



UNSW
A U S T R A L I A

Medical Sciences
Medicine

School of Medical Sciences
Research Internship

SOMS3001
(6 UOC)

SEMESTERS 1 & 2
2016

CRICOS Provider Code 00098G

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Please read this outline in conjunction with the following pages on the [School of Medical Sciences website](#):

- [Advice for Students](#)
- [Learning Resources](#)

(or see "STUDENTS" tab at medicalsciences.med.unsw.edu.au)

COURSE AIMS

The main aim of the course is to introduce undergraduate students to research in the biomedical sciences. Students will undertake a supervised research project that places emphasis on advanced disciplinary knowledge, the use of specialised techniques relevant to their chosen research area, critical thinking and scientific communication. Students gain experience in semi-independent research activity, scientific writing and oral presentation.

SOMS3001 Convenor
A/Professor Patsie Polly
patsie.polly@unsw.edu.au
Level 4 East, Wallace Wurth Building
Ph: 9385 2924

SOMS3001 Co-Convenor
Dr Annie Luo
a.luo@unsw.edu.au
Level 4 East, Wallace Wurth Building
Ph: 9385 0558

APPROACH TO LEARNING AND TEACHING

The learning and teaching philosophy underpinning this course is centred on students taking on the role of a researcher, under close supervision. The student serves as an intern or, more appropriately, an apprentice. In doing so, they develop advanced disciplinary knowledge, the use of specialised techniques relevant to their chosen research area, critical thinking, evaluation and synthesis of information in addition to scientific research communication in the oral and written forms.

The principal form of teaching is based on research supervision and direction by specialist researchers within the Faculties of Science or Medicine. The technical knowledge for this course, in the form of techniques, protocols, technical tips and materials, is provided by each laboratory and supervisor. The scientific knowledge is gathered independently, using Web-based and other resources. It is up to the student to take major responsibility for their own learning and completion of tasks within the course.

STUDENT LEARNING OUTCOMES

At the conclusion of this course, students should be able to:

1. demonstrate an understanding and practice of workplace health and safety in addition to laboratory safety standard operating procedures
2. access, critically evaluate, synthesise and reference a body of scientific literature that informs their research topic
3. demonstrate practical skills in research, including techniques directly related to their specific research topic, accurate recording of experimental data and ability to work in a team
4. critically assess their research data, integrate it into the wider field, and communicate effectively the findings in both oral and written formats
5. demonstrate good reflective practice on your professional skills development upon engagement and completion of assessment tasks development.

ATTENDANCE REQUIREMENTS

The course extends for one semester. Attendance requirements will be dictated by the nature of the work in relation to preparing and writing a literature review and subsequently a manuscript, preparing and delivering two seminars and by the nature of the research project. Attendance requirements will be agreed mutually between student and supervisor, depending on the nature of the work at the time. As with academic staff, the minimum time required is 8 hrs/week.

On the SoMS website Student Advice page, see also:

- [Attendance](#)
- [Special Consideration](#)

HEALTH AND SAFETY

UNSW aims to provide a physically safe, healthy and secure learning and working environment for all students. Your supervisors in this course are responsible for your safety during dedicated research time. In return you are expected to behave with respect toward them and your fellow students; you are expected to follow instructions from your supervisors and complete the necessary training. If you are concerned about your health or safety during the course please tell your supervisor immediately.

It is important that you familiarise yourself with the risks and hazards involved with your research work and the control measures in place to prevent harm to you and others. At the start of your SOMS3001 research internship you must complete mandatory H&S courses, and identify with your supervisor other H&S courses or training you need to undertake. Before commencing specific laboratory tasks you should familiarise yourself with any relevant risk assessments and safe work procedures. You should document your completion of these H&S activities. You should discuss specific training and other requirements with your supervisor.

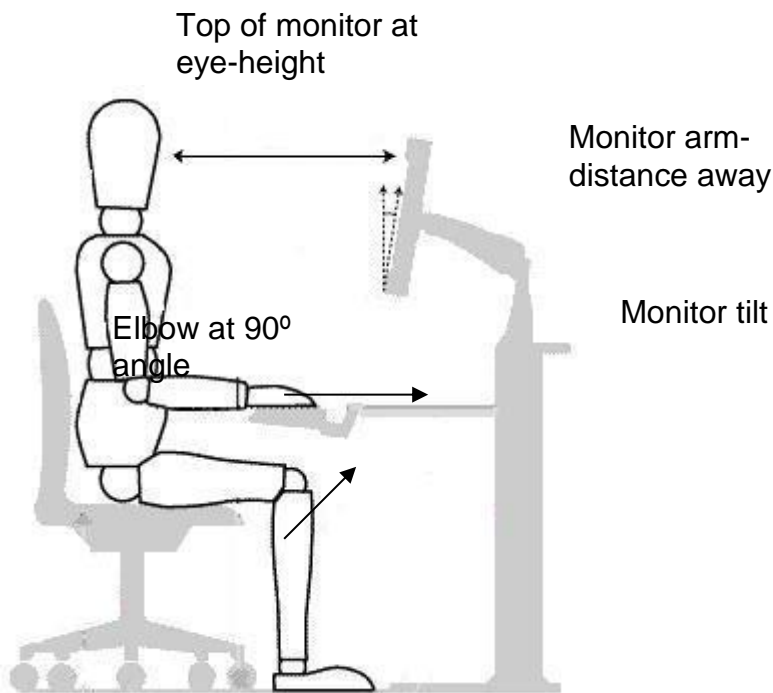
Information and contacts regarding H&S training and requirements can be found at: <http://medalsciences.med.unsw.edu.au/staff/health-safety/induction-and-training>

Below is a list of the mandatory and other common H&S courses that students taking part in research activities within SOMS undertake training. Students need to enrol into the mandatory courses following course enrolment.

- OHS awareness training (online, mandatory for all students)
- Ergonomics training (online, mandatory for all students)
- Green lab (online, mandatory for all students undertaking laboratory work)
- Lab safety awareness and hazardous substances for students (online, mandatory for all students undertaking laboratory work)
- PC2 Biosafety training (mandatory for all students who will be working in a PC2 laboratory, enrol via MyUNSW)
- Ionising radiation training (mandatory for all students who will be working with radiation, enrol via MyUNSW)
- Others – Animal Handling, S8 drugs, GMOs – as required (discuss with supervisor).

Student Risk Assessment

Workstation set-up



Personal Protective Equipment Required

Manual handling of pots



Closed in Footwear

- All pots contain real human tissue that has been generously donated to medical science and **must be treated with appropriate respect and dignity**.
- Specimens are preserved in Perspex and contain a range of preserving chemicals that may be harmful. Chemicals used include **formalin, pyridine, sodium dithionate**. A full list of chemicals and associated MSDS information is available in the H&S Station and on the SoMS website.

MANUAL HANDLING OF POTS

1. It is recommended that all students wash their hands thoroughly as they leave practical class. Chemical residues may be present on pots.
2. **Carry one pot at a time.** Use two hands at ALL TIMES and support the base of pot.

3. **Avoid rough handling and/or tilting of pots.** This can cause leaking joints or tear tissue in specimen.
4. Limit the number of pots on a table at any one time.

SPILLS AND LEAKAGES

If a specimen is leaking or broken, do not attempt to wipe up the spillage. Clear the area and immediately inform the Museum Manager or a member of academic staff. A spill kit will then be used to absorb the chemicals.

Emergency Procedures

In the event of an alarm, follow the instructions of the demonstrator. The initial sound is advising you to prepare for evacuation and during this time start packing up your things. The second sound gives instruction to leave. The Wallace Wurth assembly point is in the lawn in front of the Chancellery. In the event of an injury inform the demonstrator. First aiders and contact details are on display by the lifts. There is a first aid kit in the laboratory.

Clean up and waste disposal

Not necessary in these practicals.
No open-toe shoes allowed

Declaration

I have read and understand the safety requirements for this practical class and I will observe these requirements.

Signature:.....Date:.....

.....
Student Number:.....

Date for review: 13/2/2017



| Hazards | Risks | Controls |
|---|---|--|
| Physical Sharp plastic | 'Stabbing' wound of hand | <ul style="list-style-type: none"> • Use disposable gloves |
| Biological Antibody | Inoculation/Irritant | <ul style="list-style-type: none"> • Do not eat, drink or smoke in the teaching laboratory • Use disposable gloves |
| Chemical Acrylamide Azide ...PBS | Corrosive/Flammable Irritant/neurotoxic Irritant Mild Irritant | <ul style="list-style-type: none"> • Low concentrations of chemicals used • Use disposable gloves |

Pipetting ergonomics

Pipetting is another work aspect that can cause aches and pains. Here are some handy hints:

- Adjust your chair or stool so that your elbow is at a 90° angle while pipetting.
- Adjust the height and position of sample holders, solution container, and waste receptacle so that they are all approximately the same.
- Try to work with your hands below shoulder height.
- Let go of the pipette from time to time and give the fingers/hand a break
- Do not twist or rotate your wrist while pipetting
- Use minimal pressure while pipetting
- Try to switch periodically between different types of work.

For more information on preventing repetitive strain while pipetting click on <http://www.anachem.co.uk/rsi>

Personal Protective Equipment required

| | | | |
|---|--|---|---|
|  Closed in Footwear |  Lab. Coat optional |  Gloves |  Safety Goggles optional |
|---|--|---|---|

Emergency Procedures

In the event of an alarm sounding, stop the practical class and wait for confirmation to evacuate from demonstrators. Then wash your hands and pack up your bags. Follow the instructions of the demonstrators regarding exits and assembly points.

Clean up and waste disposal

- Remove your gloves and dispose in the biowaste bins provided.
- Dispose of all pipette tips in the bin provided.

Ethics Approval

This type of practical does not require ethics approval.

Declaration

I have read and understand the safety requirements for this practical class and I will observe these requirements.

Signature:.....Date:.....

.....

Date for review: 13/2/2017

ASSESSMENT

| | |
|-------------------------------|-----|
| Literature Review | 20% |
| Research Seminar Presentation | 20% |
| Laboratory Performance | 20% |
| Research Report | 40% |

Literature Review **20%**

Description: The literature review should be 1,500 words and should give a detailed account of published scientific literature most directly relevant to the project being undertaken. It should contain a brief introduction that identifies briefly the problem under investigation and background to it, the body of the review and a conclusion relating the body of knowledge to the research aims and objectives. The review should be critical, highlighting limitations of the literature and/or areas of controversy. It should be adequately referenced with recent and appropriate studies and have clear and logical flow. The word count for the literature review excludes non-text elements such as diagrams and tables, which can be used. Penalties will apply for an inability to observe the word limit. The general and referencing style should follow that of a journal relevant to the area of research.

Feedback Process: Assessment and feedback are based on a rubric aligned with that used for Honours in SOMS. Criteria within the rubric address the following: Background, Critical Analysis, Project Rationale, Hypotheses, Aims, Integration of Methods, References and Presentation. The review will be marked and feedback provided by the supervisor and examiner.

Learning Outcomes Assessed: Access, critically evaluate, synthesise and reference a body of scientific literature that informs their research topic.

Due: TBA

Length: 1,500 words +/- 10%

Copies: Two hard copies. One soft copy must be submitted via Turnitin via Moodle.

Attachment: One assignment coversheet to accompany the hard copy.

Research Seminar Presentation

20%

Description: The seminar is of 15 minutes duration, with 12 minutes for presentation and 3 minutes for questions. The presentation should largely cover the results of the research project. A clear, concise and appropriate introduction should be provided which identifies the limitations of the literature and areas of controversy. Clear and valid aims and hypotheses should also be stated. Presentation of the results should be clear and logical and should use text, figures, tables as appropriate. The significance of any important findings should be addressed and appropriate conclusions made. The results of the study should be placed within a broader context and suggestions should be made for future experiments. The seminar should have clear and logical flow, good pace (i.e. neither hurried nor laboured) and use good quality visual aids. The student should demonstrate understanding of the questions raised during question time by giving appropriate answers.

Feedback Process: Assessment and feedback are based on a rubric aligned with that used for Honours in SOMS. Criteria within the rubric address the following: Background, Hypotheses, Aims, Methods, Results, Discussion, Presentation Skills and Questions. The seminar will be marked and feedback provided by the supervisor and guest academics and/or research group members.

Learning Outcomes Assessed: Access, critically evaluate, synthesise and reference a body of scientific literature that informs their research topic. Critically assess their research data, integrate it into the wider field, and communicate effectively the findings in oral format.

Date: TBA

Venue: TBA

Length: 15 minutes in duration. 12 minute presentation, 3 minute question time

Description: The supervisors, including the primary supervisor and other members of the research group closely associated with the project, will provide an assessment of the level of research skill demonstrated throughout the research project. This assessment will be based on student's research performance throughout the course including motivation and organisational skills, research (laboratory) skills (including adherence to good lab practice and work health and safety), note keeping, critical analysis and the ability to respond to feedback.

Feedback Process: Assessment and feedback are based on a rubric aligned with that used for Honours in SOMS. Criteria within the rubric address the following: Motivation and Organisational Skills, Research Skills, Laboratory Notebook, Critical Analysis Skills and Written Communication Skills. Laboratory performance will be assessed and feedback provided by the supervisor and any members of the laboratory closely associated with execution of the research project.

Learning Outcomes Assessed: Demonstrate an understanding and practice of workplace health and safety in addition to laboratory safety standard operating procedures.

Demonstrate practical skills in research, including techniques directly related to their specific research topic, accurate recording of experimental data and ability to work in a team.

Description: The general format of the research report is aligned with the guidelines for the project manuscript assessment item submitted for Honours in the School of Medical Sciences. It should contain an abstract, acknowledgments, brief introduction with aims and hypotheses, materials and methods, results, discussion and references sections. The word count should be 2,500 words. This word limit excludes the abstract, acknowledgements and references sections, as well as supplementary data (if present), tables, figures and legends used in the text. Penalties will apply for an inability to observe the word limit. The abstract should succinctly and accurately summarise the aims and outcomes of the project. The acknowledgments are to be used to indicate how much of the research was performed independently or cooperatively.

The brief introduction, aims and hypothesis section should define the problem being examined and place it in the context of published work in the area without being a complete review of the literature. It should identify the limitations of the literature and areas of controversy and give clear and valid aims and hypotheses. The methods should be appropriate and valid for the stated aims and clearly described and fully referenced. The results should reflect the body of laboratory work including sufficient controls and replicates and analysis of data using appropriate statistical tests. Material needed for a complete understanding or evaluation of the work, but which does not fit well in the manuscript format, should be included as supplementary data. Presentation of the results should be clear and logical and should be communicated appropriately (using figures and tables as well as text). The discussion should be relevant to the introduction, methods, and results sections, logical in presentation and scientific content, show critical/creative analysis, place the findings of the study in the context of past studies and have suggestions for future studies. Please note that all work which is integral to the manuscript but was not performed by the student (i.e. undertaken by another member of the research group) is to be clearly disclosed in the Methods and/or Results sections of the report, where appropriate. This work may then be referred to in the Discussion and be assessed in the context of the methods and results attained by the student. The referencing style of the project manuscript should align with the requirements of the literature review.

Feedback Process: Assessment and feedback are based on a rubric aligned with that used for Honours in SOMS. Criteria within the rubric address the following: Introduction, Hypotheses, Aims, Materials and Methods, Results, Discussion, References and Overall Presentation. The report will be marked and feedback provided by the supervisor and examiner.

Learning Outcomes Assessed: access, critically evaluate, synthesise and reference a body of scientific literature that informs their research topic. Critically assess their research data, integrate it into the wider field, and communicate effectively the findings in written format.

Due: TBA

Length: 2,500 words +/- 10%

Copies: Two hard copies. One soft copy must be submitted via Turnitin© via Moodle.

Attachment: One assignment coversheet to accompany the hard copy.

E-Portfolio and Reflective Practice

Reflective practice is an important aspect to developing critical thinking and evaluation of outcomes in medical research. Students should engage in this practice and can reflect on their research experience within their ePortfolios/reflective blogs.

Students should also be aware that research data discussions should be kept within lab meetings and for presentation as part of course requirements via Moodle or within the scheduled assessment tasks. Therefore, due to the competitive nature of medical research communication, please be advised that any data should be kept confidential and not shared online. This is how research integrity is maintained.

NOTE: The ePortfolios/reflective blogs should be used as a reflective space, rather than discussing research content and any data or unpublished methods that may have been generated as part of your own research project or the laboratory you have trained in. Students should NOT upload research data or methods into their ePortfolios/reflective blogs. Always set your ePortfolio to 'private' in order to avoid general visibility and retain confidentiality.

Assessment of ePortfolio will be based on the following criteria: demonstration engagement with ePortfolio, reflective practice, building an awareness of skills, including subject/course related skills, professional development and related skills, transferrable skills, development of career awareness and skills for future employability or post-graduate programs, work experience, personal values, strengths and weaknesses

GUIDELINES FOR SUPERVISION

The primary supervisor should be a SoMS Academic member of staff.

GUIDELINES FOR EXAMINATION SOMS3001 GRADES

>85 (HD)

Work of superior quality in all aspects of research, scientific writing, and oral presentation, demonstrating the ability to organise information in a clear and concise manner, the integration of information from a wide range of sources and containing clear examples of excellent critical evaluation.

75-84 (DN):

Work of very good quality in all aspects of research, scientific writing, and oral presentation, but showing lesser ability to organise information in a clear and concise manner, integrate information from range of sources and critically evaluate the literature and research data.

65-74 (CR):

Good quality in all aspects research, scientific writing, and oral presentation but with inadequacies in understanding, critical skills, organisation and presentation.

50-64 (PS):

Adequate quality work with significant deficiencies in understanding, critical skills, organisation and presentation

School of Medical Sciences SOMS3001 Research Report - Instructions to Authors

(Adapted from the Uniform Requirements for Manuscripts Submitted to Biomedical Journals, the British Journal of Pharmacology, the Journal of Anatomy, the Journal of Pathology and the Journal of Physiology)

Manuscripts must include: 1. Title Page, 2. Abstract, 3. Introduction, 4. Methods, 5. Results, 6. Discussion, 7. Acknowledgements, 8. List of references, 9 Tables, 10. Figures and 11. Supplementary Data (optional).

Title Page

Title: The title should contain no more than 150 characters (including spaces) and clearly indicate the subject matter of the paper.

Authors: The author's name in full and the name and addresses of the department(s) and institution(s) to which the work should be attributed.

Word Count: The word count excluding abstract, acknowledgments, references and figure legends should be listed.

Abbreviations: list all abbreviations used

Abstract

An abstract of up to 250 words should follow the title page. The abstract should provide the background for the study, experimental approach, major findings and conclusions. It should be understandable without reference to the rest of the paper. References may not be cited.

Introduction

The introduction should give a clear account of the background for the study, and the research objective or hypothesis tested should be stated. The introduction should be understandable to a non-specialist.

Methods

The methods must be described in sufficient detail to allow the experiments to be interpreted and repeated by an experienced investigator. Give references to established methods, provide references and brief descriptions for methods that have been published but are not well known; describe new or substantially modified methods. Identify the apparatus, drugs and chemicals used, give the manufacturer's name and address in parentheses after each item. Describe the statistical methods used and define all statistical terms, abbreviations, and symbols. Specify the computer software used. Where appropriate, describe your selection of the subjects (patients or laboratory animals, including controls), identify the age, sex, strain, number used and other important characteristics of the subjects.

Results

Present your results in logical sequence in the text, tables, graphs and illustrations. The description of the experimental results should be succinct, but in sufficient detail to allow the experiments to be analysed and interpreted by the reader. Where data is presented the mean results with standard errors, the number of observations, and statistical significance, should be given where appropriate. The rationale for performing the experiments may be briefly mentioned in the Results section, but

conclusions or interpretation of results should not be presented. Do not repeat in the text all the data that is presented in the tables or graphs. Headed paragraphs may be used to aid in the presentation of the results.

Please note that all work which is integral to the research report but was not performed by the SOMS3001 student (i.e. was undertaken by another member of the supervisor's and/or co-supervisor's research group) is to be clearly disclosed in the Methods, Results and/or Acknowledgments as appropriate.

Discussion

In the discussion explore possible mechanisms or explanations for the findings of your study, compare and contrast your results with those from other relevant studies, state the limitations of the study, and explore the implications of the findings for future research. Do not repeat in detail data or other material given in the Introduction or the Results sections. The main conclusions should be conveyed in the final paragraph.

Acknowledgements

The author should acknowledge those who have provided funds, reagents, technical help and scientific advice.

References

In the text, references to other work should take the form: (Bolton and Kitamura, 1983) or 'Bolton and Kitamura (1983) showed that...' When a paper written by two authors is cited, both names are given; for three or more authors only the first name is given, followed by 'et al.' References to unpublished observations or personal communications should be mentioned in the text only, and not included in the list of references. Direct reference to original research sources should be used whenever possible.

The reference list at the end of the manuscript must be arranged alphabetically according to the surname of the first author. When the names of first authors are identical, the alphabetical order of the surnames of subsequent authors takes precedence over the year of publication. The authors' names are followed by the year of publication in brackets. If more than one paper by the same authors in one year is cited, a, b, c, etc. are placed after the year of publication, both in the text and in the list of references. All authors should be quoted for papers with up to seven authors; for papers with more than seven authors, the first six should be quoted followed by et al.

The format for references to papers and books, and to chapters in books, is as follows:

Lipp P, Egger M & Niggli E (2002). Spatial characteristics of sarcoplasmic reticulum Ca^{2+} release events triggered by L-type Ca^{2+} current and Na^+ current in guinea-pig cardiac myocytes. *J Physiol* **542**, 383-393.

Adrian ED (1932). *The Mechanism of Nervous Action*. Humphrey Milford, London.

Buchan AMJ, Bryant MG, Polak JM, Gregor M, Ghatei MA & Bloom SR (1981).

Development of regulatory peptides in the human fetal intestine. In *Gut Hormones*, 2nd edn, ed. Bloom SR & Polak JM, pp. 119-124. Churchill Livingstone, Edinburgh.

For those articles published on online ahead of print, that have not been assigned full publication details the DOI (digital object identifier) should be used. See example below:

Lipp P, Egger M & Niggli E (2002). Spatial characteristics of sarcoplasmic reticulum Ca^{2+} release events triggered by L-type Ca^{2+} current and Na^+ current in guinea-pig cardiac myocytes. *J Physiol*; DOI: 10.1113/jphysiol.2001.013382.

Tables

Each table should be given on a separate page. Tables are numbered consecutively according to the order in which they have been first cited in the text. Tables should be numbered with Arabic numerals and the number should be followed by a brief descriptive title at the head of the table. Tables should be self-explanatory, with necessary descriptions provided in footnotes underneath the table. Give each column a short or abbreviated heading.

Figures and Legends

Figures should be numbered consecutively according to the order in which they have been first cited in the text. Figure legends can appear below the figure and/or on a separate page. Each figure should be given a title and a legend that explains the figures in sufficient detail that, whenever possible, they can be understood without reference to the text. All symbols and abbreviations should be explained within the legend. If a figure has been published, acknowledge the original source.

Supplementary Data

Material needed for an in depth evaluation of the work, but which does not fit well in manuscript format, should be included as Supplementary Data. These data should only be included if they enhance the overall understanding of the research but should not be essential for the understanding of the manuscript.

Abbreviations, Units and Symbols

Use only standard abbreviations; the full term for which an abbreviation stands should precede its first use in the text. SI units and symbols should be used for physicochemical quantities. Gene names and loci should be in italics, and proteins should be in roman. Virus nomenclature (and acronyms) should follow the guidelines of the International Committee on the Taxonomy of Viruses (ICTV). Chemical nomenclature should follow the International Union of Pure and Applied Chemistry (IUPAC) definitive rules for nomenclature. Pharmacological units should follow the guidelines given in the British Journal of Pharmacology.

Formatting and Technical Instructions

Text should be times roman, 12 point font, with 1.5 line-spacing throughout the manuscript. Margins should be 3 cm on the left-hand side, 2 cm on the right-hand, 2 cm at the top and 2 cm at the bottom. The manuscript should be no more than 5000 words excluding; the abstract, acknowledgements and references, tables, figures, legends, and supplementary data.

| Criteria | Literature Review (Mark out of 10 for each marking criteria) | | | | | | |
|--|---|---|---|--|--|--|--|
| | 10-9.0 Outstanding | 9.0-8.5 Excellent | 8.4-8.0 Very Good | 7.9-7.5 Good / Average | 7.4-6.5 Fair | 6.4-5.0 Poor | 5-0 Very Poor |
| Background ____/10 x 3.0 | Very comprehensive, detailed and focused introduction. | Highly detailed and focused introduction. | Detailed and focused introduction | Detailed introduction. | Some key basic information missing in introduction. | Major lack of key basic information in introduction. | Lack of significant detail in introduction. |
| Critical Analysis ____/10 x 2.0 | Comprehensive critical analysis of strengths and limitations of the literature. | Critical analysis of strengths and limitations of the literature | Some critical analysis of strengths and limitations of the literature. | Some critical analysis of strengths and limitations of the literature but mostly descriptive | Limited critical analysis of strengths and limitations of the literature, mostly descriptive | Very limited critical analysis of strengths and limitations of the literature. | No critical analysis of strengths and limitations of the literature presented |
| Project Rationale, Hypotheses & Aims ____/10 x 1 | Project rationale, hypotheses and aims clearly outlined and comprehensively justified. | Project rationale, hypotheses and aims clearly outlined and justified. | Project rationale, hypotheses and aims outlined and justified. | Project rationale, hypotheses and aims partly outlined and justified. | No clear project rationale or hypotheses. Aims outlined but not justified. | Project rationale, hypotheses and aims not clearly outlined. | No project rationale, hypotheses or aims apparent. |
| Integration of Methods ____/10 x 1 | Clear and concise description of proposed experiments and clear integration with the literature. Clear relevance to the research field. Well developed, very clear and concise links between hypotheses, aims and literature. | Clear description of proposed experiments and integration with the literature. Relevance to the research field. Very clear links between hypotheses, aims and literature. | Mostly clear description of experiments, integration with literature and relevance to the research field, some elements unclear. Clear links between hypotheses, aims and literature. | Description of experiments mostly clear, integration with literature and relevance to the research field, some elements lacking. Minor inconsistencies in experimental design. Some links between hypotheses, aims and methods and literature. | Description of experiments, integration with literature and relevance to the research field, lacked some major aspect. Poor links between hypotheses, aims and methods and literature. | Description of experiment, integration with literature and relevance to the research field, unclear and lacks major aspects. No links between hypotheses, aims and methods and literature. | Experiments not described. Integration with literature and relevance to the research field not described, No hypotheses, aims or methods |
| References ____/10 x 1 | Predominant and comprehensive use of primary articles. Many articles presented from recent or seminal publications. | Predominant use of primary articles. Many articles presented from recent or seminal publications. | Predominant use of primary articles. Could have used more articles from recent or seminal publications. | Some over reliance on reviews or texts. Could have used more articles from recent or seminal publications | Some over reliance on reviews or texts. Many articles not from recent or seminal publications. | Significant over reliance on reviews or texts. Limited number of recent or seminal articles used. | Use of literature limited to a few articles and reviews. Poor attempt to explore literature. |
| ____/10 x 1 | Citation style correct and consistent throughout. Reference list completely accurate with no errors. | Citation style correct and consistent. Reference list complete, but a few minor errors. | Citation style consistent. Reference list incomplete, and some minor errors. | Some references inconsistent between text and list with many minor errors. Citation style mostly consistent. | Many references inconsistent between text and list with many minor errors. Citation style incorrect / inconsistent. | Many inconsistencies between text and list. Some major errors. Inappropriate citation style used. | Many references inconsistent between text and list. Many major errors. |
| Presentation ____/10 x 1 | No grammatical or spelling errors. Professional expression and style used consistently. All figures accurate, focussed and informative | No grammatical or spelling errors. Professional expression and style mostly used. All figures accurate, focussed and informative. | No grammatical errors and minor spelling errors. Professional expression and style used. All figures accurate, focussed and informative | Minor grammatical errors and minor spelling errors. Professional expression and style used. Most figures accurate and informative. | Minor grammatical errors and minor spelling errors. Professional expression used. Most figures accurate, but not so relevant. | Major grammatical and spelling errors. Professional expression used Numerous errors in figures or largely irrelevant | Major grammatical and spelling errors. Language used not professional. No relevant figures. |

| Criteria | Research Report (Mark out of 10 for each marking criteria) | | | | | | |
|---|---|--|---|--|---|---|---|
| | 10-9.0 Outstanding | 9.0-8.5 Excellent | 8.4-.8.0 Very Good | 7.9-7.5 Good / Average | 7.4-6.5 Fair | 6.4-5.0 Poor | 5-0 Very Poor |
| Introduction, Hypothesis & Aims ____/10 X 1.5 | <ul style="list-style-type: none"> Concise and clear account of the scientific background and the rationale of the experiment. Very clear links between hypotheses / aims and literature. | <ul style="list-style-type: none"> Concise and clear account of the scientific background and the rationale of the experiment. Clear links between hypotheses / aims and literature. | <ul style="list-style-type: none"> Clear account of the scientific background and the rationale of the experiment. Clear links between hypotheses / aims and literature. Minor errors. | <ul style="list-style-type: none"> Clear account of the scientific background and the rationale of the experiment. Minor omissions or errors. Links between hypotheses / aims and literature | <ul style="list-style-type: none"> A good introduction of the scientific background and the rationale of the experiment. Some factual error or omissions. Some links between hypotheses / aims and literature | <ul style="list-style-type: none"> Some introduction to the scientific background and the rationale of the experiment. More detail needed. Some links between hypotheses / aims and literature. Factual errors or omissions in text. | <ul style="list-style-type: none"> Lacking detail of the rationale of the experiment and scientific background. No links between hypotheses / aims and literature. Factual errors or omissions in text. |
| Materials & Methods ____/10 X 1.5 | <ul style="list-style-type: none"> Clear and detailed description of experiments and data analysis (including statistical analysis). | <ul style="list-style-type: none"> Clear description of experiments and data analysis (including statistical analysis). | <ul style="list-style-type: none"> Good description of experiments and data analysis (including statistical analysis), with minor errors. | <ul style="list-style-type: none"> Description of experiments and data analysis (including statistical analysis) mostly clear but significant detail lacking. Minor errors present in methods. | <ul style="list-style-type: none"> Description of experiments and data analysis (including statistical analysis) lacking major details. Minor errors present methods. | <ul style="list-style-type: none"> Description of experiments and data analysis (including statistical analysis) lacking major details. Major errors in methods. | <ul style="list-style-type: none"> Description of experiments and data analysis (including statistical analysis) absent or unclear. |
| Results: Description & Content ____/10 X 1.5 | <ul style="list-style-type: none"> Logical and clear description of the experimental results with reference to tables and figures. No conclusions or interpretation of results presented. Sufficient controls and replicates with appropriate data analysis (including statistics) performed correctly. | <ul style="list-style-type: none"> Clear description of the experimental results with reference to tables and figures. No conclusions or interpretation of results presented. Sufficient controls and replicates with minor errors in data analysis (including statistics). | <ul style="list-style-type: none"> Clear description of the experimental results with reference to tables and figures. No conclusions or interpretation of results presented. Sufficient controls and replicates with minor miscalculations in data analysis (including statistics) or inaccurate presentation of data. | <ul style="list-style-type: none"> Good description of the experimental results with reference to tables and figures in most instances. Generally no conclusions or interpretation of results presented. Sufficient controls and replicates with significant minor miscalculations in data analysis (including statistics) or inaccurate presentation of data. | <ul style="list-style-type: none"> Description of the experimental results lacks required detail and appropriate reference to figures and tables. Some conclusions or interpretation of results presented. Sufficient controls and replicates. Inappropriate data analysis, including statistics, used in some parts or inaccurate presentation of data. | <ul style="list-style-type: none"> Description of the experimental results lacks required detail. Some conclusions or interpretation of results presented. Insufficient controls and replicates used. Major errors or omissions in data analysis. | <ul style="list-style-type: none"> No description of the experimental results given. Lack of controls and replicates with appropriate data analysis (including statistics) performed. |
| Results: Presentation ____/10 X 1.5 | <ul style="list-style-type: none"> Graph axes labelled and units of measurement given in parentheses. Legends explain the figures in sufficient detail that they can be understood without reference to the text. Tables clearly labelled with clear footnotes if necessary so self-explanatory. No errors in presentation. | <ul style="list-style-type: none"> Graph axes labelled and units of measurement given in parentheses. Legends explain the figures in sufficient detail that they can be understood without reference to the text. Tables clearly labelled with footnotes if necessary so self-explanatory.. A few minor errors in data presentation. | <ul style="list-style-type: none"> Graph axes labelled and units of measurement given in parentheses. Not all legends explain the figures in sufficient detail. Most tables clearly labelled with footnotes if necessary so self-explanatory. Some minor errors in data presentation. | <ul style="list-style-type: none"> Most graph axes labelled and units of measurement given in parentheses. Not all legends explain the figures in sufficient detail to be understood without reference to the text. Most tables clearly labelled with footnotes if necessary so self-explanatory. Some significant errors in data presentation. | <ul style="list-style-type: none"> Results are poorly presented, most graph axes labelled and units of measurement given in parentheses. Not all legends explain the figures in sufficient detail that they can be understood without reference to the text. Most tables are self-explanatory, some errors in description or labels. Some significant errors in data presentation | <ul style="list-style-type: none"> Results are poorly presented. Most graph axes not labelled or missing units of measurement. Most legends do not explain the figures in sufficient detail that they can be understood without reference to the text. Most tables are not self-explanatory and/or poorly labelled. Major errors in data presentation | <ul style="list-style-type: none"> Results poorly presented or missing. Graph axes not labelled and units of measurement absent. Legends do not explain the figures in sufficient detail that they can be understood without reference to the text. Tables are not self-explanatory and/or poorly labelled. Major errors in data presentation |

| Criteria | Research Report (Mark out of 10 for each marking criteria) | | | | | | |
|---|--|--|---|---|--|---|--|
| | 10-9.0 Outstanding | 9.0-8.5 Excellent | 8.4-8.0 Very Good | 7.9-7.5 Good / Average | 7.4-6.5 Fair | 6.4-5.0 Poor | 5-0 Very Poor |
| Discussion _____/10 X 2.0 | <ul style="list-style-type: none"> Discussion is insightful, clear and logical. Extensive interpretation of the results with reference to previous scientific studies. Significance of findings extensively placed within the broader context of the field. Comprehensive critical analysis of strengths and limitations of experiments. Future directions identified and clearly justified. | <ul style="list-style-type: none"> Discussion is clear and logical. Appropriate interpretation of the results with reference to previous scientific studies. Significance of findings well placed within the broader context of the field. Significant critical analysis of strengths and limitations of experiments. Future directions identified and justified | <ul style="list-style-type: none"> Discussion is clear. Appropriate interpretation of results, some reference to previous studies, but not always. Significance of findings placed within the broader context of the field. Critical analysis of strengths and limitations of experiments. Future directions identified and justified | <ul style="list-style-type: none"> Discussion is mostly clear. Appropriate interpretation of the results with a few minor errors. Reference to previous scientific studies in most cases. Significance of some findings placed within the broader context of the field. Some critical analysis of strengths and limitations of experiments. Future directions identified and mostly justified | <ul style="list-style-type: none"> Discussion is unclear in many areas. Some inappropriate interpretation of the results. Lacking reference to previous scientific studies. Significance of findings not placed within the broader context of the field. Lacking some critical analysis of strengths and limitations of experiments. Future directions identified. | <ul style="list-style-type: none"> Results are restated with little interpretation or reference to previous scientific studies. Major findings not placed within the broader context of the field. No critical analysis of strengths and limitations of experiments. No future directions identified. Misunderstanding of some major concepts. | <ul style="list-style-type: none"> Results are restated with no interpretation or reference to previous scientific studies. Findings not place within the broader context of the field. No critical analysis of strengths and limitations of experiments. No future directions identified. Little understanding of most major concepts. |
| References _____/10 X 1 | <ul style="list-style-type: none"> Predominant and comprehensive use of primary articles. Many articles presented from recent or seminal publications. Citation style correct and consistent throughout. Reference list completely accurate with no errors. | <ul style="list-style-type: none"> Predominant use of primary articles. Many articles presented from recent or seminal publications. Citation style correct and consistent. Reference list complete, but a few minor errors. | <ul style="list-style-type: none"> Predominant use of primary articles. Could have used more articles from recent or seminal publications. Citation style consistent. Reference list incomplete, and some minor errors. | <ul style="list-style-type: none"> Some over reliance on reviews or texts. Could have used more articles from recent or seminal publications. Some references inconsistent between text and list with many minor errors. Citation style mostly consistent | <ul style="list-style-type: none"> Some over reliance on reviews or texts. Many articles not from recent or seminal publications. Many references inconsistent between text and list with many minor errors. Citation style incorrect / inconsistent. | <ul style="list-style-type: none"> Significant over reliance on reviews or texts. Limited number of recent or seminal articles used. Many inconsistencies between text and list. Some major errors. Inappropriate citation style used. | <ul style="list-style-type: none"> Use of literature limited to a few articles and reviews. Poor attempt to explore literature. Many references inconsistent between text and list. Many major errors. |
| Overall Presentation _____/10 X 1 | <ul style="list-style-type: none"> No grammatical or spelling errors. Professional expression and style used consistently. All figures accurate, focussed and informative Word count 5000±500 | <ul style="list-style-type: none"> No grammatical or spelling errors. Professional expression and style used. All figures accurate, focussed and informative. Word count <or>5000±500 | <ul style="list-style-type: none"> No grammatical errors but some spelling errors. Professional expression and style used. All figures accurate, focussed and informative Word count 5000±500 | <ul style="list-style-type: none"> Some grammatical and spelling errors. Professional expression and style used. Most figures accurate and informative. Word count 5000±500 | <ul style="list-style-type: none"> Some grammatical and spelling errors. Professional expression used. Most figures accurate, but not so relevant. Word count: <or>5000±500 | <ul style="list-style-type: none"> Major grammatical and spelling errors. Professional expression used. Numerous errors in figures or largely irrelevant Word count: 5000±500 | <ul style="list-style-type: none"> Major grammatical and spelling errors. Language used not professional. Numerous errors in figures or largely irrelevant Word count: <or>5000 |

| Criteria | Research Seminar (Mark out of 10 for each marking criteria) | | | | | | |
|---|---|---|--|---|--|---|--|
| | 10-9.0 Outstanding | 9.0-8.5 Excellent | 8.4-8.0 Very Good | 7.9-7.5 Good / Average | 7.4-6.5 Fair | 6.4-5.0 Poor | 5-0 Very Poor |
| Background, Hypotheses & Aims & Methods /10 x 1.5 | <ul style="list-style-type: none"> Very clear & concise description of background. Can be easily understood by a non-expert audience. Well-developed links between hypotheses, aims, methods and literature | <ul style="list-style-type: none"> Clear & concise description of background. Can be understood by a non-expert audience. Clear links between hypotheses, aims and methods and literature | <ul style="list-style-type: none"> Clear description of background. Can mostly be understood by a non-expert audience. Good links between hypotheses, aims and methods and literature | <ul style="list-style-type: none"> Good description of background. Occasionally difficult for non-expert audience to understand. Links made between hypotheses, aims and methods and literature | <ul style="list-style-type: none"> Unclear description of background. Occasionally difficult for non-expert audience to understand. Insufficient links between hypotheses, aims and methods and literature | <ul style="list-style-type: none"> Poor description of background. Difficult for non-expert audience to understand. Lacking links between hypotheses, aims and methods and literature | <ul style="list-style-type: none"> Lacking description of background. Cannot be understood by a non-expert audience. No links between hypotheses, aims, methods and literature |
| Results /10 x 2 | <ul style="list-style-type: none"> All data presented very clearly, accurately and with sufficient detail Direct and clear links to aims Controls, replicates and group data and analysis appropriate and presented | <ul style="list-style-type: none"> All data presented clearly, accurately and with sufficient detail Some links to aims Controls, replicates and group data and analysis appropriate and presented | <ul style="list-style-type: none"> Most data presented clearly, accurately and with sufficient detail Some links to aims Controls, replicates and group data and analysis appropriate and presented | <ul style="list-style-type: none"> Most data presented clearly and accurately but some errors some links to aims. Controls, replicates and group data and analysis presented only sometimes | <ul style="list-style-type: none"> Most data presented clearly and accurately but some errors Limited links to aims. Limited controls, group data and analysis presented | <ul style="list-style-type: none"> Some data presented clearly but with major errors. Limited links to aims. No controls, group data and/or analysis presented | <ul style="list-style-type: none"> Data presentation confusing and with major errors / omissions. No links to aims No controls, group data and/or analysis presented |
| Discussion /10 x 1.5 | <ul style="list-style-type: none"> All data evaluated critically. Significance of findings placed within the broader context of the field. Conclusions appropriate. Clear demonstration of an understanding of the limitations of the data | <ul style="list-style-type: none"> All data evaluated critically. Most findings placed within the broader context of the field. Good demonstration of an understanding of the limitations of the data | <ul style="list-style-type: none"> Most data evaluated critically. Most findings placed within the broader context of the field. Good demonstration of an understanding of the limitations of the data | <ul style="list-style-type: none"> Most data evaluated critically. Most findings placed within the broader context of the field. Most conclusions appropriate. Some demonstration of an understanding of the limitations of the data | <ul style="list-style-type: none"> Some critical evaluation of data. Some findings placed within the broader context of the field. Errors in conclusions. Some demonstration of an understanding of the limitations of the data | <ul style="list-style-type: none"> Limited critical evaluation of data. Most findings not placed within the broader context of the field. Some conclusions. Lack of demonstration of an understanding of the limitations of the data | <ul style="list-style-type: none"> No critical evaluation of data. Findings not placed within the broader context of the field. No conclusions. No demonstration of an understanding of the limitations of the data |
| Presentation: Structure & Material /10 x 1 | <ul style="list-style-type: none"> The font, colour, graphics and slide layout used greatly enhances the presentation. Figures clearly labelled. No errors. Clear and logical structure throughout | <ul style="list-style-type: none"> The font, colour, graphics and slide layout used enhances the presentation. Figures clearly labelled. Minor errors. Clear and logical structure throughout | <ul style="list-style-type: none"> The font, colour, graphics and slide layout used enhances the presentation. Figures labelled. Minor errors. Mostly clear and logical structure throughout | <ul style="list-style-type: none"> The font, colour, graphics and slide layout used sometimes distracts from the presentation. Figures used and labelled with some errors. Mostly clear and logical structure throughout | <ul style="list-style-type: none"> The font, colour, graphics and slide layout used sometimes distracts from the presentation. Not all figures used are labelled or have errors. Lacking clear and logical structure | <ul style="list-style-type: none"> The font, colour, graphics and slide layout used distracts from the presentation. Poor use of figures including lack of labels or errors. Lacking clear and logical structure | <ul style="list-style-type: none"> The font, colour, graphics and slide layout used distracts from the presentation. Figures used not labelled. No logical structure to presentation |
| Presentation: Engagement /10 x 1 | <ul style="list-style-type: none"> Delivery clear, articulate and professional. Well-paced and timing perfect. Confident stance and body language. Enthusiastic. | <ul style="list-style-type: none"> Delivery clear, articulate and professional. Well-paced. Confident stance and body language. Enthusiastic. | <ul style="list-style-type: none"> Delivery mostly clear, articulate and professional. Well-paced. Mostly confident stance and body language. Enthusiastic. | <ul style="list-style-type: none"> Delivery mostly clear, occasional lapses in clarity and/or speed. OK stance and body language, some lapses. | <ul style="list-style-type: none"> Delivery mostly clear, occasional lapses in clarity and/or speed. Some major lapses in body language. | <ul style="list-style-type: none"> Delivery largely unclear / inaudible. Poorly paced. Major lapses in body language. | <ul style="list-style-type: none"> Delivery largely unclear / inaudible. Poorly paced. Didn't engage with audience at all. |
| Questions /10 x 3 | <ul style="list-style-type: none"> All responses to Qs demonstrated clear understanding of the project and its relevance. Consistently strongly argued and accurate answers to questions drawing from related literature. | <ul style="list-style-type: none"> Responses to Qs demonstrated clear understanding of the project and its relevance. Strongly argued and accurate answers to questions drawing from related literature. | <ul style="list-style-type: none"> Responses to Qs demonstrated understanding of the project and its relevance. Mostly accurate answers to questions, drew from related literature | <ul style="list-style-type: none"> Responses to Qs demonstrated some understanding of the project and its relevance. Average but seemingly accurate answers to questions. | <ul style="list-style-type: none"> Responses to Qs demonstrated some understanding of the project or its relevance. Multiple minor errors made in responses to questions | <ul style="list-style-type: none"> Responses demonstrated little understanding of the project and its relevance. Major errors made in responses to questions. | <ul style="list-style-type: none"> Responses did not demonstrate any understanding of the project. Significant errors made in responses to questions. |

| Criteria | Laboratory Performance (Mark out of 10 for each marking criteria) | | | | | |
|---|---|--|---|---|--|---|
| | 10 – 9.0 Outstanding | 8.9 - 8.5 Excellent | 8.4 - 7.5 Very Good | 7.4 - 6.5 OK/Average | 6.4 – 5.0 Fair/below average | 4.9 – 0 Poor |
| Motivation & Organisational Skills _____/10 X 2 | <ul style="list-style-type: none"> Exceptionally planning and time-management skills Demonstrated appropriate initiative in all situations | <ul style="list-style-type: none"> Excellent planning and time-management with rare lapses Demonstrated appropriate initiative in most situations | <ul style="list-style-type: none"> Good planning and time-management with occasional lapses Demonstrated initiative in many but not all situations | <ul style="list-style-type: none"> Planned well but struggled to manage multiple activities or complex tasks Demonstrated initiative in many but not all situations, sometimes the initiative was inappropriate | <ul style="list-style-type: none"> Inadequate planning lacks due regard of time limits Demonstrated little initiative, or initiative was largely inappropriate | <ul style="list-style-type: none"> Very poor time-management skills Demonstrated little or no initiative |
| Research Skills _____/10 X 2 | <ul style="list-style-type: none"> Exceptionally high laboratory/research skills, required minimal teaching and supervision Appropriate attention to precision and accuracy | <ul style="list-style-type: none"> Excellent laboratory/ research skills, required minimal teaching and supervision Appropriate attention to precision and accuracy, with minor lapses | <ul style="list-style-type: none"> Good laboratory/ research skills, required minimal teaching and supervision Appropriate attention to precision and accuracy with occasional lapses. | <ul style="list-style-type: none"> Good laboratory/ research skills, required some on-going teaching and supervision Limited attention to precision and accuracy | <ul style="list-style-type: none"> Poor laboratory/research skills, required constant teaching and supervision Limited attention to precision and accuracy | <ul style="list-style-type: none"> Extremely poor laboratory/ research skills, required constant teaching and supervision No attention to precision and accuracy |
| Laboratory Notebook _____/10 X 2 | <ul style="list-style-type: none"> The protocols for all experiments are described with enough detail to allow another researcher to follow with ease All data collected are presented or location of stored recorded. The data are clearly labelled. | <ul style="list-style-type: none"> The protocols for all experiments are described with enough detail to allow another researcher to follow All data collected are presented or location of stored recorded. The data are clearly labelled, with minor omissions | <ul style="list-style-type: none"> The protocols for most experiments are described with enough detail to allow another researcher to follow Most of the data collected are presented or location stored recorded. Most of the data are clearly labelled | <ul style="list-style-type: none"> The protocols for some but not all experiments are described with enough detail to allow another researcher to follow Not all of the data collected are presented or location stored recorded. Most data is clearly labelled | <ul style="list-style-type: none"> Some experimental protocols recorded, but without enough detail to allow another researcher to follow Poor record of data collected or location where it is stored. The data are not labelled. | <ul style="list-style-type: none"> No detail of experimental protocols recorded No record of data collected or location where it is stored. |
| Critical Analysis Skills _____/10 X 2 | <ul style="list-style-type: none"> Excellent knowledge of relevant literature and the ability to relate the relevant literature to interpretation of results Thorough awareness of limitations of the study and appreciation of future directions | <ul style="list-style-type: none"> Able to discuss, interpret and apply the relevant literature to own data with minimal supervisory guidance Good appreciation of the limitations of the data and can suggest future directions for the study | <ul style="list-style-type: none"> Able to discuss, interpret and apply the relevant literature to own data with some supervisory guidance Understands the limitations of the data and can suggest future directions for the study | <ul style="list-style-type: none"> Able to discuss, interpret and apply the relevant literature to own data but needed significant supervisory guidance Has some appreciation of the limitations of the data and future directions of the study | <ul style="list-style-type: none"> Limited ability to discuss, interpret the relevant literature. Relied on heavily on supervisor for critical analysis and interpretation of the data Has limited understanding of the limitations and future directions of the study | <ul style="list-style-type: none"> Has no knowledge of the relevant literature Unable to critically analyse and interpret own data Little or no appreciation of the limitations of the study. Unable to suggest future directions. |
| Written Communication Skills _____/10 X 2 | <ul style="list-style-type: none"> No supervisor contribution needed to complete assessment tasks Written work is excellent in every way. No correction necessary. Results presented suitable for publication, including appropriate graphical presentation and consistency in treatment of data | <ul style="list-style-type: none"> Minimal supervisor contribution needed to complete assessment tasks Written work is coherent well-structured and very easy to follow and read. Few corrections required. Results presented in a manner that is largely suitable for publication, including appropriate graphical presentation and consistency in treatment of data | <ul style="list-style-type: none"> Some supervisor contribution needed to complete assessment tasks Written work easy to read and follow. Few structure, grammatical or typographical errors present Presented results in a manner that is satisfactory but not necessarily ideal minor inconsistent in the presentation | <ul style="list-style-type: none"> Some supervisor contribution needed to complete assessment tasks Written work has many structure, grammatical or typographical errors. Results presented in a manner that is mostly satisfactory with some errors in the presentation | <ul style="list-style-type: none"> Significant supervisor contribution needed to complete assessment tasks Written work lacked structure and required significant correction of spelling and grammar. Results presented in a manner that is unsatisfactory with many errors | <ul style="list-style-type: none"> Large amount of supervisor contribution needed to complete assessment tasks Written work lacked structure. Very poor written English skills. Presentation of results inappropriate with many errors. Not all results presented. |