# Section 4.3.4 – The Scientific Poster

## The Scientific Poster

The scientific poster should be a **summary of the investigation**, just the bones and the highlights. It is not a full report, the **logbook provides the details** and gives flesh to the bones.

The poster should have the following sections:

- ***Title:*** The poster title should be written as a question that briefly conveys the interesting issue, the general experimental approach, and the system (for example, a chemical, a model or an experimental set-up).

- ***Abstract:*** Inclusion of an abstract on a poster is optional.

- ***Introduction***: A one or two sentence overview of the purpose of the investigation and why the research question is of interest should be provided. The investigation should be placed in the context of appropriate background theory (including relevant secondary sources of reliable information) and prior investigations and linked to a hypothesis (before a brief description of the experimental approach that tested a hypothesis or research question is provided). Sufficient background information, definitions and relevant formulas should be used to enable a peer to understand the nature of the investigation. Unlike a manuscript, the poster's introduction is an appropriate place to put a photograph or illustration that communicates some aspect of the research question.

- ***Methodology:*** The investigation type, apparatus, materials and procedure should be described briefly although well enough to allow others to replicate it exactly. The detail used for a formal practical report is not required; for example, figures and flow charts can be used to illustrate experimental design, a photograph or labelled drawing of a system or setup may be included, and the method that was used could be summarised as a flow chart. This section should clarify why the student performed the investigation in the way that was chosen.

- ***Results:*** In this section, the student should select relevant raw (i.e. uninterpreted) data generated from the investigation and recorded in the student's logbook. The student should consider the most appropriate form in which to present the data, for example table form, as an easy-to-read figure or as percentages/ratios. It is not an effective use of poster space to present both a table of results and a graph since they both represent the same information. The following points should be checked in constructing the poster:
  - ensure that graphics are clear, easily read, titled and fully labelled
  - clearly present data trends and/or relationships
  - sequentially number all tables, graphs and diagrams
  - use a sentence or two to draw attention to key points in the tables, graph and diagrams
  - only provide a sample calculation for repeat calculations.

Although this section is usually dominated by calculations, tables and figures, all significant results should be stated explicitly in prose form, including a statement about whether the investigation generated useful results and whether the hypothesis was supported.

- ***Discussion:*** This section examines whether the data obtained supports the hypothesis, explores the implications of the findings and judges the potential limitations of the experimental design. It focuses on a question of understanding 'What is the meaning and/or the significance of my investigation results?' This involves analysis in explaining what the results clearly indicate, what has been found and what is known with certainty based on results in order to draw conclusions as well as interpretation in explaining the significance of results, identifying ambiguities and further questions that arise, and finding logical explanations for problems in the data.

In this section, the student should:

- Show clearly whether the data supports, partly supports or refutes the hypothesis by stating the relationships or correlations the data indicate between independent and dependent variables. The relationship between the evidence and the conclusions drawn from the evidence should be made explicit. The terms 'proved', 'disproved', 'correct' or 'incorrect' in relation to the hypothesis should be avoided since this level of certainty may be unlikely in a single investigation; terms such as 'supported', 'indicated' and 'suggested' are more appropriate to evaluate the hypothesis.

- Compare expected results with those obtained, analyse experimental design and errors and acknowledge any anomalous data or deviations from what was predicted. Ignoring data that contradicts claims or predictions is a departure from scientific method. Such data should be examined carefully and, where possible, the procedure should be repeated to obtain further data. If replication is not possible then flaws in the procedure or investigation design should be identified and the student should discuss how and why the procedure or investigation design may have affected the data, and how the procedure or investigation design could be changed to eliminate – or minimise the effects of – the identified flaws. If an experiment was within the tolerances, the student could still account for the difference from the ideal.

- Derive conclusions based on findings about the research question and link conclusions to the aim of the investigation.

- Relate findings to earlier work undertaken in the area under investigation. The investigation will be an extension of previous theoretical understandings and investigations undertaken and these should be discussed in relation to the student's own data. If the investigation relates to a specific theory consideration of how well the theory has been illustrated may be included.

Writing this section generally involves moving from the specific (directly related to the experiment) to the general (how the findings relate to wider understanding of scientific concepts).

- ***Conclusions:*** The conclusion should state the main investigation result and whether the hypothesis was supported. This should be justified using specific details selected from the investigation findings. The significance of the results should be discussed in terms of how they link to relevant chemical concepts and current scientific understanding, who may find the results of interest and what relevance they have in everyday applications. The conclusion is also where the limitations of the investigation design and suggested improvements could be summarised, possible future work that could be done to refine or extend conclusions could be identified and/or the implications of conclusions could be explained.

- ***References and acknowledgments:*** Listed references should be referred to in the body of the poster. Any standard referencing format may be followed, for example, Harvard or APA. Individuals should be thanked for specific contributions (for example, access to specialist equipment use, statistical advice, laboratory assistance) and the organisation for which they work and their position should be included. References and acknowledgments are not included in the poster word count.

**NB:** The poster can be done as an **electronic poster using a template** containing the categories listed above, with text entered or pasted into boxes. A range of sample poster formats, templates and online poster resources are available via www.juddy.com.au

Sample templates have been included on the following page. However, there are numerous free powerpoint samples available online:

https://www.posterpresentations.com/html/free_poster_templates.html
https://www.genigraphics.com/templates
https://www.makesigns.com/SciPosters_Templates.aspx

## Suggestions for effective scientific poster communication

Scientific posters are widely used in academia, research and in the general scientific community as a visual means of communicating the outcomes of scientific investigations. Key design principles for effective scientific poster communication include:

- Logical sequencing and easy identification on the poster of the hypothesis or question, aim and conclusion and other key parts of the investigation.
- Inclusion of only the essential details for conveying what was done in the investigation and what was discovered (for example, only the key aspects of an experimental procedure should be outlined).
- Use of a range of visual aids (for example, tables, photographs, diagrams and graphs) to reduce the amount of text required and to avoid overcrowding of the poster.
- Use of font, font size and colours that will be easily read by all those viewing the poster.
- Careful editing of text – terminology and spelling should be checked; wording should be simplified; acronyms should be defined; and complexity should be reduced (for example, phrases or bullet points, rather than sentences, should be used). A test is that others with little or no background in the area under investigation should be able to understand the language and identify the key points of the investigation.
- Clear labelling of all images (for example, diagrams or photographs of the experimental set-up or results).
- Graphs drawn with clear, relevant scales, grids, labels and annotations.
- Editing of graphs derived directly from spreadsheet programs so that graphs do not have coloured backgrounds, grid lines, or boxes and that, in cases where multiple graphs are shown on the same set of axes, each graph is labelled rather than requiring a reader to use a key.
- Axis labels formatted in sentence case (Not in Title Case and NOT IN ALL CAPS).
- Calculations presented in a clear, non-repetitive manner (for example, one sample calculation can be shown and then the results of similar calculations can be displayed in a table) and appropriate units must be shown.
- All references stated and appropriate acknowledgments provided.
- Creation, printing and checking of a mock-up poster prior to submission of a final poster for assessment.

## Poster Templates

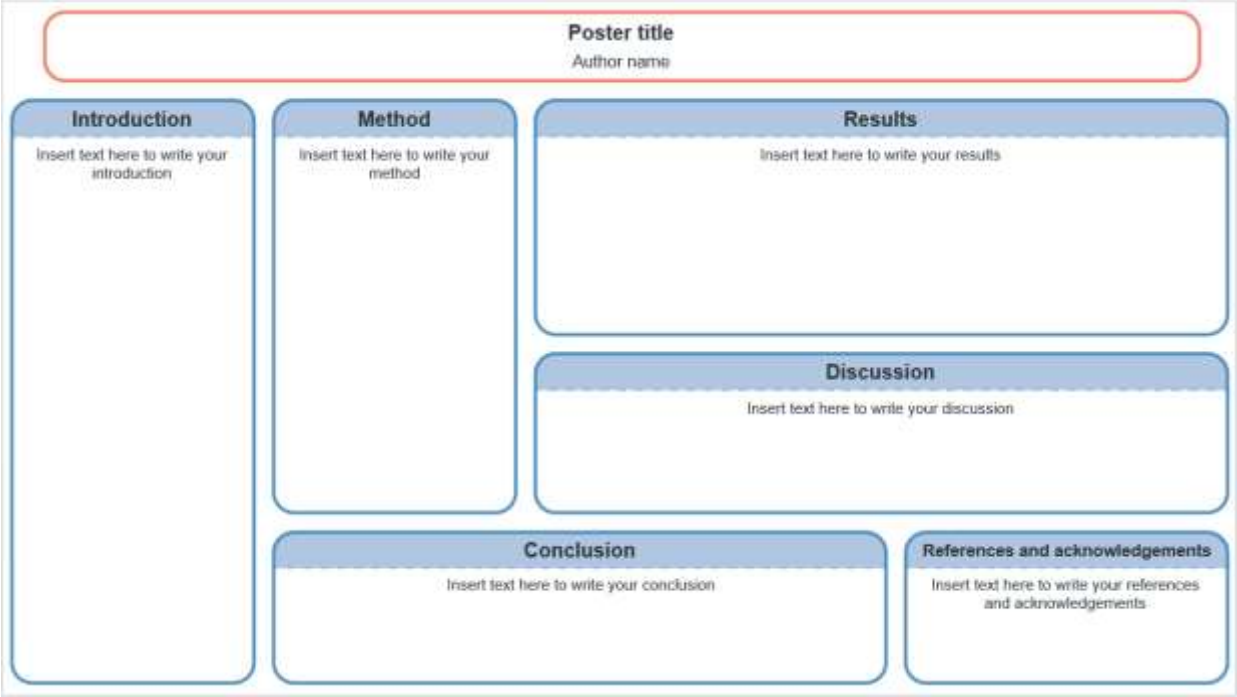


***Figure 1*** *– Sample template 1*

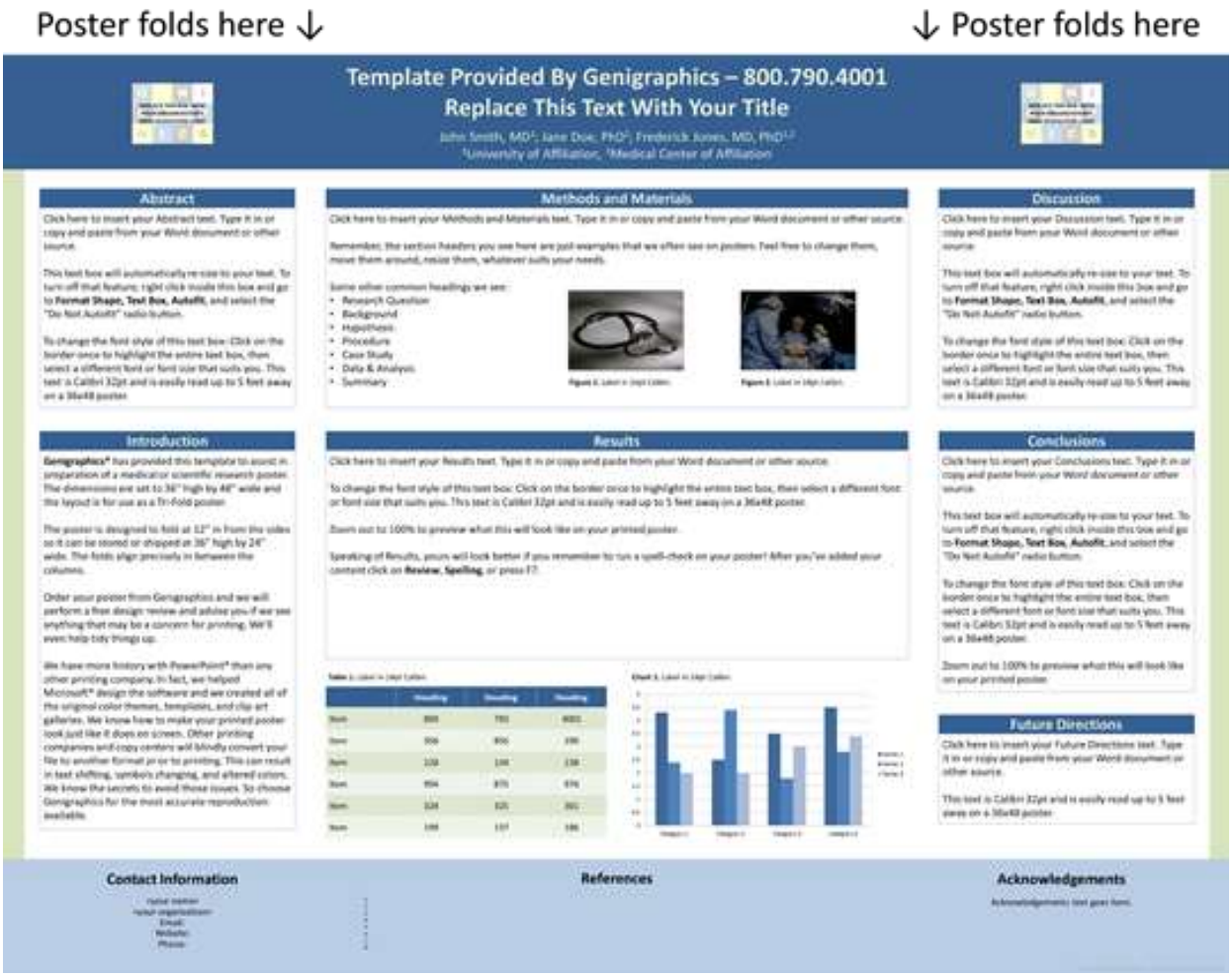


***Figure 2*** *– Sample template 2*

# PRACTICAL INVESTIGATION ASSESSMENT RUBRIC

| | |
|---|---|
| Stage 1 | /15 |
| Stage 2 | /8 |
| Stage 3 | /12 |
| **TOTAL** | **/35** |

## Stage 1 – Planning

| Section | Sub-Section | 0 marks | 1 mark | 2 marks |
|---|---|---|---|---|
| Title/Question | Question under investigation | Not shown | The title is a relevant research question relating to the Units 3 & 4 Physics Areas of Study. | |
| | | | | |
| Introduction | Aim | Not shown | A general aim or purpose of the investigation is stated. | The aim of the investigation, including the variables under consideration, is clearly stated. |
| | Hypothesis | Not shown | A formulation of an appropriate hypothesis and/or prediction. | Independent formulation and justification of an appropriate hypothesis and/or prediction. |
| | Background Physics | Not shown | Some identification and discussion of relevant background concepts. | Accurate identification and explanation of the main relevant background concepts. |
| | Classification of Variables | Not shown | Some variables are defined. | The independent, dependent and controlled variables are all clearly defined. Each variable can be classified as qualitative or quantitative |
| | | | | |
| Methodology | Planned Method | Not shown | Conducts investigations mostly under direction, generally using appropriate equipment and materials and demonstrating a systematic approach. Step-by-step instructions are outlined. | Independently designs and conducts investigations selecting appropriate equipment and materials, demonstrating a systematic and comprehensive approach. Concise step-by-step instructions are outlined in the logbook. |
| | Validity | Not shown | The method is valid –only one independent variable is changed at a time. | The method is valid. Only one independent variable is changed and how to measure the dependent variable is outlined. How to maintain control variables has been outlined. Two continuous independent variables have been examined. |
| | Repeatability & Reliability | Not shown | The method chosen provides sufficient detail to provide both repeatability and reliability. | |
| | Safety & Ethics | Not shown | Some relevant hazards are listed and/or appropriate safety measures have been stated | |

**TOTAL STAGE 1: / 15**

## Stage 2 – Conducting Investigations

| Section | Sub-Section | 0 marks | 1 mark | 2 marks |
|---|---|---|---|---|
| Conducting Investigations | Laboratory Skills | Not shown | Demonstrated application of given safe and ethical work practices in undertaking and reporting investigations. | Demonstrated independent and responsible application of safe and ethical work practices in undertaking and reporting investigations. |
| | Data Collection | Not shown | Generation and collection of data that is mostly relevant to the question under investigation. | Systematic generation and collection of sufficient and repeated data that is relevant to the question under investigation. |
| Results | Raw results table | Not shown | Results table is correctly formatted, with SI units and a title. Repeated measurements are clearly identifiable and averaged. | Results table is correctly formatted, with units and a title. Repeated measurements are clearly identifiable and averaged. Correct application of significant figures and uncertainties has been included |
| | Graphing Results | Not shown | Results have been graphed. A minimum of 2 graphs have been constructed. Axes labelled appropriately and SI units used. | Results have been graphed. A minimum of 2 graphs have been constructed. Where possible a relationship between variables has been investigated and stated. Axes labelled appropriately and SI units used. Outliers have been identified. |

**TOTAL STAGE 2: / 8**

## Stage 3 – Analysing & Communicating

| Section | Sub-Section | 0 marks | 1 mark | 2 marks |
|---|---|---|---|---|
| Discussion | Analysis & Evaluation of Primary Data | Not shown | Investigation results have been presented in an appropriate format to illustrate relevant trends. Data is referred to and/or evaluated. | Highly proficient presentation of investigation results in an appropriate format to illustrate relevant trends, patterns and relationships. From graphs, a title, axis labels, outliers and line of best fit have been considered. Primary data is specifically referred to and specifically analysed and evaluated. The significance of the primary data is clearly, concisely and coherently articulated |
| | Links to Relevant Physics Concepts | Not shown | The results of the investigation have been summarised and discussed in the context with a relevant Physics concept | A sophisticated analysis and evaluation of the links between investigation findings and relevant Physics concepts is evident. |
| | Outliers | Not shown | Any outliers are identified and subsequent treatment of outliers is discussed clearly, concisely and coherently | |
| | Limitations & Improvements | Not shown | At least one limitation in data collection and at least one suggested improvement in data collection is discussed. | At least one limitation in data and methodology is discussed. Sources of error are outlined. At least one relevant suggested improvement in data collection is discussed clearly, concisely and coherently. |
| | | | | |
| Conclusion | Response to the Aim | Not shown | Conclusion relates to the purpose of the investigation but is too general, too restrictive and/or does not take sufficient account of the uncertainties. | Conclusion can be reasonably inferred from the data and the relationships obtained, takes into account uncertainties, explains differences between expected and actual results and offers reasonable suggestions for improving and/or extending the investigation. |
| | | | | |
| References & Acknowledgements | Referencing of Quotations and Source | Not shown | A list of relevant references is provided, written in APA referencing style. | |
| | | | | |
| Poster | Presentation | Not shown | Summarised information inserted under appropriate headings. Scientific conventions have been followed, including symbols and units. | Summarised information inserted under appropriate headings. Word count does not exceed 1000. Scientific language has been used contextually. Poster is eye-catching and all diagrams are labelled. |

**TOTAL STAGE 3: /12**