# 2019/20 Student guide to BB30042 Final year BSc undergraduate projects

Unit convenor: Dr Chris Todd

# This document contains the following Sections:

Project Overview

What is a project?

Staff responsibilities

Student responsibilities

Assessment

Overview

Report submission

Report format

Project interview

Assessment criteria

# Overview

These Final Year undergraduate BSc projects are taken in **a single** semester. The practical work involved and the coursework must be completed within the single semester.

|  |  |  |
| --- | --- | --- |
| **Submission deadlines:** | **Electronically on Moodle** | **Two paper copies submitted to the Undergraduate Office in 4South** |
| **Semester 1** | **1pm Monday 6 January 2020** | **1pm Monday 6 January 2020** |
| **Semester 2** | **1pm Monday 11 May 2020** | **1pm Monday 11 May 2020** |

**KEY POINTS**

* You **must** keep a record of what you do for the project, the Project Activities Record, (this includes those not doing wet lab work) AND submit this record with the project report.
* The quality and quantity of results are **not** assessment criteria; marks are awarded for progress and report production and not for whether a particular answer was determined.
* Students undertaking ‘wet’ projects are NOT to be in labs all the time; it is expected that three days per week will be spent on the project but this includes reading and writing time. (The expectation is the project takes about 360 hr; typically 33 hr per week for 10 weeks plus 30 hr to complete the write up.) Just being in a lab for longer does not get you extra marks!
* The word LIMIT is strictly 6000, no plus 10% allowed, though shorter can be fine.
* You **must** attend a project induction presentation at the start of the semester in which you are taking your project.
* You should attend the project sessions that explain report writing.

**AIMS**

To get an insight into how scientific investigations are planned, taking into account the resources and time available; the techniques required and (where appropriate) the statistical analysis that will be applied to the data; to learn how to analyse and interpret new knowledge in the light of previous work in the field; to recognise the importance of safety in the design and conduct of scientific research; to learn how to write up a scientific investigation employing established conventions.

**LEARNING OUTCOMES**

By the end of the project the student should be able to: identify potential sources of error and/or variation during a scientific investigation; have developed some ability to analyse the outcome of their investigations in the light of previous published work; display some higher level and/or new skills; communicate the outcome of a piece of research effectively in writing.

# What is a project?

The project must be investigative, involving the acquisition and processing of new information in a way that can increase the understanding of a biological problem: it is not sufficient to report without further analysis on findings that have already been made by others (though knowing what others have done is an important component of the project). The project may involve the production of new primary data or the acquisition, compilation and critical analysis of previously published data. **Students should be aware that original investigations carry an element of risk and there are stern challenges with all projects. However, negative results and ‘failed’ experiments from a well conducted investigation can be written up into a first class report.**

An investigation involves four main stages: planning (including safety assessment), carrying out the work, analysing and interpreting the results and reporting the outcome. The planning of the project may have to be carried out in advance by the academic supervisor. However, the background to the project should be explained to you and where possible you should have some input into the planning stage.

You are assigned to an “academic supervisor” (member of academic staff) who has overall responsibility for the conduct of the project. In addition, you may also be allocated an “advisor” or “laboratory supervisor” (a postdoctoral contract researcher or postgraduate student) who will provide additional support particularly with more routine aspects of the day to day conduct of the project e.g. waste disposal. As far as possible both “academic supervisor” and “advisor” should be present at meetings with the student at which progress is reviewed and aims redefined.

# Staff responsibilities

**ACADEMIC SUPERVISOR**

The academic has overall responsibility for the project and should: monitor progress of the project to ensure the aims are realistic; ensure that the project does not take a disproportionate amount of the student’s time; provide advice on the writing of the report; deal with any disciplinary matters e.g. inattention to safety procedures; and ensure that the “advisor” knows what is expected of them. Typically the Supervisor should meet with the student at least once per week.

The Academic supervisor should ensure that there is adequate support and space for the student to carry out experiments. However, there is no requirement to provide write up space or computer facilities (other than when specialist facilities are required) as these are generally available to students in the Library and Learning Centre (open 24hrs).

The Academic Supervisor should ensure that the student is given appropriate training in safe working practices and make the student aware of risk assessments, before commencing any work in a lab.

**LABORATORY SUPERVISOR/ADVISOR**

Postdoctoral researchers and postgraduate students may be called on to help supervise undergraduate projects. Their responsibilities are: to give practical advice and help during the investigative stage of the work; to monitor progress of the student and alert the academic supervisor to any concerns over poor laboratory practice, lack of work or excessive work; to help take decisions over the aims and direction of the project; to give advice on what should be included in the project report. Responsibilities of the researcher will be agreed early on in the project at a meeting between the academic supervisor and the researcher. The extent of the involvement of researchers in supervision will depend upon previous experience. Senior researchers may be given additional responsibilities and be nominated as joint or sole supervisor of the project. In either case they will be provided with their own copy of the project report. Apart from the situation where the Director of Teaching has agreed that a senior researcher may act as sole supervisor, the ultimate responsibility for the project rests with the academic.

**PROJECT ASSESSORS**

The Project Assessor is the markers of the project report. The Project Assessors will be appointed from the other staff. The Project Supervisor and the Project Assessor agree a mark for the project report.

# Student responsibilities

**GENERAL**

You should start your project in Week 1 of the semester and have completed the investigative part of the project by the end of Week 10 of the semester.

Submission of the report will be exactly 14 weeks after the start of the Semester in which the project is taken. You should NOT be carrying out your investigative work during any vacation period unless this has specific approval through your supervisor from the Director of Teaching.

A project is expected to involve around 360 hr of effort. This equates to an average of 33 hr per week for 10 weeks plus a further 30 hr to complete the written report. Some projects may require a work pattern that is heavier in some weeks but this will even out over the course of the semester.

SAFE WORKING

You are responsible for undertaking the required project work in a safe and sensible way. You should follow the safety guidance given to you. If you do not follow safe procedures you may well be prevented from carrying out laboratory work.

You are only allowed to carry out practical work between 8.00am and 6.30pm on weekdays. The Project Supervisor or the Laboratory Supervisor/Advisor (or an appropriate substitute nominated by the Project Supervisor) should be either in the laboratory or field site, or close by, when you are carrying out practical work. The level of supervision should be appropriate for the safety assessment of the procedure being used. If *occasionally* out of hours working is required one to one supervision must be provided. No practical work can be carried out during vacation periods unless expressly permitted by the Director of Teaching.

**RECORD KEEPING**

You **must** keep a record of your project activities (a Project Activities Record). This includes recording activities outside of any laboratory work, as well as the details of experimental work. You should record your thoughts as well as the physical aspects. You should take this Project Activities Record to each meeting with your Project Supervisor, so that the supervisor can see the extent and quality of your progress. This will assist them in guiding and assessing you. It will also help you considerably when it comes to writing your Project Report.

You should record your project activities, findings and conclusions in the Project Activities Record. Typically this will be in the form of a notebook but electronic formats may be more appropriate (for example, bioinformatics projects).

The Project Activities Record should record all of the methodological development and research conducted by you, and is the day-to-day working document for your project. A successful Project Activities Record should be utilisable by a subsequent student to continue the project after you have left. Thus, it should be written with sufficient precision and clarity that would allow such use.

Below is a list of minimum expectations (where appropriate) but it is not intended to be an exhaustive list:

* A clear description of the experiments/procedures.
  + Question(s) being asked/hypotheses being addressed.
  + Protocols clearly described and/or depicted in flowchart/mind map form.
  + Pseudocode for bioinformatics programs.
  + Details of reagents/quantities/concentrations.
  + Details of databases consulted and version numbers for programs used (including appropriate citations and referencing of literature, and URLs where appropriate and dates of download).
  + Experimental details recorded (lengths of incubations, temperatures, program parameters, normalization methods used, etc.).
* Clear recording of results
  + Clear observations made.
  + Data recorded appropriately (raw data is recorded, including program outputs if space permits).
  + Electronic files file identities noted.
  + Charts/tables/graphs used appropriately, with clear titles, axes labelled, clear descriptions of units, sample sizes, parameters used.
* Results are interpreted clearly.
* Reflections on protocols, materials and methods for future work.
* Reagents produced are clearly identified and storage details clearly recorded, e.g.
  + Samples
* Cell stocks
  + Seeds
  + Constructs
  + Program names and version numbers
* Each experiment/procedure/action is clearly dated.
* Plan for the Project Report.

**SUPERVISION MEETINGS**

You should communicate regularly with your Project Supervisor. This is essential if progress is to be made at an appropriate pace and to correct any errors that might creep in. It is also a way of demonstrating to your supervisor that you know what is going on and that you have ideas about the direction in which to take the project. Meetings are typically once a week.

Do not rely on only the Lab Supervisor/Advisor for overall supervision.

# Assessment

**OVERVIEW**

The assessment of your project consists of two main parts: Performance on project and the written Report. The performance on project is normally assessed by your Project Supervisor and the assessment criteria are presented below. The written Report is normally assessed by your Project Supervisor and a Project Assessor. You will attend a meeting with the Project Assessor at which you discuss your report. The Supervisor and the Assessor then agree a mark for the project report.

The mark for the performance on project is weighted 0.26 and the mark agreed for the report weighted 0.74.

**REPORT SUBMISSION**

Submission of the final report must be electronically **AND** as TWO hard copies together with the Project Activities Record.

The electronic version must be submitted through the Departmental Coursework Submission Moodle course. The electronic submission will be timed by Moodle and late submission will be penalised in accordance with University procedures. The electronic version of the report should contain all the material present in the print version within a SINGLE file (PDF format, other formats are NOT acceptable), unless this makes the file larger than 20Mb (the maximum Moodle is set to handle). In which case, the text only should be submitted as a single file and the remaining items, figures etc., should be submitted through the facility provided on the Moodle course for the project unit.

The TWO unbound print copies (we bind these for you in covers we prepare in a standard format) should be handed in to the Undergraduate Office in 4South building, where you must also sign the declaration that the work is your own. At the end of the year one copy will be returned to you.

**REPORT FORMAT OVERVIEW**

The primary directive about the project report is that the standard of writing should be equivalent to a journal article in the subject area of your project. (It will though be longer and contain more details than most journal articles.) Thus the standard of every aspect, which includes citations and reference style, layout, content and presentation, is expected to be high.

The report should be typed with line spacing of AT LEAST 1.5 on A4 paper, pages numbered at the top. Double sided printing is permitted. All pages, including graphs, diagrams and tables, must carry a clear margin of not less than 1.25cm on all sides, preferably 3cm LH margin. Failure to observe this may result in material being cut out during binding and page trimming. The first page must be a title page, carrying the full title of the project, the name of the student, the year and **the word count**. (Do **not** use double, or multiple, columns for the main text.)

You are strongly advised to discuss a plan of the report with your supervisor early in the writing stage. The guidance given below is **general** and fits with the majority of projects that are lab-based. Where your project involves more field work, data acquired by non-lab means or is in any other way a little out of the ordinary, make sure you get specific guidance from your supervisor about how the report should vary from the general style. However, you cannot expect the project supervisor to tell exactly how to write the best report. This is, after all, your work and not that of the supervisor. There are examples of previous project reports on Moodle for you to use to see the quality required.

Where possible, reports should be concise. The reports for this unit should **never** exceed 6,000 words of text. (This is around 24 pages, but often projects have more pages than this due to the inclusion of images and figures.) **This report is not subject to the standard University guidelines about word limits and the limit of 6000 words is STRICTLY administered.** The word count does **not** include: the project title; the contents page; any list of abbreviations; the lay summary; the abstract; diagrams; tables; figure legends; the reference list at the end; acknowledgements; and appendices. All other text is included: e.g. sub-headings; and citations in the body of the text.

Appendices should be kept within reasonable bounds and are not a repository for data that you could not otherwise fit in the word limit. Projects that have generated large quantities of data, such as visual images, require particular skill in the presentation of these data. Image selection, the production of composites and the tabulation of image data are all methods of distilling information without resorting to 'photo album' methods. Ingenuity in data presentation is rewarded. An over-long project report will be viewed as evidence of inability to cope with the challenge of presentation and will, therefore, be penalised.

The report should be written concisely, avoiding undue verbosity, especially in the ‘Introduction’. Keep sentences short and avoid unnecessary phrases such as "at this moment in time" and “in fact”. Avoid all jargon and do not try to make the text more interesting by using familiar language. In particular, do not use an apostrophe unless indicating possession, i.e. can’t, won’t, shouldn’t etc are **not** acceptable. If you can precis a paragraph then do so. You should put each section to one side and reread it later to judge its clarity objectively.

It is usually possible to reduce an early version of a report by about a third through the ruthless pruning of unnecessary words. You may be surprised by how many can be removed and how this improves the writing.

**REPORT FORMAT DETAILS**

The project report will generally **closely follow the established conventions used in scientific journals** and contain ALL the following sections regardless of the nature of the project: (though the content of each part will vary enormously)

Lay summary

Abstract

Introduction

Materials and Methods

Results

Discussion

References

Additionally, there may also be Acknowledgements and Appendices, but these are not formal requirements of the assessment of the report. If you believe you need additional support for writing then please use the Academic Skills Centre to get that assistance (<https://www.bath.ac.uk/professional-services/academic-skills-programme-asp/> ).

* **Lay summary**

A lay summary is written in a style such that the topic and relevance of the project can be understood by a general audience. The lay summary should be between 100 and 700 words long but around 200 is usual. Almost all grant applications and many publications require a lay summary to be produced so as to be better able to demonstrate the impact of research on the public.

Within the journal *PLOS Biology* this summary is called the Author Summary. Their Guidelines for Authors gives the following advice:

“Distinct from the scientific abstract, the author summary is included in the article to make findings accessible to an audience of both scientists and non-scientists. Ideally aimed to a level of understanding of an undergraduate student, the significance of the work should be presented simply, objectively, and without exaggeration.

Authors should avoid the use of acronyms and complex scientific terms and write the text using a first person voice. Authors may benefit from consulting with a science writer or press officer to ensure they effectively communicate their findings to a general audience.”

More detailed additional information can be found on the University of Bath web site at:

<http://www.bath.ac.uk/marketing/public-engagement/assets/HowToWriteLaySummariesUKOLN.pdf>

* **Abstract**

The length is usually no longer than 300 words and summarises the theme of the problem and the results. Do not use an abbreviation (other than for units) unless you first make clear what it means. Do not include references. Write the abstract **last** when you know what you have described in the report.

* **Introduction**

The Guidelines for Authors from the journal *PLOS Biology* state:

“The introduction should put the focus of the manuscript into a broader context. As you compose the introduction, think of readers who are not experts in this field. Include a brief review of the key literature. If there are relevant controversies or disagreements in the field, they should be mentioned so that a non-expert reader can delve into these issues further. The introduction should conclude with a brief statement of the overall aim of the experiments and a comment about whether that aim was achieved.”

The Introduction to your report should be concise and typical length is 500 to 1000 words.

* **Materials and Methods**

Using the past tense, this section should describe concisely, but above all clearly, how the various procedures were carried out. The description should be sufficient that someone else could repeat your experiments i.e. do NOT relegate items to an appendix.

This section must NOT be written as a series of instructions.

Specialised techniques used in one or a few experiments are usually better described with the experiment in results i.e. do not describe "one-off" experiments here; this is a common problem and causes the reader to have to move repeatedly between the two sections.

You **should not** give experimental results in this section unless they explain or illustrate special points, provide data for calibration curves or serve similar purposes. Do include a description of any statistical methods employed with relevant references. Do not make this a story of what you did each week.

State the source of your materials e.g. (Sigma) or (gift from Dr J Smith, University of Hope).

This is the section in which a good deal of sub-division and writing as notes are acceptable provided that both are not over-done.

Take care to state exactly the substances used, their concentration and, where relevant, how they are used e.g. MgSO4.7H2O and not MgSO4 when the hydrated salt is used. Although you must include all necessary detail, avoid irrelevancies. For example, ‘stored at 4°C’ is important detail, whereas ‘stored in cold room 0.32’ is irrelevant detail.

* **Results** or **Experimental section**

This section should describe what you did and should be arranged in a **logical** order that **need not be chronological**. The design of this section provides the backbone of the report. The section is usually divided into sub-sections of related experiments. Avoid excessive division. Results should not be relegated to an appendix, except where a clear data summary is also presented in this section.

An experiment is usually best described as follows

1. Give a short statement of objectives (here is where continuity of the report can be maintained as experiment A leads to experiment B even if they were carried out in a different order)
2. Describe briefly how you did the experiment (the technical details should mostly have been covered in the Materials & Methods)
3. Show the results in writing or in Tables or Figures. Only exceptionally should the same data be repeated in both tables and figures.
4. Abstract and summarise the significant results from Tables and Figures in a text format. (Figures **alone do not** make a Results section.)
5. End, if appropriate, with a short statement of conclusions and follow with a lead sentence or paragraph to the next experiment. Do not give Discussion here i.e. interpretation or speculation.

Within this section, only exceptionally should you refer to other work so that references will rarely be cited here. (Of course all other sections will have citations.)

Figure and Table legends are not included in the word count, so there is no reason to not include all the necessary detail. Also, ensure that figures are large enough to be easily read; the overall size of the report is limited in terms of words, not in terms of how many pages overall. Most figures can be expected to fill a full A4 page.

Each Table and Figure should be numbered (i.e. Table 1, Table 2, Figure 1, Figure 2 etc). Tables and Figures must be self-contained and understandable on their own, without reference to the text i.e. there must be a figure legend that on its own should be sufficient for a reader to understand the data. Equally it should be possible to know the main findings from the text.

Tables should be carefully compiled and designed to leave no room for misinterpretation and to lighten the reader's task. The simpler they are the better; three simple tables are usually better than one large table containing the same data. If possible, arrange the Table so that important results occur close together and well separated from less important results.

The title of the Table should be concise but give the key facts about its contents.

Headings of columns should be accurate, including units of measurement where appropriate, and, if necessary, explained by footnotes.

Numerical data must be supplemented by statistics unless the latter are omitted for good reasons that should then be given in the text. The form of the statistics will be determined by the data and the points to be made by them.

All tables must be referred to at a suitable place in the text.

Graphs are Figures and should be labelled as such, continuing any numbering (i.e. they are **not** labelled as ‘Graph 1’ etc). Graphs should be self-explanatory with titles that are informative. Both axes and contents of the graphs should be labelled clearly and accurately. Use footnotes to explain labels where there is insufficient space within the figure. For graphs, use symbols and connecting lines that will not confuse the reader, ensure that both are sufficiently large in the final version.

Always refer to Figures in the text.

It is legitimate to give brief numerical results in the text if they do not justify a table or figure.

Figures that are images of results should be of high quality and clearly reveal the experimental data, otherwise they should be replaced by other representations. Photos of gels should have all lanes labelled and a relevant explanation in the legend. Molecular weights should be given in numbers down the side of the gel (not just a lane labelled MWT!). Bands discussed in the text should be indicated with an arrow or other appropriate sign.

For a very detailed results section give a summary at the end. Leave conclusions and speculation until Discussion, this is not the place.

Statistics is a subject that justifies detailed treatment, but not here. Suffice to say

1. Your data may be invalid if experiments are not carefully designed and data cannot be analysed.
2. Thus, ensure you do (whenever possible) sufficient replication (determined by the variability of your system) to enable valid statistics analysis.
3. For complex experiments seek advice from a statistician.
4. If the text loses flow and readability because of repeated parenthetical statistical statements, present them in other ways e.g. Figure/Table footnotes; lengthy analyses could in very rare cases go into an appendix; you could dedicate a separate table to the analysis. Seek advice.
5. If your statistics knowledge is really poor then a way to begin is to consult one of the many good books on statistics for bioscientists. Your supervisor may well also be able to provide some guidance, but there is also MASH ( <http://www.bath.ac.uk/study/mash/> ) which can help increase your understanding of this topic.

* **Discussion**

This is typically the most difficult part of the report to write. It is difficult to do well because it requires analysis, not a statement, of the results. There should be an assessment of the significance of your work, especially in relation to that of others, a restatement of the problem as a consequence of your findings and a forecast of how the research might be developed.

Discussions can be divided to correspond with major divisions of the Experimental/Results section but do so sparingly because the main function of the discussion is to present a coherent and critical view of the particular problem that has been studied. Make sure you state what the results do not mean as well as what they do.

Sometimes there can be a case for a combined Results and Discussion section, where the data are particularly complicated. Check with your supervisor before attempting to combine these sections.

* **References** (The list of references at the end of the project is not included in the word count.)

The Harvard (Bath) system, as detailed in handouts from the library, is the preferred method for these reports. The University Regulations may permit journal names to be abbreviated but these abbreviations are fixed and not left to your devising (see Chemical Abstracts Source Index 1985). The habit of some journals to number references and to refer to the numbers in the text is **NOT** acceptable for project reports.

All references mentioned in the text should be in the reference list. No references may be in the Reference list that are not mentioned in the text or in Legends under Figures or Tables.

The remaining two sections are optional but are often included. (Neither are included in the word count, nor the assessment.)

* **Acknowledgements**

You should acknowledge the help given by people who have provided you with materials for your work, who have helped you with ideas or time, and, of course, the bodies who have provided financial support or practical facilities.

* **Appendices**

**These should be kept to a minimum**. This section may contain raw data, which appears in the processed form in the report, otherwise the material should be included in the report. It is not acceptable to use the appendix as a dumping ground for material you want to include but cannot fit within the word limit.

**Assessment Criteria for Marks Awarded for Project Performance**

|  |  |
| --- | --- |
| **Class**  (mark) | **Indicative attributes and performance measures** |
| **First**  70-100% | Highly motivated and well organised, advice or guidance is taken on board readily but with many appropriate tasks undertaken without prompting; quick to learn methodologies and understand complex concepts, able to contribute to project design and to design of individual activities (both of which require reading of the relevant literature and analysing the data as the project progresses, not at the end); keeps scrupulous records of work carried out; clearly shows initiative and an ability to work independently and competently; where applicable, demonstrates high levels of manual dexterity; shows a careful logical approach to new techniques; produces reliable results; shows clear potential that they could become an excellent researcher.  Top Firsts show all, mid First most and low Firsts show many of the above attributes. |
| **Upper Second**  60-69% | Motivated, organised, and generally capable of carrying out work skilfully and accurately with a minimum of supervision; advice is taken on board readily but this may occasionally need repeating; may require prompting to undertake basic procedures or to tie up loose ends; showing a sound understanding of the concepts underpinning the research and demonstrating technical competence; good record keeping; reliable results; shows strong signs that they could become a good researcher.  Top upper second show all, mid upper second most and low upper second show many of the above attributes. |
| **Lower Second**  50-59% | Evidence of motivation and organisation but usually needing regular prompting; advice is sometimes ignored or misunderstood; generally adequate technique, with some mistakes; keeps clear records of work undertaken; planning of work and use of time not well organized. |
| **Third**  40-49% | Always needing regular guidance and not always putting advice into practice; record keeping general competent but some detail missing; with obvious deficiencies in technique and application. |
| **Narrow Fail**  35-39% | Lacking commitment; attendance unreliable; has difficulty following instructions; record keeping poor with several omissions; data inaccurate, suspect, or scanty. |
| **Fail**  0-30% | Lacking application, and failing to respond to encouragement; demonstrating little understanding of the project and/or little technical competence, including basic operations such as the care for apparatus, equipment, or organisms; attendance unreliable including missed appointments or deadlines; record keeping very poor with many omissions; data lacking or unreliable; struggling to follow simple instructions. |

**BSc Project Report assessment criteria**

These assessment criteria apply to both lab and non-lab projects. The assessment criteria are framed in terms of skills demonstrated and these are applicable regardless of the nature of the project undertaken.

The key criteria for a high quality project report are the demonstration of the higher level skills of analysis, evaluation and creation.

Analysis involves appraising, comparing, contrasting, criticising, discriminating, distinguishing and examining. By analysing you show that you can break the concept into parts and show how each part is related to one another.

Evaluation requires the making of judgements which have to be defended, their values explained and the supporting logic thoroughly argued.

Creation requires the putting together of information in an innovative way. This may be done by highlighting how the aims of the project have been moved forward and, where relevant, the future direction that would be undertaken to advance this area.

Demonstrating these skills will require the synthesis of ideas using the most up to date published knowledge of the subject area combined with the ‘results’ obtained by the student. The report will have clear justification of why the question being addressed is relevant as well as a critical analysis of the greater understanding developed through undertaking the project. (Here ‘understanding’ is used in the collective sense of overall understanding, rather than increased understanding of the topic by you, the student).

A fully developed future direction would typically include: justification as to why the proposed future direction is better than other possible options; why the proposed direction is worth pursuing in itself and compared to other options; and a consideration of what the outcomes of such future work might be (at a detailed specific level rather than a general level e.g. not ‘to improve human health’).

In order to present such ideas the report will demonstrate an understanding of the general principles of scientific writing, akin to writing a primary publication for a journal in your area. Whilst the format may vary dependent upon context the common features are:

* suitable format that is related to the way similar work has been presented in the past;
* technically competent – spelling, grammar and general presentation;
* citation and referencing of the most up to date relevant work of others;
* clearly presented ‘results’ in suitable formats;
* consideration of what the ‘results’ of the investigation mean and do not mean;
* logically argued and clearly written.

The term ‘results’ applies to a range of outputs that depend upon the style of project undertaken. For lab-based projects these are typical experimental results but for other projects the output may be quite different. With non-lab projects the ‘results’ may be the formal arguments make based on what others have done. Some non-lab projects do generate new data that is in quite different formats to typical lab experiments. These variations mean that the Results section of the report can vary quite significantly from report to report.

Characteristics of First Class reports:

There needs to be clear demonstration of very high quality, detailed work that effectively and coherently addresses the key criteria.

First Class work can have some weaknesses in the general principles of scientific writing but these must be very minor/limited.

Characteristics of Upper Second Class reports:

There needs to be clear demonstration of some high quality detailed work that addresses the key criteria.

Upper Second Class work can have some weaknesses in the general principles of scientific writing but these must not be significant.

Where there is demonstration of an excellent adherence to the general principles of writing but not providing evidence of some high quality work addressing the key criteria then the work cannot be given a mark above 65%.

Characteristics of Lower Second Class reports:

There needs to be demonstration of some attempt at detailed work that addresses the key criteria.

Lower Second Class work can have some weaknesses in the general principles of scientific writing but these must not be extensive.

Characteristics of Third Class reports:

There needs to be demonstration of some attempt at work that addresses the key criteria.

Third Class work can have some weaknesses in the general principles of scientific writing but these must not be very extensive.

Characteristics of Fail reports:

There is little or no demonstration of an attempt at work that addresses the key criteria.

Failing work can show adherence to the general principles of scientific writing but these do not compensate for a lack of work that addresses the key criteria.

# GENERAL NOTES ON SCIENTIFIC WRITING IN GOOD ENGLISH

Scientific writing should be precise, clear, concise and straightforward. Few write naturally in this way but most can train themselves to do so. It is difficult to write well scientifically so do not be alarmed if drafts of your report are much altered and improved by your supervisor.

The following books are aids to good writing:

1. H.W. Fowler and F.G. Fowler (Latest Edition). The concise Oxford Dictionary of current English. Oxford, Clarendon Press
2. H.W. Fowler (1965). Modern English Usage. Oxford, Clarendon Press.
3. E. Gowers revised by B. Fraser (1973). The Complete Plain Words. HMSO, London.

"The complete Plain Words" is invaluable and should be compulsory reading for all scientists. It contains much good, sensible advice. Some that applies especially to scientific writing is given below:

1. In choice of word prefer the familiar to the far-fetched, the concrete to the abstract, the simple to the circumlocution, the short to the long and, less firmly, the Saxon to the Romance.
2. Avoid superfluous words: "in fact" is usually unnecessary. Suspect terms include "with reference to" and "in case of ". They are often replaceable by single words. Phrases, which are all too common in American writing, such as "visual unattractiveness" for "ugly", should be cut down to size.
3. Scientists tend to use jargon; replace it if possible by plain words. Foreign phrases can be useful but use them only when there is not an acceptable equivalent in English. Letters and words in language other than English should be underlined (= italics in print).
4. Construction of sentences is a large subject that can only be referred to briefly in these notes. For a scientist, the main objective must be precision and clarity, and this usually means short, simple sentences or clauses. Also, use the active rather than the passive form and the direct rather than the indirect expression. Thus not "The report that is proposed to be made " but "the proposed report". Similarly, not "You are not required to do any titrating..." but "You need not titrate", not "B was observed by A" but "A observed B".
5. Do not use contractions (e.g. it’s for it is, can’t for cannot, aren’t for are not) unless you are quoting speech.

Common grammatical errors to watch out for: Affect is the verb, Effect the noun; the possessive pronoun ‘its’ does not have an apostrophe; verbs should be singular where the collective noun is singular; data is the plural whereas datum is the singular; the past tense of the verb ‘to lead’ is ‘led’, not ‘lead’.