BENCHMARK

VCE Chemistry Assessments

**Student name** _____

# 2027 VCE Chemistry

## Task Book

### Open SAC 4.3: Student-designed investigation

- Unit 4, Outcome 3: **40 marks**
- Class time is **at least 10 hours**

**What you submit**

- A scientific poster of no more than 600 words
- Your logbook, with every entry dated

**How it is assessed**

- Ten line items, set out in the marking scheme
- The poster and the logbook are assessed together

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# The task

You will design and carry out your own scientific investigation, then present it as a scientific poster. The investigation must generate primary quantitative data that you collect yourself in the laboratory. It must relate to the production of energy, the production of chemicals, or the analysis or synthesis of organic compounds, and it should be inspired by a contemporary chemical challenge, such as using less energy or making a product more efficiently.

You will develop a question, state an aim and a hypothesis, and plan a method that complies with safety and ethical guidelines. After generating your data, you will analyse and evaluate it, identify limitations, link your results to chemical ideas, discuss their implications and draw a conclusion that answers your question.

## Working with others

You may generate data with a partner if your teacher approves it. Your logbook, analysis and poster must be entirely your own, and your logbook records who generated each set of data.

## Checkpoints

Your teacher initials each checkpoint in the table below when you have shown the work described. Practical work starts only after Checkpoint 1 is signed.

| Checkpoint | Class time | What you show your teacher | Initials |
|---|---|---|---|
| 1. Proposal | 1 hour | Your proposal, written in your logbook (see below) | |
| 2. Trial run | 1 hour | A trial of the method, with the changes it showed were needed, recorded in your logbook | |
| 3. Data generation | 3 hours | Raw data recorded in your logbook in every session, with the date and units | |
| 4. Analysis | 2 hours | Processed data, a table and a graph, with any outliers identified and their treatment explained | |
| 5. Poster | 2 hours | A draft poster with every section present, written in class | |
| 6. Submission | 1 hour | Final poster and logbook | |

The total is 10 hours of class time. Your teacher will give you the dates for each checkpoint.

## Your proposal

Write your proposal in your logbook for Checkpoint 1. It contains:

- the investigation question, the aim and a hypothesis with its chemical reason
- the independent variable and the values you will use, and the dependent variable and how you will measure it
- the controlled variables and how you will keep each one constant
- the equipment and chemicals, with quantities and concentrations, and a method outline
- a risk assessment: the hazard, the risk and the control for each chemical and procedure.

# Poster requirements

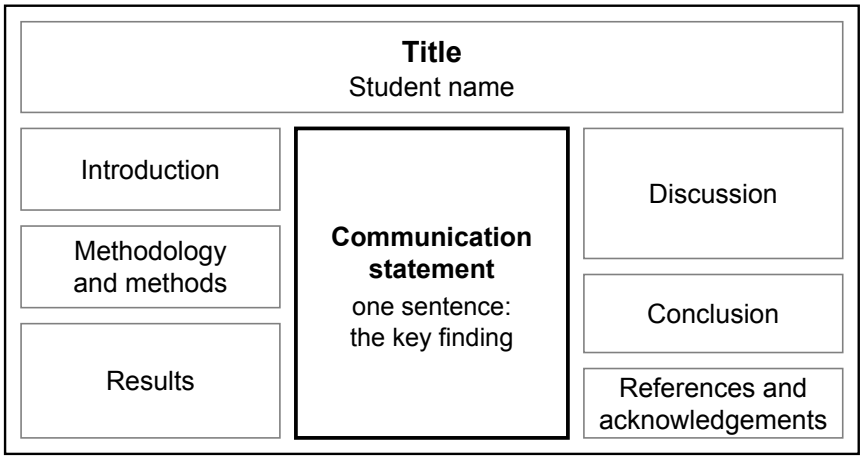
Your poster communicates your investigation to both technical and non-technical audiences. It may be electronic or printed, on any size of paper or number of panels. Conciseness, clarity and legibility come first.

## Word limit

- Your poster must not exceed **600 words**.
- Text in tables, graphs, image captions, references and acknowledgements is not counted.
- Write your word count in the bottom right corner of the poster.

## Layout

Arrange your poster as shown below. The communication statement sits in the centre and takes up 20 to 25% of the poster space.




## Sections

| Section | What it contains |
|---|---|
| Title | The question under investigation |
| Introduction | Why you undertook the investigation, a clear aim, a hypothesis or prediction, and the relevant chemical concepts |
| Methodology and methods | A brief outline of the methodology you selected, and a summary of how you generated and analysed the data |
| Results | Your data in the formats that best show trends, patterns or relationships |
| Communication statement | One sentence that reports the key finding and answers the question |
| Discussion | Interpretation and evaluation of your data; limitations of the data and methods, with improvements; links to chemical concepts; whether the data support your hypothesis |
| Conclusion | A response to the question, and the extent to which your analysis answers it, with no new information |
| References and acknowledgements | Every quotation and sourced item, and the help you received |

## Logbook requirements

Your logbook authenticates your work: it shows that the data in your poster are yours and were generated as you describe. It may be printed or electronic. Your teacher sights and initials it during every practical session.

- Date every entry, and never remove a page or delete an entry. Cross out a mistake with one line so it can still be read.
- Record your planning: the question, aim, hypothesis, variables, method and risk assessment, and every later change to the method with the reason for it.
- Record raw data at the time you measure it, in tables with headings and units, and note the instrument and its resolution.
- Record observations, including anything unexpected.
- Record your preliminary analysis: means, calculations and graphs, and any outliers, with how you treated them and why.
- Record the sources you read and the help you received.

### Safety

- Complete a risk assessment for every chemical and procedure, using the safety data sheets, and have it approved before you start.
- Wear safety glasses and a lab coat throughout, and nitrile gloves wherever your risk assessment requires them.
- No open flames. Heat with a hot plate or a water bath.
- Use only the chemicals and concentrations in your approved risk assessment, and dispose of waste as your teacher directs.
- Stop and tell your teacher if anything happens that your risk assessment did not plan for.

### Ethics

- Record every result, including results that do not fit the trend. Treat outliers openly and explain the treatment.
- Never change, invent or copy data. Data in your poster must match your logbook.
- Acknowledge every source, and anyone who helped you, including a partner who generated data with you.
- Choose an investigation that does not harm people, animals or the environment, and use the smallest quantities that give reliable data.

# Marking scheme

Your teacher marks the poster and the logbook together, choosing one level for each line item: VH, H, M, L or NA, worth 4, 3, 2, 1 or 0 marks. The ten line items total 40 marks.

| Line item | VH (4) | H (3) | M (2) | L (1) | NA (0) |
|---|---|---|---|---|---|
| **Title and investigation question** | Names the independent and dependent variables and the values studied; the data can answer it. | Names both variables; the data can answer it. | Names one variable clearly, or is too broad for the data to answer. | A topic or an aim, not a question. | No title or question. |
| **Introduction** | Clear aim; hypothesis gives a direction and a correct chemical reason; relevant concepts explained and linked to a contemporary challenge. | Clear aim; hypothesis gives a direction and a reason; most relevant concepts explained. | Aim given; hypothesis lacks a reason or a direction; concepts listed, not explained. | Aim or hypothesis unclear or untestable; little relevant chemistry. | No introduction. |
| **Methodology and variables** | Methodology named and justified; all relevant controlled variables, with how each is kept constant; at least five values, three trials each. | Methodology suits the question; variables identified, most controls explained; at least five values with repeats. | Controls not explained, or fewer than five values, or no repeats. | Method summarised without variables, or the design cannot answer the question. | No methodology. |
| **Logbook** | Every session dated and initialled; specific approved risk assessment; raw data with units and resolution; every change and outlier explained. | Sessions dated; approved risk assessment; raw data with units; most changes and outliers explained. | Some entries undated; generic risk assessment; outliers removed without a reason. | Few entries; raw data missing or written up later. | No logbook. |
| **Results** | All processing correct, with suitable significant figures; table with headings and units; suitable graph, titled, units on axes, line of best fit within the data. | Processing correct; table and suitable graph with minor faults in titles, units or precision. | Errors in processing, an unsuitable graph type, or missing units. | Raw data only, with no processing or graph. | No results. |
| **Discussion: analysis** | Trend described with specific values and fully explained with correct chemistry, linked to the introduction. | Trend described with data and explained with mostly correct chemistry. | Trend described without data, or the explanation is incomplete. | Results restated with no explanation. | No analysis. |
| **Discussion: evaluation** | Accuracy judged against a theoretical value; precision from the repeats; main errors classed as random or systematic, with effects and specific improvements. | Accuracy and precision distinguished and judged; main errors with their effects; improvements given. | Errors named without effects; general improvements; accuracy and precision confused. | Only “human error” or “equipment error”, with no effect stated. | No evaluation. |

| Line item | VH (4) | H (3) | M (2) | L (1) | NA (0) |
|---|---|---|---|---|---|
| **Discussion: limitations and hypothesis** | Limitations of the data and method, and assumptions, with their effect on the conclusion; hypothesis judged against specific evidence. | Main limitations identified; hypothesis judged against the evidence. | Limitations listed without effects; hypothesis judged without evidence. | Hypothesis mentioned with no judgement. | Not addressed. |
| **Communication statement and conclusion** | One central sentence giving the key finding and answering the question; conclusion states how far the question is answered, with nothing new. | Statement gives the key finding; conclusion answers the question. | Statement restates the aim or is more than one sentence; conclusion partly answers the question. | Statement or conclusion unrelated to the data. | Neither present. |
| **Science communication** | All sections in order, within 600 words, count shown; correct terms, formulas, state symbols and units; sources in one style; help acknowledged. | Within 600 words; minor notation errors; sources referenced. | Over 600 words, several notation errors, or inconsistent referencing. | Sections missing; frequent errors; sources not referenced. | No poster. |
| **Total** | | | | | **/40** |

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