigations in order to obtain primary and secondary data and information
- CH12 – 3** Conducts investigations to collect valid and reliable primary and secondary data and information
- CH12 – 4** Selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media
- CH12 – 5** Analyses and evaluates primary and secondary data and information
- CH12 – 7** Communicates scientific understanding using suitable language and terminology for a specific audience or purpose

Knowledge and Understanding:

- CH12 – 12** Explains the characteristics of equilibrium systems, and the factors that affect these systems

Task Overview:

This task contains two parts.

This HSC task is associated with the Chemical Equilibrium topic.

Part A - First-Hand Investigation

To complete this part, you are to research a real-world example of equilibrium and perform a 1st Hand Investigation that relates to that example. The findings of this investigation are to be written as a scientific report AND explain the validity and reliability of sources used in the secondary source investigation.

Part B – Research (Poster)

In this part, you are to then develop a poster/presentation that explains the application of equilibrium and Le Chatelier's principle to the investigation you conducted. The poster/presentation will be used to present the concept to an audience of Year 12 Chemistry students.

General Information:

Due date: Friday 16th of February 2024.

Length: The investigation report produced for this assignment should not exceed 5 pages (report should not be more than 800 words ($\pm 10\%$)).

Format: The format should include the appropriate scientific report style, as outlined in the guide below. The use of appropriate communication styles in the presentation of the report is at the discretion of the student, however, the information presented should be clear and use appropriate scientific terminology. The research/poster must communicate the application of equilibrium and Le Chatelier's principle to your given investigation topic.

Part A – Practical Investigation

Select and research **ONE** real-world equilibrium.

Analyse the behaviour of this equilibrium, relating this to your understanding of Le Chatelier's principle, and collision theory.

You may choose one of the following examples. You may NOT choose the Haber process.

Examples include:

- *Effect of ocean acidification on marine life (eg coral, invertebrates) [Carbonate equilibria]*
- *The formation of stalagmites and stalactites in limestone caves*
- *The manufacture of soft drinks*
- *Chlorination of swimming pools*
- *Ozone-oxygen cycle of ozone layer*
- *Methanol production*
- *Treatment of carbon monoxide poisoning*
- *Photochromic (transition) lenses*
- *Formation of kidney stones*
- *The manufacture of sulfuric acid*
- *OR another example of your choosing (which must be approved by your teacher)*

You are to then **conduct an experiment that can model** your chosen topic above and prepare a scientific report that adequately communicates this knowledge to the scientific community (your audience). You are to follow the guidelines below on how to write a scientific report.

Scientific Report Structure:

1. Abstract: An abstract summarises (usually in one paragraph of 300 words or less) the major aspects of the entire report in a prescribed sequence that includes (this is written last, once the report is complete):

- The overall purpose of the study and the research problem(s) you investigated;
- The basic design of the study;
- Major findings or trends found as a result of your analysis; and,
- A brief summary of your interpretations and conclusions.

2. Background: It establishes the underlying context and informs the reader of the science behind the investigation you are undertaking. This must be detailed and should include information about the chemistry involved. (approx. 3 – 6 paragraphs). For each of your sources, **you should evaluate their validity, reliability and limitations.**

3. Aim: It is the goal or the purpose of the investigation.

4. Scientific question: The question that specifically identifies the concept that you are exploring in your investigation (approx. 1 – 3 lines)

5. Hypothesis: It is a proposed explanation made on the basis of limited evidence as a starting point for further investigation and can be supported or refuted by investigation. It usually uses the if ... then ... statement as a scaffold and must link to what you will change and what you will measure. You must include your reason and justification.

6. Variables: Any characteristics, numbers, or quantities that can be measured or counted. In some experiments where dependent and independent variables are not directly applicable, only controlled variables are required.

7. Materials: These are the tools or equipment and chemicals used in your experiment.

8. Risk Assessment: This is a careful evaluation of what could cause harm/hazards to people during a scientific investigation. At least 3 risks should be included, and three control measures. The risk assessment should be presented as a table. You may use the Chemical Safety in Schools link:

<https://online.det.nsw.edu.au/ecmjsp/chemicals/chemicals.cfm#skipToContent>

9. Method: These are a sequence of steps of how the experiment is done. They should provide clear logical instructions, including how/what equipment is used to collect the data, and includes repetition.

10. Results: It is a record of measurements and observations made and should be presented in an appropriate table.

11: Discussion: This is a section where you explain and evaluate your results and observations, showing how they relate to your literature review, and making an argument in support of your overall conclusion. You should include suggestions on how to improve the *accuracy* and *reliability* of your results and give a judgement on the *validity* of the investigation. Your discussion should have at least 4 sections.

Section 1: This is the section in which you interpret your results. You should refer directly to the data that was gathered and analyse it using your graph. You should look for trends and discuss why they have occurred. You can link this to your background research to further indicate your understanding of why this trend has occurred.

Section 2: This is the section in which you analyse the accuracy and precision of the data you collected. It is a good idea to give a definition of each term before you start discussing how your investigation performed. You also need to make sure that you provide evidence (specific examples) of how your investigation was/wasn't accurate or precise. You should also include how you could improve the investigation to increase accuracy and precision.

Section 3: This is the section in which you analyse the reliability of the data you collected. It is a good idea to give a definition of the term before you start discussing how your investigation performed. You also need to make sure that you provide evidence (specific examples) of how your investigation was/wasn't reliable. You should also include how you could improve the investigation to increase reliability.

Section 4: This is the section in which you analyse the validity of the data you collected. It is a good idea to give a definition of the term before you start discussing how your investigation performed. You also need to make sure that you provide evidence (specific examples) of how your investigation was/wasn't valid. You should also include how you could improve the investigation to increase validity.

12. Conclusion: It is a brief description of the purpose of the experiment, a discussion of your major findings, an explanation of your findings, and recommendations for further study. You should refer to the aim of the investigation and provide a judgement on whether the hypothesis was proven or disproved, and the consequences/implications of this. Your conclusion should always be based on evidence and refer directly to evidence from your investigation.

13. Reference list and appendix: Detailed list of all sources used in the report (you should try to use references in your background information/introduction section and in your discussion), and you may include diagrams in your appendix (**none of these are included in the page limit**).

* **BIBLIOGRAPHY and RESOURCE EVALUATION:**

You will be creating a bibliography for EACH of the **5 (minimum) resources** that were used.

Your bibliography must be created using the **APA 6th edition**. See guide here:

https://libguides.library.usyd.edu.au/ld.php?content_id=22193083,

Online reference generator: <https://www.mybib.com/tools/apa-citation-generator>

AND

Write a paragraph of evaluation of your sources (for validity and reliability): see here:

https://guides.library.illinoisstate.edu/ld.php?content_id=14672390

Part B – Research (Poster)

- This should be a visually appealing poster/presentation.
- This must communicate the application of equilibrium and Le Chatelier's principles of your given process/application.
- Remember this should give the audience a clear understanding of your research

In your research (poster), you may include visuals such as images, text, diagrams and relevant equations to your chosen equilibrium example (content should be long enough to be presented in less than 5 minutes). To assist you in analysing the equilibrium, the following must be included:

- Describe Le Chatelier's principle and the conditions under which (factors that affect) a shift in equilibrium occurs
- Describe your given system- including any relevant process/es, reactant/s, intermediate/s, product/s, and catalysts, using words, diagrams and equations, and any other relevant details
AND ALL relevant factors would shift the equilibrium
- Explain the system at a particle level using collision theory including diagrams, text with cause-and-effect language and relate it to Le Chatelier's principle and rate of reaction
- Explain the impact of your given system (the system or its product/s) on AT LEAST ONE OR MORE of the following: environment, society or industries. You must include a MINIMUM of 3 impacts.

MARKING CRITERIA:

Area of Assessment	Outcome	A	B	C	D	E	
Working Scientifically	CH12-1 Abstract	(5) - Extensive understanding of the scientific question demonstrated - Detailed and condensed summary of the key aspects - History and applications of the research and has a link to future use in society. - Approximately 1 -2 paragraphs in length	(4) - Thorough understanding of the scientific question demonstrated - Condensed summary of the key aspects - History and applications of the research and has a link to future use in society. - Approximately 1 -2 paragraphs in length	(3) - Satisfactory understanding of the scientific question demonstrated - General summary - History and applications of the research and approximately 1 -2 paragraphs in length	(2) - Basic abstract supplied - General summary - History and applications of the research and a couple of sentences used	(1) - General summary - A couple of sentences used	(0) No attempt
	CH12-1 Aim/Hypothesis	(5) Explicit and succinct detailed links between real world scenario and investigation.	(4) Explicit detailed links between real world scenario and investigation.	(3) Explicit links between real world scenario and investigation.	(2) Obvious implied links between real world scenario and investigation.	(1) Limited links between real world scenario and investigation.	(0) No attempt
	CH12-2 Experimental Design	(25-21) -Outstanding experimental design. -Sophisticated completed list of all equipment used -Lists all safety issues (3 or more) with conducting the investigation, explains how each issue was solved or reduced At an extensive level -Clear logical method in third person, in correct order, detailed and in numbered steps Include how the dependent variable will be measured, along with any other variables -An advanced level of validity, accurate and reliability.	(20-16) -High standard of experimental design. -Lists all safety issues (3 or more) with conducting the investigation Explain how each issue was solved or reduced At a thorough level. -Clear logical method in third person at thorough level, with no personal pronouns included -Detailed completed list of all equipment used -A high level of validity, accuracy and reliability	(15-11) -Sound experimental design. -Lists of most of the equipment used -Lists some safety issues (2) with conducting the investigation Explain how each issue was solved or reduced At a sound level. -Logical method in third person at high level, a few personal pronouns included -A moderate level of validity, accuracy and reliability	(10-6) -Basic experimental design. -Basic list of equipment used -Lists some safety issues (2) with conducting the investigation Attempts to explain how each issue was solved or reduced At a basic level. -Basic method, not well sequenced, some personal pronouns included -Design contains errors in accuracy, reliability or validity.	(5-1) -Limited experimental design. -Simple list of some of the equipment used -Lists some safety issues (1) with conducting the investigation Attempts to explain how issue was solved or reduced At an elementary level. -An elementary method, not sequenced, has personal pronouns included -Design copied from a source without modification to improve reliability, accuracy or validity.	(0) No attempt
	CH12-3 Report presentation	(5) Report presentation has no grammatical errors and correct subheadings Scientific language consistently used	(4) Report presentation has a few grammatical errors and correct subheadings Scientific language mostly used	(3) Report presentation has a mix of some grammatical errors and subheadings mostly used Scientific language is somewhat present	(2) Report presentation has grammatical errors and some subheadings used A scientific term is used in the report	(1) Report presentation has a lot of grammatical errors present	(0) No attempt

CH12-4 Processes qualitative and quantitative data	(5) An extensive analysis of primary and secondary data that relates to task AND Vividly explains and describes how secondary data relates to the experiment.	(4) Thoroughly explains the cause and effect of primary data that relates to task AND Thoroughly explains and describes how secondary data relates to the experiment.	(3) Adequately collects and describes attained results that relates to the task AND Adequately describes how secondary data relates to the experiment.	(2) Basic collection of data that relates to the task AND Basic identification of secondary data and its relation to task.	(1) Limited collection of data that relates to the task OR Limited identification of secondary data and its relation to task.	(0) No attempt
CH12-5 Background	(5) - The research is extensive - 6 or more detailed research ideas summarised. - Extensive use of scientific journals/ papers used and cited - Detailed analysis of the ideas and linked to focus area	(4) - The research is thorough - 5 or 6 detailed research ideas summarised. - Thorough use of scientific journals/ papers used and cited - Satisfactory analysis of the ideas and linked to focus area	(3) - The research is general - 3 or 4 research ideas summarised. - General use of scientific journals/ papers used - General analysis of the ideas	(2) - The research is basic - 2 research ideas summarised. - Basic analysis of the ideas	(1) - The research is basic - No structure to the response	(0) No attempt
CH12-5 Background/E valuation of Resources	(5) - Correctly creates an APA style bibliography with at least 5 sources - Extensive evaluation of the validity and reliability of five resources. - Extensive limitations of articles clearly stated - Author's conclusions clearly and correctly identified - Clear personal link to main research topic	(4) - Correctly creates an APA style bibliography of at least 4 sources - Thorough evaluation of the validity and reliability of four resources. - Limitations of articles clearly defined - Correct statement of article but main idea missed - Statement connecting article to research topic	(3) -Creates an APA style bibliography of at least 3 sources -Sound evaluation of validity and reliability of three resources. -Sound attempt at stating the article's limitations -Article connected but no reflection provided	(2) -Creates a bibliography of at least 2 sources -Basic evaluation of validity and reliability of some resources. -Basic statements of articles' limitations -Incorrect statement of article's conclusions -Article within same field, but no direct link to main research topic	(1) -An attempt to create a bibliography of sources -Limited or incorrect evaluation of validity or reliability of a resource. -Poor attempt to describe the limitations of information in article -Reason behind the article unknown -Article un-related to other sources or irrelevant	(0) No attempt
CH12-7 Language used in presentation and relevant to Year 12 audience	(5) Presentation includes ALL relevant scientific terminology, equations and labeled diagrams. AND presentation appropriate for the Year 12 audience.	(4) Presentation includes MOST relevant scientific terminology, equations and labelled diagrams. AND presentation appropriate for the Year 12 audience.	(3) Presentation includes SOME relevant scientific terminology, equations and labeled diagrams. AND presentation appropriate for the Year 12 audience.	(2) Presentation includes FEW scientific terminologies, equations and labeled diagrams. AND presentation appropriate for the Year 12 audience.	(1) Presentation includes at least one scientific terminology, equation/s and labelled diagram/s. AND/OR presentation appropriate for the Year 12 audience.	(0) No attempt

Area of Assessment	Outcome	A (10-9)	B (8-7)	C (6-5)	D (4-3)	E (2-1)	(0)
Knowledge and Understanding	CH12-12 Characteristics of the equilibrium system and the factors that affect it	States Le Chatelier's principle AND describes ALL of the factors that cause a shift in equilibrium AND Description of system including ALL of the following: - Relevant process/es - Reactant/s - Product/s - Catalyst/s - diagrams - relevant equation - additional information AND Explains, in detail, the system at particle level and refers to collision theory. Including all relevant: - diagram/s text including cause and effect language AND Explains, in detail, the impact (minimum 3) of the system on ONE or MORE of the following: society, environment or industry/ economy USING: positive and negative impact/s where applicable - cause and effect language	States Le Chatelier's principle AND describes MOST of the factors that cause a shift in equilibrium AND Description of system including MOST (5) of the following: - Relevant process/es - Reactant/s - Product/s - Catalyst/s - diagrams - relevant equations - additional information AND Explains the system at particle level and refers to collision theory. Including all relevant: - diagram/s text including cause and effect language AND Explains, the impact (3) of the system on ONE or MORE of the following: society, environment or industry/ economy USING: positive and negative impact/s where applicable - cause and effect language	States Le Chatelier's principle AND describes SOME of the factors that cause a shift in equilibrium AND Description of system including 4 of the following: - Relevant process/es - Reactant/s - Product/s - Catalyst/s - diagrams - relevant equation additional information AND Describes the system at particle level and refers to collision theory. Including all relevant diagram/s and text AND Describes the impact (2 or more) of the system on ONE or MORE of the following: society, environment or industry/ economy USING positive and negative impact/s where applicable	States Le Chatelier's principle AND identifies ALL the factors that cause a shift in equilibrium AND Description of system including 3 of the following: - Relevant process/es - Reactant/s - Product/s - Catalyst/s - diagrams - relevant equations OR identifies ALL parts of the system AND Describes the system at particle level and refers to collision theory. Including all relevant diagram/s and text AND Describes an impact of the system on ONE of the following: society, environment or industry/ economy USING positive and negative impact/s where applicable	States Le Chatelier's principle AND identifies MOST of the factors that cause a shift in equilibrium AND Identifies SOME of the parts of the system: - Relevant process/es - Reactant/s - Product/s - Catalyst/s - diagrams - relevant equations AND Describes the system at particle level and refers to collision theory. Including all relevant diagram/s and text AND Describes an impact of the system on ONE of the following: society, environment or industry/ economy including positive and negative impact/s where applicable	No attempt

Outcomes						
CH12 – 1 (Abstract/Aim/Hypothesis) = / 10	CH12 – 2 (Experiment Design) = / 25	CH12 – 3 (Report Presentation) = / 5	CH12 – 4 (Results & Data Processing) = / 5	CH12 – 5 (Background & Evaluation of Sources) = / 10	CH12 – 7 (Communication) = / 5	CH12 – 12 (Research & Poster) = / 10
Total Grade	A 50 – 45	B 44 – 39	C 38 – 15	D 14 – 6	E 5 – 0	Total Marks = / 70

Feedback
