Notice of Assessment Task
Year 10 Science
Student Research Project

Date of initial notification:	**Date of submission of task:**
Wednesday, 5 March, 2025 Term 1, Week 6	Wednesday, 19 March, 2025 Term 1, Week 8

Task Number: 1

Time Allowed: 2 Weeks

Course Component/Focus area/topic/module:
Stage 5: Chemical World

Task Description

You are to plan and conduct a practical investigation to demonstrate the law of conservation of mass in a chemical reaction and explain how mass is conserved in closed systems.

Outline

As a science student, you have been tasked with planning and conducting an investigation to demonstrate the law of conservation of mass in a chemical reaction. You will also investigate and explain how mass is conserved in closed systems.

You must develop a suitable hypothesis to be investigated, carry out the investigation, collect data, and analyse your results. Finally, you will produce a scientific report which contains the following sections: aim, introduction, hypothesis, method, risk assessment, results, discussion, conclusion, and references.

The audience for your report is your science teacher. Therefore, the report should use appropriate scientific language and terminology. You will be assessed based on your ability to structure your report and write cohesively. In the method section, you will also be assessed on how well you can write in passive voice and past tense.

You will have 3 periods of class time to work on the assessment task.

1. In the first lesson, your teacher will demonstrate the procedure, and then you will plan the investigation with your team of 2–3 others. Your team will need a suitable table to record your results before the next lesson. You will also need to develop your hypothesis for the investigation.
2. In the second lesson, you and your team will conduct the investigation. You will receive the chemicals and equipment listed in the investigation scaffold. You must work collaboratively and efficiently to the complete investigation in the given time.
3. In the third lesson, you will have time to analyse your data and work on writing your scientific report. The report is your own work, and only the initial planning information and results should be shared with your peers. You are also expected to write and refine your report at home.

This is a compulsory Assessment Task that must be completed to achieve a ROSA in Science.

Requirements:

- You are to either type up, save as a PDF and submit your *Student Research Project* via Google Classroom, *or* submit a handwritten version to your Science teacher on **Wednesday 19 March, Week 8** by the end of the school day, 2:50pm
- Use the marking criteria as a guide to the requirements of the project.
- All work should be your own and must be in your own words.
- Safety is an important part of any scientific investigation. It is essential that you carry out your project with safety in your mind.
- If you do not submit your Student Research Project, an Academic Warning Letter may be issued.

Outcomes/Competencies to be assessed in this task:

SC5-4WS	develops questions or hypotheses to be investigated scientifically
SC5-6WS	undertakes first-hand investigations to collect valid and reliable data and information, individually and collaboratively
SC5- 17WS	discusses the importance of chemical reactions in the production of a range of substances, and the influence of society on the development of new materials

Feedback: How will I receive feedback on this task?

☒ Written

☒ Individual

STUDENT RESEARCH PROJECT
Writing a Scientific Report

A scientific report documents all aspects of a first-hand investigation. Scientific reports allow their reader to understand the experiment without doing it themselves. These reports also give others the opportunity to check the methodology of the experiment to ensure the validity of the results.

A scientific report is written in several stages. We write the introduction, aim, and hypothesis before performing the experiment. We record the results during the experiment and complete the discussion and conclusion after the experiment.

Title:	Concise and specific description of the investigation.
Aim:	Brief statement to identify what is being tested.
Introduction:	Background information or theory related to the topic.
Hypothesis:	Testable statement about the relationship between the independent and dependent variables.
Apparatus:	Lists the equipment used and quantities needed.
Risk assessment:	• Identifies all hazards and suggests steps to mitigate the risks associated with each hazard. • Often included as a table.
Method:	• Provides a numbered list of steps that describe the procedure in a way that others can replicate. • Identifies independent, dependent and controlled variables. • Includes what type of data will be recorded, and where it will be recorded. • May include a scientific diagram.
Results:	• Presents data collected during the investigation. • Usually includes a table and graph.
Discussion:	• Re-states the aim and hypothesis to frame the discussion. • Includes calculations of results and errors. • Interprets results and compares them with expected results. • Discusses errors and limitations. • Includes scientific implications, and suggestions for future research.
Conclusion:	• Summarises the findings of the investigation and the significance of the results. • Includes a statement referring to the prediction or hypothesis.
References:	• Uses an accepted citation method.

Scientific Report Scaffold

Investigating into Conservation of Mass

Aim:

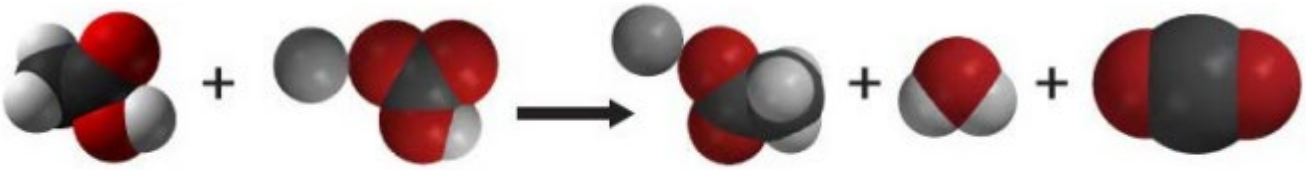
To determine how the mass of baking soda and vinegar reacting would differ if the gas produced was contained or if it were allowed to be released.

Introduction:

A chemical reaction is defined as a process in which one or more reactants, are converted to, one or more products (Treichel, 2006). A variety of factors can be used to identify when a chemical reaction has taken place, including change in temperature, formation of a gas, formation of a solid (precipitate), change in colour and emission of light (CK-12 Foundation, 2021). Whenever a physical change or chemical reaction happens, the mass of the chemicals before is the same as the mass of the chemicals after. This is called the Law of conservation of mass.

Conservation of mass is a law central to chemistry. The principle is that the mass of matter, in a closed system, will always be the same no matter what type of change happens to the matter. Even in a chemical reaction when atoms interact and create new products, mass is conserved. This is because the new substances created are composed of atoms that were present in the reactants. The atoms from the reactants come apart, rearrange and re-bond in a different arrangement to form the products (American Chemical Society, 2019). No new atoms have entered or left the system so the mass is conserved.

One example of a common chemical reaction is one between vinegar (acetic acid) and baking soda (sodium bicarbonate). Here is the chemical equation showing models of the molecules involved in the reaction.



If you count up the number of each type of atom on the left of the arrow (reactants), you'll see that there are an equal number on the right (products), just bonded in different arrangements. No new atoms are created during the reaction and no existing atoms disappear or are destroyed, so mass is conserved.

Hypotheses:

Read the aim and introduction to help you write your hypothesis.

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Apparatus:

Use the procedure to determine an accurate apparatus list. Don't forget to include sizes, quantities, and concentrations.

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Risk Assessment:

Use the apparatus list and method to help you write your risk assessment.

Items/Chemicals	Hazard	Control measures

Procedure:

1. Measure 100mL of vinegar (5% acetic acid) using a measuring cylinder.
2. Pour the measured 100mL of vinegar (5% acetic acid) into an empty 1.25L soft drink bottle.
3. Using the funnel, pour 1 level teaspoon (5mL) of baking soda (sodium bicarbonate) into the test tube.
4. Tie and tape some thin cotton thread around the test tube.
5. While holding the cotton thread, slowly slide the test tube into the bottle, being careful not to mix any of the baking soda and vinegar.
6. Suspend the test tube above the vinegar and tightly screw the lid back onto the bottle so that the thread is held firmly in the lid.
7. Place the soft drink bottle onto the electronic balance and record the total mass of the bottle and its contents before the chemical reaction.
8. Mix the vinegar and the baking soda by gently shaking the bottle.
9. Record any observations of the chemical reaction.
10. Place the soft drink bottle onto the electronic balance and record the total mass of the bottle and its contents after the chemical reaction.
11. Repeat steps 1-7 and immediately open the lid of the bottle after mixing.
12. Record any observations of the chemical reaction.
13. Place the soft drink bottle onto the electronic balance and record the total mass of the bottle and its contents after the chemical reaction.

Variables:

Read the aim, introduction and your hypothesis to help you identify the independent, dependent and controlled variables for this experiment.

Independent variable (the variable that is changed on purpose).

Dependent variable (the variable that is measured/observed to obtain results).

Controlled variables (The variables that are kept the same, so they do not influence the results. Include how the variable was kept the same).

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Method:

Re-write the above procedure into a method section below. Convert the method into passive voice and past tense in the space provided.

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Draw a scientific diagram of the equipment set up and include labels. Remember that scientific diagrams are drawn in 2D with a pencil and ruler. The labels should be neatly ruled, and the lines should not cross each other.

Results:

Construct a table to record your results. Don’t forget to include the correct units in the column headings.

Discussion:

Paragraph 1: describe what happened in the experiment. Outline what the results show, referring to the data in your response.*(How did the mass of the bottle before the reaction compare with the mass after the reaction? If a change in mass was recorded, give a valid explanation that will account of this change. If a change of mass was not recorded, give a valid explanation that will account for this.)*

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Paragraph 2: link your findings back to the law of conservation of mass. To do this you will have to re-read the introduction, and perhaps look up some more information. *(What law is obeyed in this lab? Explain the meaning of the law in your own words. When the solutions were mixed, did a chemical change occur? What was the evidence in the observations?)*

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Paragraph 3: assess the validity and reliability of this experiment. Identify potential sources of error and how they can be overcome if you repeated the experiment again.

Conclusion: write your conclusion below. The conclusion should summarise the findings from the experiment and link it back to the hypothesis being supported or refuted.

References:

When conducting a first-hand investigation, you should first do some research. It is important that all sources of information used to write your report are recorded in a reference list. The references used to write the introduction for this report are recorded in APA format below.

American Chemical Society (2019) *Grade 5 - Lesson 4.1 Conservation of Mass*. Retrieved February 25, 2025, from https://www.acs.org/content/dam/acsorg/education/k-8/inquiry-in-action/fifth-grade/g5-l4.1-bkgd.pdf

CK-12 Foundation. (2025). *Signs of Chemical Reactions*. Retrieved February 25, 2025, from https://www.ck12.org/chemistry/signs-of-chemical-reactions/lesson/Recognizing-Chemical-Reactions-MS-PS/

Treichel, P. M. (2025). *Chemical reaction*. Brittanica. Retrieved February 25, 2025, from https://www.britannica.com/science/chemical-reaction

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MARKING CRITERIA – Student Research Project

Outcome	Component	1 mark	2 marks	3 marks	4 marks
SC5-4WS	Hypothesis	Poorly worded hypothesis. May not have referred to the variables correctly.	A statement of prediction of the relationship between the variables.	The hypothesis is valid. It is testable, includes a prediction and is based on scientific theory.	
SC5-6WS	Variables	Correctly identifies one or 2 of the following: dependent, independent, or controlled variables.	Correctly identifies the dependent and independent variables. Controlled variables are listed. However, how they are kept constant may not be described or are not suitable.	Correctly identifies the dependent and independent variables. All controlled variables have been identified, and strategies to keep the controlled variables constant are valid.	
	Method	The method is missing information. Units and or quantities may be incorrect or absent. It may not be written in the third person or past tense.	Appropriate method. Well written, although some minor details may be missing. May jump between active and passive voice and or present and past tense.	Excellent method, written so that it could be repeated precisely by another person without prior knowledge of the experiment. Written in passive voice, past tense.	
	Results: Table	Data is poorly displayed or unorganised. Some components of the table are missing.	Data is displayed in an organised table which includes headings and units. Data is clearly recorded. Some minor details may be missing.	Data is displayed in a well-organised table which includes all headings and correct units. Data is accurately recorded.	
SC5- 17WS	Discussion: Description of results	Limited description of results. Ideas are not clearly expressed.	Basic description of results and an attempt has been made to explain results (possibly incorrectly).	Results are correctly described. Valid explanation of results has been provided.	Results have been clearly and correctly described. Clear and valid explanation of results is provided. In addition, the discussion demonstrates an understanding of the content of the investigation.

Outcome	Component	1 mark	2 marks	3 marks	4 marks
	Discussion: Analysis of results	Unclear attempt to link findings to law of conservation of mass. Limited description of evidence for a chemical change. Ideas are not clearly expressed.	Findings have been linked to law of conservation of mass (possibly incorrectly), and basic understanding of evidence for a chemical change.	Results are correctly interpreted and linked to law of conservation of mass. Clear understanding of evidence for a chemical change.	Results have been correctly interpreted and linked to law of conservation of mass. Clear understanding of evidence for a chemical change. In addition, results have been related to findings in research.
C5-6WS	Discussion: Sources of error and further research	One possible source of error has been identified. May have suggested improvements.	Some sources of error have been identified, and improvements have been suggested. However, they may be inadequate.	Some sources of error have been identified, and adequate improvements have been suggested.	Possible sources of error have been identified, and adequate improvements have been suggested to improve the accuracy, reliability and validity.
	Conclusion	The conclusion lacks detail. It states if the hypothesis is supported or refuted; however, limited reasons are given.	An acceptable conclusion is drawn which correctly states how the hypothesis has been supported or refuted.	Correctly identifies and explains how the evidence supports or refutes the hypothesis. Justifies inferences and conclusions.	
	References	Sources referenced are not reliable, and information may be missing.	Some sources are referenced but may have information missing.	Several relevant sources are referenced in the correct format.	

COMMENT: _____

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TOTAL MARK:

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