Chemistry 4MX Project Report Guidelines

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Planning: As the final months of the placement approach, students should discuss the form, structure and content of the final report with their placement supervisor. It is important to complete a draft copy of the report at least 3 weeks before the end of the placement in order to receive feedback from the placement supervisor. Students are therefore advised to begin the process early and devise a schedule compatible with their supervisor’s availability.

Content: The main aims of your report are to inform a chemist who has no special knowledge of your work about your area of research and to demonstrate your skill in writing and presenting a clear account of a piece of research. The report should reflect a substantial amount of the work carried out during the year, although it need not refer to all of the work undertaken. The aim is to produce a coherent self-contained research report. The report should not be a collection of unrelated mini-projects or a diary of activities. It may be appropriate to focus entirely on the most substantial of several projects undertaken or to tie together a number of small projects under a common theme. In all cases the report should refer to primary research literature in the field and be discussed in the context of current front-line research. Final reports vary in length, but are typically 50-60 pages including all figures and literature references. It should be of publication quality, but there are no restrictions on the formatting style of the report. Use of standard company report templates is perfectly acceptable.

Submission: Since there is no requirement for an industrial placement project report to leave the company’s premises, the report may include confidential material, in which case the academic supervisor will read it on site during the final assessment visit to be arranged towards the end of the placement. However, if the report is not confidential it speeds the marking process if it is sent to the academic supervisor as soon as it is completed and at least 1 week before the assessment visit. Year Abroad reports should be submitted in PDF format via Turnitin before the end of the placement.

Structure: There are many different ways to format a research report and these are reflected in the various styles of different scientific journals. The structure of a student’s report may be influenced by the field of research or company policy. A general guide is given below and these elements should all be incorporated.

Title page This should give your name, project title, supervisor, class and date.

Abstract (i.e. summary) This should describe clearly and concisely the main objectives and results of the work and give the reader a clear idea of what has been achieved (usually less than 1 page of text). The abstract should be independent of the main text – consider that it may be read independently of the report by an unfamiliar chemist. It is often a good idea to structure an abstract like the main report. Write a couple of sentences of introduction to put the work in context. Indicate why this area of research is important. Describe the aims of the project and the strategy that was employed. Next describe the main results of the work, give key data if possible and indicate the extent of your work and the techniques employed. Finally write a concluding section which may explain the significance of your results, how they impact the research community and the future prospects.

Table of Contents This should list, by page number, the various components of the report.

Introduction What did you set out to do, and why? Describe the background to the problem, summarising previous work and explaining the motivation for your study. Your report should begin with an introductory chapter in which relevant (current) literature is discussed in the context of the project. This should lead in to a section in which the aims of the project are described. Before the significance of the work can be assessed, it is vital to know why it was performed and why the problem under investigation is important. The introduction section should not consist of an in-depth description of the activities of the host company.

Methods Descriptions of experimental work should be given in sufficient detail to enable experienced experimental workers to repeat them (e.g. the degree of purity of materials and the relevant quantities used should be given). Lengthy descriptions of established methods are unnecessary. Apparatus should be described only if it is non-standard; commercially available instruments are referred to by their stock numbers e.g. Unicam Solaar 929, Perkin-Elmer 457 or Bruker WP 300 spectrometers. The accuracy and precision of primary measurements should be stated and errors on all calculated quantities must be reported. Unexpected hazards encountered during the experimental work should be noted. Overall, the description of experimental work, the recording of spectroscopic data and the nomenclature of compounds must follow the style of an appropriate scientific journal.

Results and Discussion In some cases Results and Discussion sections can be separated easily, in others it is more appropriate to combine them. It may also be appropriate to structure these sections according to specific activities. The structure should be discussed with your placement supervisor. A results section should include a basic explanation and interpretation of the data within a dialogue explaining why each experiment was performed in context of the project aims. Discussion and conclusions sections involve wider interpretation of the data, including a discussion of what we can learn from your work, and what further work needs to be done. A discussion of the reliability and significance of your results should be included. You should present your results clearly. Some of the copious amounts of data produced in certain projects might best be presented in an
Appendix. You should interpret and discuss the significance of your results, relate them to previous work in the field with appropriate reference to the literature, and perhaps make recommendations for future work.

Conclusions This should summarise succinctly, the main conclusions of your work. Word-for-word duplication of the abstract should be avoided. In contrast to the abstract, the conclusions section is not designed to be read independently of the report. Ideally it should summarise the main results and conclusions and explain their impact and significance, it may include suggestions for future work.

Figures, Tables and Equations Should be numbered and referred to in the text. It is probably best to do this as the Chapter number followed by the sequential number within that Chapter of the Figure or Table. Thus, the third Figure in Chapter 2 would be numbered “2.3”. Axes of graphs must be labelled with the appropriate units. The points plotted on graphs and entries in Tables are numbers. Therefore, axis labels and column headings should be expressed as the physical quantity divided by its units; e.g. volume / cm³, velocity / m s⁻¹, etc. Where output from instruments does not include such information, it should be added. Students should where possible construct their own figures, tables and equations. If a figure is copied from elsewhere, this should be made clear by insertion of “adapted from [ref], “copied from [ref], “figure produced by [name]” as appropriate.

Acknowledgements You may wish to give credit to those who have helped you.

References All references to other pieces of published or unpublished work must be attributed in the text (as superscript numbers following punctuation marks) and numbered in order of appearance as recommended in an appropriate Royal Society Journal. The entry for each reference should lead the reader unambiguously to the page and volume of the correct journal. Again, the protocol of an appropriate Royal Society of Chemistry journal must be followed (consult journals publishing complete research papers i.e. in the general format introduction, methods, results and discussion. E.g. Dalton Transactions, Physical Chemistry Chemical Physics, Organic & Biomolecular Chemistry)

Appendices (where applicable) This is where you may choose to present some of the detail of your data, especially if its presence in the main body of your report would seriously disrupt the flow and intelligibility of your narrative.

Tips Getting Started: Often the most difficult part! A good first step in writing a research report is to clarify the aims of the project. Write the general project aims and motivation, but also focus in on clear experimental targets perhaps as bullet points (e.g. design a specific drug molecule, synthesize it using specified reactions, assay it for efficacy using a particular protocol). Also include the strategies you devised. The aims may have changed as the project progressed, but it is not necessary to reflect this progression in your report. Following this, write the main conclusions, describe how far you have progressed towards achieving the aims. Writing an abstract is also a good exercise to complete early in the process. The abstract is a miniature version of your report (see above). It should contain introduction, aims, results and conclusions. The main purpose of the introduction is to explain the significance of the work in order to justify the aims. The results included in the abstract should support the conclusions drawn. Writing fragments that logically support each other will assist in creating a consistent narrative throughout the main report. Inject enthusiasm where possible; if the reader enjoys the abstract, they are more likely to read the main report!

Common problems: (1) too many disparate topics to draw together, (2) all the experiments have failed, (3) the subject is not well represented in the scientific literature and/or colleagues are not familiar with the scientific literature. It is common for someone who works in a very specialised area for any length of time to find it difficult to describe their work to non-experts without assuming prior knowledge and without the use of impenetrable jargon. You should try to step back from what you have been doing and ask yourself whether your peers could understand what you have written. You may wish to discuss such matters with your supervisor before you start to write the report. It is advisable to present your supervisor with a typed early draft of your project for comments at least three weeks before submission. Further general information may be found in “How to do your Student Project in Chemistry”, by F.H. Jardine (Chapman and Hall, 1994) and in “Effective Communication for Science and Technology”, by J. van Emden (Palgrave, 2001).
Referencing and Plagiarism

All material contained within your report should be original and not copied from the sources used for reference. Submitting the work of others as your own is a serious offence. Statements made and results reported should be referenced to their primary sources (i.e. not to subsequent review articles). If a phrase or sentence is quoted, this should be made clear by use of quotation marks. If a figure is copied from elsewhere, this should be made clear by insertion of “adapted from [ref]”, “copied from [ref]”, “figure produced by [name]” as appropriate.

Marking and Feedback

Academic Supervisors will provide feedback directly to the student in the form of an annotated copy of the project report, together with provisional marks based on the average marks assigned for each element by their supervisors. Feedback will be returned within 2 working weeks of the deadline. Once all of the marks are available, the marks for each student are considered in detail at a meeting of the Placements Committee that takes place in Semester 1. At this meeting the marks are moderated as appropriate to eliminate the possible effects of the variable marking characteristics of placement supervisors and taking into account any special circumstances. The final marks are then submitted to the Board of Examiners for approval after which they are published, usually towards the end of November.