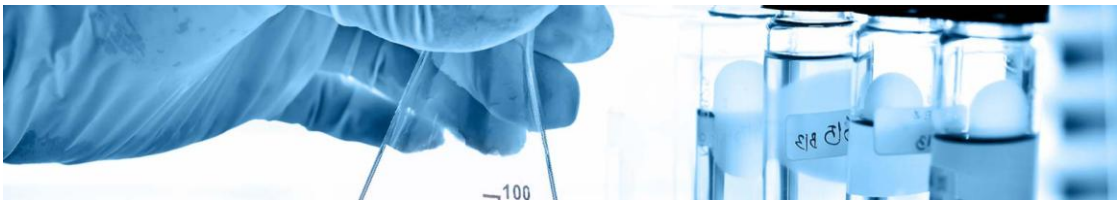

Investigation (Poster SAC)

Year 12 VCE Logbook

Name _____ Partner's name _____

This log book is to be kept in the chemistry classroom at all times.

All data taken must be recorded and dated in this log book. This book is divided into lined, graph and clear pages for students to record in tables, drawings or by graphs. Each page should be dated with first-hand data clearly and neatly shown so that others can read and evaluate the data. All observations expected and unexpected should be carefully documented.

On the last pages is a section on what should be included under different headings that the report must address. A glossary of terms is also provided as per VCAA (accessed 28/05/2026). Students are encouraged to be familiar with terms such as validity, accuracy, precision and use them appropriately in their discussion and conclusion.

Marking guide.

Name:	**Comments**	
Explanation or reason for undertaking the investigation, including a clear aim, a hypothesis and/or prediction and relevant background chemical concepts in log book.		
Question	Yes/no	
Aim	Yes/no	
Independent variable	Yes/no	
Dependent variable	Yes/no	
Controlled variables	Yes/no	
a hypothesis	Yes/no	
relevant background chemical concepts 150 words max.	Yes/no	
Overall score/5		
Brief outline of the selected methodology used to address the investigation question. ***Quantities of reagents/materials must be included***		
Equipment required including quantities	Yes/no	
Numbered steps	Yes/no	
Repetition used	Yes/no	
Method is easy to follow and unambiguous	Yes/no	
Says how to measure dependent variable.	Yes/no	
Overall score/5		
Results		
Appropriate Graphs and tables used	Yes/no	
Overall score / 2		
Discussion / 18		
Conclusion / 3		
Poster submission		
Appropriate references and acknowledgements	Yes/no	
Poster size matches the criteria	Yes/no	
Poster submitted on time	Yes/no	
Overall score / 3		
Final score / 36		

VCE Investigation Log Book - What to include under Eeach heading

1. Title

   Clearly state the independent variable and dependent variable.

2. Aim

   Write a clear statement explaining what the investigation intends to find out, whilst mentioning the relationship you are investigating between the independent and dependent variables.

3. Hypothesis

   Predict the expected outcome based on prior knowledge and reasoning. Use the If …….. then……..because……. approach.

4. Method

   (always keep in mind this is a precise set of instructions to allow others to replicate the investigation exactly.)

   i. Write a numbered logical and sequential step-by-step procedure.

   ii. Specify how the independent variable will be changed and how the dependent variable will be measured.

   iii. Describe how controlled variables will be kept constant to ensure a fair test.

   iv. Include details on the number of repeats or trials, emphasizing that controlled variables must remain the same in all repeats to ensure consistency and reliability.

5. Materials

   • List all tools, chemicals, equipment, and safety gear needed.

   Be specific eg. 2 X 200mL beaker, 1 X electronic balance +/- 0.001

   • Include quantities or amounts where applicable.

6. Safety

   • Identify hazards associated with the materials or procedures.

   • List safety precautions necessary to prevent accidents or injuries.

   • Specify required protective equipment such as gloves, goggles, or aprons.

   • Mention emergency guidelines briefly.

7. Risk Assessment

   • Identify each potential risk that may occur during the investigation.

   • Assess the severity and likelihood of each risk.

   • Describe control measures to minimize these risks, asp er table below.

   • Consider waste management or environmental safety where relevant.

Hazard identified	How to mitigate the risk	Action taken if risk occurs.

8. Data Collection / Observations

    • Record all raw data clearly and systematically.

    • Use properly formatted tables to organize data with clear labels and units.

    • Note any unexpected observations or occurrences during the experiment.

9. Results

    • Present processed data through averages, calculations, or graphs.

    • Ensure all graphs are properly formatted with clearly labeled titles, axes, and units.

    • Choose graph types that best represent the data.

    • Highlight patterns or trends in the results by using lines-lines-of-best-fit.

10. Discussion / Analysis

    • Explain what the data shows about the relationship between the variables.

    • State whether the hypothesis was supported or contradicted by the results.

    • Discuss any anomalies or sources of error.

    • Explain why the results occurred using scientific principles.

    • Suggest specific improvements to increase accuracy or increase validity by control variables.

    • Suggest future studies that can add value to the investigation.

11. Conclusion

    • Summarize the main findings in relation to the aim.

    • Clearly state whether the hypothesis was accepted or rejected.

    • Comment on the significance or implications of the results.

Terms used in this study as per VCAA study design (accessed 2026)

When analysing and discussing investigations of a quantitative nature, the following terms require consideration:

- **True value:** The value that would be found if the quantity could be measured perfectly.
- **Accuracy:** A measurement value is considered to be accurate if it is judged to be close to the true value of the quantity being measured. Accuracy is a qualitative term; a measurement value or measurement result may be described, for example, as being 'less accurate' or 'more accurate' when compared with a true value.
- **Precision**: A measure of the repeatability or reproducibility of scientific measurements and refers to how close two or more measurements are to each other. A set of precise measurements will have values very close to the mean value of the measurements. Precision gives no indication of how close the measurements are to the true value and is therefore a separate consideration to accuracy.
- **Measurement result**: Refers to a final result, usually the average of several measurement values. In the (unusual) case where only one value has been measured, then measurement result also applies to that single measurement value.
- **Repeatability:** The closeness of the agreement between the results of successive measurements of the same quantity being measured, carried out under the same conditions of measurement. These conditions include the same observer, the same measurement procedure, the same measuring instrument used under the same conditions, the same location, and replicate measurements on the same or similar objects over a short period of time. Experiments that use subjective human judgement(s) or that involve small sample sizes may yield results that may not be repeatable. Repeatability can be used to evaluate the quality of data in terms of the precision of measurement results. Ideally, measurements should be repeated where possible to produce a measurement result.
- **Reproducibility:** The closeness of the agreement between the results of measurements of the same quantity being measured, carried out under changed conditions of measurement. These changed conditions, involving replicate measurements on the same or similar objects, include a different observer, different method of measurement, different measuring instrument, different location, different conditions of use and different time. The purposes of reproducing experiments include checking of claimed precision and uncovering of any systematic errors that may affect accuracy from one or other experiments/groups. Experiments that use subjective human judgement(s) or that involve small sample sizes or insufficient measurements may also yield results that may not be reproducible. Reproducibility links closely to the accuracy of an experiment. Reproducibility can also be used to evaluate the quality of data in terms of the precision of measurement results.
- **Resolution:** The smallest change in the quantity being measured that causes a perceptible change in the value indicated on the measuring instrument. This has implications for determining the number of decimal places to which a quantity may be quoted. For example, if the measurement scale on a 50 mL burette is at 0.1 mL intervals, the resolution of the burette is said to be 0.1 mL. In a titration, the user must estimate the volume between the two marked intervals on the burette so that the value reported will be to two decimal places. For example, measurement readings of 10.50 mL or 10.55 mL are possible, but a measurement reading of 10.53 mL cannot be claimed. The meniscus of the liquid will either be on the burette line marking, in which case the reading would be 10.50, or it will lie between 10.50 and 10.60, in which case it is measured as 10.55 mL.
- **Validity:** A valid experiment investigates what it sets out and/or claims to investigate. Both experimental design and the implementation should be considered when evaluating validity. An experiment and its associated data may not be valid, for example, if the investigation is flawed and controlled variables have been allowed to change. Data may not be valid, for example, if there is observer bias.

Measurement errors, uncertainty, significant figures and outliers

Measurements of quantities are made with the aim of finding the true value of that quantity. In reality, it is impossible to obtain the true value of any quantity since there will always be variations and errors.

For the purposes of this study, the term **'measurement error'** is used to describe the difference between a measurement result and the true value.

- **Random errors**: Affect the precision of a measurement and may be present in all measurements. Random errors are unpredictable variations in the measurement process and result in a spread of readings.
- **Systematic errors**: Cause readings to differ from the true value in a systematic manner so that when a particular value is measured repeatedly, the error is the same. Systematic errors result from limitations in the instrument itself or incorrect calibration, or inappropriate methods (including parallax).
- **Repeated measurements**: Are made to reduce the effect of random errors (and reduce the likelihood of mistakes).
- **Mistakes**: Sometimes called personal errors. Mistakes should not be included in reporting and analysis as part of the ethical consideration of data handling. Rather, the experiment should be repeated correctly.
- **Uncertainty**: The uncertainty of the result of a measurement reflects the lack of exact knowledge of the value of the quantity being measured. VCE Chemistry requires only a qualitative treatment of uncertainty.
- **Significant figures**: Should be considered in all calculations. The following guidelines apply to VCE Chemistry:
  - all digits in numbers expressed in standard form are significant: for example, 4.320×10^{-6} has four significant figures
  - all non-zero numbers are significant: for example, 42.3 has three significant figures
  - zeros between two non-zero numbers are significant: for example, 4.302 has four significant figures
  - leading zeros are not significant: for example, 0.0043 has two significant figures
  - trailing zeros to the right of a decimal point are significant: for example, 42.00 has four significant figures
  - for numbers less than one, 0.4 has one significant figure and 0.04 also has one significant figure, whereas 0.40 has two significant figures and 0.400 has three significant figures
  - whole numbers written without a decimal point will have the same number of significant figures as the number of digits, with the assumption that the decimal point occurs at the end of the number: for example, 400 has three significant figures. Therefore, a stated volume of '400 mL' will be considered as having three significant figures.
- **Outliers**: Data points or observations that differ significantly from other data points or observations are sometimes called outliers. Outliers in data must be further analysed and accounted for, rather than being automatically dismissed, as an ethical approach to dealing with data. Repeating readings may be useful in further examining an outlier: for example, to determine whether the outlier is a personal mistake.
- **Data evaluation**: When evaluating personally sourced or provided data, students should be able to identify contradictory, provisional and incomplete data including possible sources of personal bias.