# Table of Contents

## People
- Meet the staff .......................................................... 3
- Help and support ...................................................... 6

## Laboratory
- What to bring to the lab ................................................ 6
- Using a laboratory notebook ........................................ 6
- Laboratory attendance ................................................ 7
- Absences ..................................................................... 7
- Pre-Lab Questions and Laboratory Reports ................. 8
- Hazards, Risks and Risk Assessments ......................... 8
- OH&S Information ...................................................... 10
- Glassware Guide and Errors ...................................... 13

## Additional Information
- Sustainability ............................................................. 14
- Good Scientific Practice ............................................. 14

## Writing Help
- Writing a full laboratory or project report .................. 16
- Writing an Executive Summary ................................. 26
- Reflective writing ...................................................... 28
- Learning Skills Unit (LSU) ......................................... 29

## Rules
- Plagiarism, collusion and consequences .................... 29
- Assessment regulations
  - Penalty for late submission of assessment ................. 31
  - Remark of assessment due to an error .................... 31
  - Repeating failed units .......................................... 32
  - Applying for special considerations ....................... 32
  - Viewing of assessment work .................................. 33
  - Hurdle Policy ....................................................... 34
  - Supplementary assessment policy .......................... 34
Meet the staff

<table>
<thead>
<tr>
<th>Head of School</th>
<th>Professor Phil Andrews</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="mailto:Phil.Andrews@monash.edu">Phil.Andrews@monash.edu</a></td>
</tr>
<tr>
<td></td>
<td>Room 121, Bld 23N Rainforest Walk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Associate Head Education</th>
<th>Associate Professor Kellie Tuck</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="mailto:Kellie.Tuck@monash.edu">Kellie.Tuck@monash.edu</a></td>
</tr>
<tr>
<td></td>
<td>Room 250, Bld23S Rainforest Walk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Associate Head International</th>
<th>Professor Tony Patti</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="mailto:Tony.Patti@monash.edu">Tony.Patti@monash.edu</a></td>
</tr>
<tr>
<td></td>
<td>Room 233, GCF Rainforest Walk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Associate Head Research</th>
<th>Professor Perran Cook</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="mailto:Perran.Cook@monash.edu">Perran.Cook@monash.edu</a></td>
</tr>
<tr>
<td></td>
<td>Room 238, Bld23 Rainforest Walk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Associate Head Postgrad Affairs</th>
<th>Dr David Turner</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="mailto:David.Turner@monash.edu">David.Turner@monash.edu</a></td>
</tr>
<tr>
<td></td>
<td>Room 123, Bld19 Rainforest Walk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chief Examiner Level 1</th>
<th>Professor Bayden Wood (Semester 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="mailto:Bayden.Wood@monash.edu">Bayden.Wood@monash.edu</a></td>
</tr>
<tr>
<td></td>
<td>Room G24A, Bld19 Rainforest Walk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chief Examiner Level 2</th>
<th>Dr Alison Funston</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="mailto:Alison.Funston@monash.edu">Alison.Funston@monash.edu</a></td>
</tr>
<tr>
<td></td>
<td>Rm G32B, Bld19 Rainforest Walk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chief Examiner Level 3</th>
<th>Associate Professor Katya Pas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="mailto:Katya.Pas@monash.edu">Katya.Pas@monash.edu</a></td>
</tr>
<tr>
<td></td>
<td>Room 124, Bld23N Rainforest Walk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chief Examiner Level 4 (Honours)</th>
<th>Associate Professor Michael Grace</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="mailto:Michael.Grace@monash.edu">Michael.Grace@monash.edu</a></td>
</tr>
<tr>
<td></td>
<td>Room G25C, Bld19 Rainforest Walk</td>
</tr>
</tbody>
</table>
# Academic Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor Phil Andrews</td>
<td>Emeritus Professor Roy Jackson</td>
<td><a href="mailto:Roy.Jackson@monash.edu">Roy.Jackson@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Phil.Andrews@monash.edu">Phil.Andrews@monash.edu</a></td>
<td>Associate Professor Christopher Thompson</td>
<td><a href="mailto:Chris.Thompson@monash.edu">Chris.Thompson@monash.edu</a></td>
</tr>
<tr>
<td>Rm 121, Bld 23N Rainforest Walk</td>
<td>Room G25B, Bld19 Rainforest Walk</td>
<td>Rm 119, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td>Professor Stuart Batten</td>
<td>Professor Cameron Jones</td>
<td><a href="mailto:Cameron.Jones@monash.edu">Cameron.Jones@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Stuart.Batten@monash.edu">Stuart.Batten@monash.edu</a></td>
<td>Associate Professor Kellie Tuck</td>
<td><a href="mailto:Kellie.Tuck@monash.edu">Kellie.Tuck@monash.edu</a></td>
</tr>
<tr>
<td>Rm 121, Bld19 Rainforest Walk</td>
<td>Rm 242, Bld23S Rainforest Walk</td>
<td>Rm 250, Bld23S Rainforest Walk</td>
</tr>
<tr>
<td>Dr Toby Bell</td>
<td>Professor Tanja Junkers</td>
<td><a href="mailto:Tanja.Junkers@monash.edu">Tanja.Junkers@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Toby.Bell@monash.edu">Toby.Bell@monash.edu</a></td>
<td>Dr David Turner</td>
<td><a href="mailto:David.Turner@monash.edu">David.Turner@monash.edu</a></td>
</tr>
<tr>
<td>Rm G32 Bld23S Rainforest Walk</td>
<td>Rm 220A, Bld23n Rainforest Walk</td>
<td>Rm 123, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td>Professor Louise Bennett</td>
<td>Associate Professor Lisa Martin</td>
<td><a href="mailto:Lisa.Martin@monash.edu">Lisa.Martin@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Louise.Bennett@monash.edu">Louise.Bennett@monash.edu</a></td>
<td>Dr Kellie Vanderkruk</td>
<td><a href="mailto:Kellie.Vanderkruk@monash.edu">Kellie.Vanderkruk@monash.edu</a></td>
</tr>
<tr>
<td>Rm G318, GCF Bld Rainforest Walk</td>
<td>Rm 157, Bld23S Rainforest Walk</td>
<td>Rm G19, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td>Dr Victoria Blair</td>
<td>Professor Don McNaughton</td>
<td><a href="mailto:Don.McNaughton@monash.edu">Don.McNaughton@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Victoria.Bair@monash.edu">Victoria.Bair@monash.edu</a></td>
<td>Dr Drasko Vidovic</td>
<td><a href="mailto:Drasko.Vidovic@monash.edu">Drasko.Vidovic@monash.edu</a></td>
</tr>
<tr>
<td>Rm G118, Bld23 Rainforest Walk</td>
<td>Rm G24, Bld19 Rainforest Walk</td>
<td>Rm 155, Bld23S Rainforest Walk</td>
</tr>
<tr>
<td>Emeritus Professor Alan Bond</td>
<td>Emeritus Professor Keith Murray</td>
<td><a href="mailto:Keith.Murray@monash.edu">Keith.Murray@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Alan.Bond@monash.edu">Alan.Bond@monash.edu</a></td>
<td>Professor David Lupton</td>
<td><a href="mailto:David.Lupton@monash.edu">David.Lupton@monash.edu</a></td>
</tr>
<tr>
<td>Room 132, Bld23 Rainforest Walk</td>
<td>Room 171, Bld23S Rainforest Walk</td>
<td>Rm 238, Bld23 Rainforest Walk</td>
</tr>
<tr>
<td>Professor Alan Chaffee</td>
<td>Professor Katya Pas</td>
<td><a href="mailto:Katya.Pas@monash.edu">Katya.Pas@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Alan.Chaffee@monash.edu">Alan.Chaffee@monash.edu</a></td>
<td>Professor Douglas MacFarlane</td>
<td><a href="mailto:Douglas.MacFarlane@monash.edu">Douglas.MacFarlane@monash.edu</a></td>
</tr>
<tr>
<td>Rm G223, Bld23N Rainforest Walk</td>
<td>Rm 124, Bld23N Rainforest Walk</td>
<td>Rm 328, GCF Bld Rainforest Walk</td>
</tr>
<tr>
<td>Professor Philip Chan</td>
<td>Dr Brett Paterson</td>
<td><a href="mailto:Brett.Paterson@monash.edu">Brett.Paterson@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Philip.Chan@monash.edu">Philip.Chan@monash.edu</a></td>
<td>Professor Philip Marriott</td>
<td><a href="mailto:Philip.Marriott@monash.edu">Philip.Marriott@monash.edu</a></td>
</tr>
<tr>
<td>Rm 243A, Bld19 Rainforest Walk</td>
<td>Rm 168, Bld23S Rainforest Walk</td>
<td>Rm G04, Bld23N Rainforest Walk</td>
</tr>
<tr>
<td>Emeritus Professor Glen Deacon</td>
<td>Professor Tony Patti</td>
<td><a href="mailto:Tony.Patti@monash.edu">Tony.Patti@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Glen.Deacon@monash.edu">Glen.Deacon@monash.edu</a></td>
<td>Professor Bayden Wood (Sem 1)</td>
<td><a href="mailto:Bayden.Wood@monash.edu">Bayden.Wood@monash.edu</a></td>
</tr>
<tr>
<td>Room 136, Bld19 Rainforest Walk</td>
<td>Rm 233, GCF Rainforest Walk</td>
<td>Rm 244A, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td>Professor Perran Cook</td>
<td>Dr Chris Ritchie</td>
<td><a href="mailto:Chris.Ritchie@monash.edu">Chris.Ritchie@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Perran.Cook@monash.edu">Perran.Cook@monash.edu</a></td>
<td>Dr Xiny Zhang</td>
<td><a href="mailto:Xiny.Zhang@monash.edu">Xiny.Zhang@monash.edu</a></td>
</tr>
<tr>
<td>Rm G25A, Bld19 Rainforest Walk</td>
<td>Rm 253 Bld23 Rainforest Walk</td>
<td>Rm G24A, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td>Professor Bart Folland</td>
<td>Professor Andrea Robinson</td>
<td><a href="mailto:Andrea.Robinson@monash.edu">Andrea.Robinson@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Bart.Folland@monash.edu">Bart.Folland@monash.edu</a></td>
<td>Associate Professor Jie Zhang</td>
<td><a href="mailto:Jie.Zhang@monash.edu">Jie.Zhang@monash.edu</a></td>
</tr>
<tr>
<td>Rm 232 GCF Bld Rainforest Walk</td>
<td>Rm 114C, Bld19 Rainforest Walk</td>
<td>Rm 145, Bld 19 Rainforest Walk</td>
</tr>
<tr>
<td>Dr Alison Funston</td>
<td>Associate Professor Kei Saito</td>
<td><a href="mailto:Kei.Saito@monash.edu">Kei.Saito@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Alison.Funston@monash.edu">Alison.Funston@monash.edu</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rm G32B, Bld19 Rainforest Walk</td>
<td>Rm 227, GCF Bld Rainforest Walk</td>
<td></td>
</tr>
<tr>
<td>Associate Professor Michael Grace</td>
<td>Associate Professor Rico Tabor</td>
<td><a href="mailto:Michel.Grace@monash.edu">Michel.Grace@monash.edu</a></td>
</tr>
<tr>
<td>Rm G25C, Bld19 Rainforest Walk</td>
<td>Rm G24B, Bld19 Rainforest Walk</td>
<td></td>
</tr>
<tr>
<td>Emeritus Professor Milton Hearn</td>
<td>Dr Boon Teo</td>
<td><a href="mailto:Milton.Hearn@monash.edu">Milton.Hearn@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Milton.Hearn@monash.edu">Milton.Hearn@monash.edu</a></td>
<td><a href="mailto:Boon.Teo@monash.edu">Boon.Teo@monash.edu</a></td>
<td></td>
</tr>
<tr>
<td>Room 228 GCF Bld Rainforest Walk</td>
<td>Rm G20, Bld23 Rainforest Walk</td>
<td></td>
</tr>
<tr>
<td>Dr Joel Hooper</td>
<td>Professor San Thang</td>
<td><a href="mailto:Joel.Hooper@monash.edu">Joel.Hooper@monash.edu</a></td>
</tr>
<tr>
<td><a href="mailto:Joel.Hooper@monash.edu">Joel.Hooper@monash.edu</a></td>
<td><a href="mailto:San.Thang@monash.edu">San.Thang@monash.edu</a></td>
<td></td>
</tr>
<tr>
<td>Rm 242, Bld23 Rainforest Walk</td>
<td>Rm 252, Bld23 Rainforest Walk</td>
<td></td>
</tr>
</tbody>
</table>
### Professional Staff

<table>
<thead>
<tr>
<th>Professional Role</th>
<th>Name</th>
<th>Email</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School Manager</strong></td>
<td>Dr Georg Beilharz</td>
<td><a href="mailto:georg.beilharz@monash.edu">georg.beilharz@monash.edu</a></td>
<td>Room 33, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td><strong>Senior Technical Officer</strong></td>
<td>Dr Peter Nichols</td>
<td><a href="mailto:Peter.Nichols@monash.edu">Peter.Nichols@monash.edu</a></td>
<td>Room G38, Bld23S Rainforest Walk</td>
</tr>
<tr>
<td><strong>Laboratory Manager (1st Year)</strong></td>
<td>Mrs Mary-Rose Carroll</td>
<td><a href="mailto:mary-rose.carroll@monash.edu">mary-rose.carroll@monash.edu</a></td>
<td>Room G04, GCF Bld Rainforest Walk</td>
</tr>
<tr>
<td><strong>Executive Assistant (HoS)</strong></td>
<td>Mrs Josephine Peters</td>
<td><a href="mailto:Josephine.Peters@monash.edu">Josephine.Peters@monash.edu</a></td>
<td>Room 129, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td><strong>Moodle Administrator</strong></td>
<td>Dr Helmy Cook</td>
<td><a href="mailto:helmy.cook@monash.edu">helmy.cook@monash.edu</a></td>
<td>Room 125, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td><strong>Research Studies</strong></td>
<td>Ms Anna Severin</td>
<td><a href="mailto:Anna.Severin@monash.edu">Anna.Severin@monash.edu</a></td>
<td>Room 317, GCF Bld Rainforest Walk</td>
</tr>
<tr>
<td><strong>Manager X-ray Diffraction Service</strong></td>
<td>Dr Craig Forsyth</td>
<td><a href="mailto:craig.forsyth@monash.edu">craig.forsyth@monash.edu</a></td>
<td>Room G48, Bld23S Rainforest Walk</td>
</tr>
<tr>
<td><strong>Senior Technical Officer</strong></td>
<td>Mr Finlay Shanks</td>
<td><a href="mailto:Finlay.Shanks@monash.edu">Finlay.Shanks@monash.edu</a></td>
<td>Room 127, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td><strong>Senior Administrative Gradate</strong></td>
<td>Ms Rebecca Stoios</td>
<td><a href="mailto:Rebecca.Stoios@monash.edu">Rebecca.Stoios@monash.edu</a></td>
<td>Room G04, GCF Bld Rainforest Walk</td>
</tr>
<tr>
<td><strong>Technical Officer</strong></td>
<td>Mrs Rodney Hall</td>
<td><a href="mailto:rodney.hall@monash.edu">rodney.hall@monash.edu</a></td>
<td>Room 103, Bld23S Rainforest Walk</td>
</tr>
<tr>
<td><strong>Technical Officer</strong></td>
<td>Mrs Maria Triantis</td>
<td><a href="mailto:Maria.Triantis@monash.edu">Maria.Triantis@monash.edu</a></td>
<td>Room 103, GCF Bld Rainforest Walk</td>
</tr>
<tr>
<td><strong>Technical Officer</strong></td>
<td>Mr Phil Holt</td>
<td><a href="mailto:Phillip.Holt@monash.edu">Phillip.Holt@monash.edu</a></td>
<td>Room 221, Bld23N Rainforest Walk</td>
</tr>
<tr>
<td><strong>Technical Officer</strong></td>
<td>Mrs Liza Verdan</td>
<td><a href="mailto:Liza.Verdan@monash.edu">Liza.Verdan@monash.edu</a></td>
<td>Room 127, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td><strong>Platform Manager</strong></td>
<td>Dr George Khairallah</td>
<td><a href="mailto:George.Khairallah@monash.edu">George.Khairallah@monash.edu</a></td>
<td>Room G45, Bld23N Rainforest Walk</td>
</tr>
<tr>
<td><strong>Reception</strong></td>
<td>Ms Sarah Williams</td>
<td><a href="mailto:Sarah.Williams@monash.edu">Sarah.Williams@monash.edu</a></td>
<td>Room 127, Bld19 Rainforest Walk</td>
</tr>
<tr>
<td><strong>Technical Officer</strong></td>
<td>Dr Shah Moghaddam</td>
<td><a href="mailto:Jamileh.Moghaddam@monash.edu">Jamileh.Moghaddam@monash.edu</a></td>
<td>Room G04, GCF Bld Rainforest Walk</td>
</tr>
<tr>
<td><strong>Senior Synthetic Lab Coordinator</strong></td>
<td>Dr Clint Woodward</td>
<td><a href="mailto:Clint.Woodward@monash.edu">Clint.Woodward@monash.edu</a></td>
<td>Room 103, GCF Bld Rainforest Walk</td>
</tr>
<tr>
<td><strong>Technical Officer</strong></td>
<td>Dr Boujemaa Moubaraki</td>
<td><a href="mailto:Boujemaa.Moubaraki@monash.edu">Boujemaa.Moubaraki@monash.edu</a></td>
<td>Room G39A, Bld23S Rainforest Walk</td>
</tr>
</tbody>
</table>

Room: Rainforest Walk
Help and Support: Science Student Services

We are here to guide and support you during your time at Monash. There are many support services and study resources available to you. You can come and see us for assistance with any of the following:

- course advice
- assistance in deciding on your major
- re-enrolment assistance
- help sorting through the (sometimes confusing) processes and requirements related to your course
- Administrative procedures

1800 MONASH (1800 666 274)

- Complete a Course Progression Check request form.
- Send a question through ask.monash.

Clayton Campus

19 Rainforest Walk,
Clayton, Victoria, 3800, Australia

What to Bring to the Lab

During your lab session, you will have access to all glassware, equipment and chemicals that you will need. You will also need the following:

- Your laboratory manual.
- A dedicated laboratory notebook (stapled A4), ruler, calculator and pen.
- Protective clothing (laboratory coat) to protect you and your ordinary clothing from damage by chemicals or fire.
- Fully enclosed shoes with firm soles are required at all times when in the laboratory. Note: You will be asked to leave the laboratory if you wear open-toe or other inappropriate footwear (including thongs, sandals, ballet shoes and slippers) during your lab session.
- Laboratory safety glasses which must be worn at all times during lab. Students who wear contact lenses should purchase special wrap-around safety goggles.

Using a Laboratory Notebook

All experimental records and field data must be recorded in a laboratory notebook. This should be a bound, preferably A4 notebook. Recording results on the practical manual, pieces of paper towel, scrap paper and loose notepaper is strictly forbidden!
A typical lab notebook entry should include:

- Your name and names of any partners.
- Title of experiment.
- Date commenced and finished.
- Details of any changes you made to the method, or details of any experimental method that you designed yourself.
- All experimental observations and calculations. Preparing tables beforehand will save you time in the lab.
- It is also helpful to make notes of any unusual events or outcomes (e.g. unexpected results) and possible explanations discussed with your demonstrator. This makes writing your discussion section of your report much easier.

Laboratory Attendance

The laboratory component is a hurdle requirement for all units. If you arrive late, you will miss the safety briefing, and will not be permitted to commence the class. The doors to the lab will close 15 minutes after the labs commence and attendance may not be permitted after this time. The pre-lab exercise must be completed and passed, prior to laboratory entry.

It is your responsibility to ensure that the workspaces used are thoroughly cleaned and dried, and that all equipment is put away before you leave.

Note: The School of Chemistry takes your well-being and safety, and that of everyone in the laboratory, very seriously. As such, you can be asked to leave the laboratory for the following reasons (see OHS Rules and Safety Precautions):

- Aggressive, offensive, or intimidating behaviour
- Behaviour which is deemed to be hazardous to yourself and/or class mates
- Wearing inappropriate footwear
- Not wearing appropriate safety equipment
- Using mobile phones in the laboratory

Absence

If you are unavoidably absent from any session you should inform the lab staff as soon as possible. If you are absent due to illness, you should provide a copy of your medical certificate and a completed in-semester special consideration form to your unit coordinator as soon as possible. These MUST be supplied if applying for a reschedule or an exemption. If you are absent due to exceptional circumstances beyond your control, provide a completed in-semester special consideration form along with supporting documentation as soon as possible. If there are exceptional circumstances beyond your control that mean you may miss a laboratory session and you know in advance, provide a completed in-semester special consideration form along with supporting documentation as early as possible. You may also be eligible for special consideration if you can show your obligation to military service, jury service, emergency services (e.g. CFA) or Monash Sport's athlete support program, if you are participating in a key event.
Where possible, arrangements will be made to reschedule the missed exercise. As per faculty policy, students are eligible for *only one laboratory session exemption per semester* and then only upon approval of a special consideration application.

If you have serious difficulties of any kind throughout the year, you should also notify the Faculty of Science Office in writing and talk to your unit coordinator/s or year level coordinator. For more information, refer to the Unit Guide for that unit.

**Pre-Lab Questions and Laboratory Reports**

Pre-lab questions must be completed online, via Moodle, before each laboratory session. The pre-lab questions are a hurdle and must be passed in order to be allowed to complete the practical exercise. If a pass mark has not been obtained for the pre-lab questions, then you will not be able to do the practical exercise or reschedule. Please note that no exemptions are given for the pre-lab questions. Please note that all results must be written in pen (not pencil), as per industry standards. This standard protects you by showing your work is original and has not been altered. It also ensures that your documents will scan properly for Moodle. Reports written in pencil will not be accepted. Graphs can be plotted in pencil.

**Hazards, Risks and Risk Assessments**

**Hazard**

The **potential** to do harm, due to the **inherent nature** of the object or situation.

E.g. The blade of a sharp knife
- The volatility, flammability and dense vapour of diethyl ether
- An electric hotplate, which has been turned on
- The corrosive properties of a concentrated hydrochloric acid solution

You need to be able to IDENTIFY hazards so that you can consider possible risks.

When you have identified the hazards, find out more about them as necessary.

**Risk**

The **probability** that a harm may actually happen. E.g.

- There is a risk of cutting yourself if a sharp knife is used incorrectly
- There is a risk that diethyl ether will catch fire if it is used in the proximity of a source of ignition
- There is a risk of burning yourself if you happen to touch the top of an electric hotplate which has been left on
- There is a risk of causing a flood in a laboratory if the running water from the tap is not directed down a suitable drain
- There is a risk of incurring a skin burn from hydrochloric acid if it is spilt on the skin when transferring some of the acid and you do not either wash it off quickly or use protective gloves

There actually has to be a **potential for exposure** to the hazard. E.g.

- There is no risk of fire from diethyl ether if the container is closed and it is stored safely and there is no source of ignition
Risk Assessments

The **process** used to minimise harm:
- Identify the hazard
- Determine the risk (see Table 1.1)
- Categorise the risk based on the **likelihood** of exposure and the **consequence** of exposure
- Decide on appropriate means of controlling/minimising risk, and disposing of waste produced
- Implement these measures and proceed

There are risks we assess every day on the road (e.g. travelling through an intersection when the lights are changing!) Risk assessments MUST be carried out before proceeding with any practical work.

To complete your risk assessment you will need to know the possible risks of each chemical or situation (e.g. broken glassware, use of electrical appliances). The SDS (Safety Data Sheet) will need to be consulted for each chemical. When you consult the SDS sheet look under HAZARDS IDENTIFICATION to help you determine the risk. Look under ACCIDENTAL RELEASE MEASURES to help you complete controlling the risk. A sample risk assessment is reproduced below. If there are not enough boxes on the Hazard Identification and Risk Assessment sheet then continue on a separate sheet of paper OR divide each row into two rows.

When working with chemicals it is very important that you understand what you are working with, what you are doing, and why. To write a Risk Assessment (see Table 1.2 on the next page) you need to list your materials and read all relevant notes about a chemical’s behaviour in the SDS. Categorise the risk and discuss with demonstrator if you have any questions. Lists the control measures that are relevant for the chemical you are using e.g. use of fumehood; wearing safety glasses and lab coat.


**Table 1.1**: Risks can be categorised as Low, Medium, High or Extreme.

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Almost Certain</th>
<th>Likely</th>
<th>Possible</th>
<th>Unlikely</th>
<th>Rare</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Injury</td>
<td>First aid treatment</td>
<td>Medical treatment</td>
<td>Admission to hospital</td>
<td>Fatality/permanent disabling injury</td>
</tr>
<tr>
<td>Insufficient</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Likely</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Extreme</td>
</tr>
<tr>
<td>Possible</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Unlikely</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Rare</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>
Table 1.2: Laboratory Exercise Partial Risk Assessment

<table>
<thead>
<tr>
<th>Identify the HAZARD – The POTENTIAL to do harm (i.e. the chemical or situation)</th>
<th>Determine the RISK – The PROBABILITY that harm may result (i.e. what could occur, and the Risk rating associated with it)</th>
<th>CONTROL the Risk – PREVENTING an incident (i.e. how do you minimise the risk, and therefore prevent it from happening)</th>
<th>DISPOSAL of WASTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>dichloromethane</td>
<td>Limited evidence of a carcinogenic effect. Medium Risk</td>
<td>Wear safety glasses, lab coat, gloves (PPE). Avoid breathing vapours, mist or gas. Work in fume hood.</td>
<td>Halogenated waste carboy in fume cupboard</td>
</tr>
<tr>
<td>sodium bicarbonate</td>
<td>Non-hazardous. Low Risk</td>
<td>Wear safety glasses, lab coat, gloves (PPE). Avoid breathing dust formation.</td>
<td>Corrosive waste carboy in fume cupboard</td>
</tr>
<tr>
<td>sucrose</td>
<td>Non-hazardous. Low Risk</td>
<td>Wear safety glasses, lab coat, gloves (PPE). Avoid breathing dust formation.</td>
<td>Solid waste container</td>
</tr>
<tr>
<td>aspirin</td>
<td>Harmful if swallowed. Irritating to eyes, respiratory system and skin. Medium Risk</td>
<td>Wear safety glasses, lab coat, gloves (PPE). Avoid breathing dust formation.</td>
<td>Solid waste container</td>
</tr>
<tr>
<td>electrical appliances</td>
<td>Possible risk of electrocution if in contact with water. Low Risk</td>
<td>Take care with use. Ensure appliances are tested annually. Minimise interaction with water.</td>
<td>N/A</td>
</tr>
<tr>
<td>broken glassware</td>
<td>Sharp when broken Cuts and stab wounds from sharp edges possible. Medium Risk</td>
<td>Take care with use of glassware. Do not handle broken glass – use dust pan and brush to collect.</td>
<td>Broken glass / contaminated glass bin</td>
</tr>
</tbody>
</table>

OH&S Information for Undergraduate Students

**Safety Rules**

- Shoes covering the **whole** foot must be worn. Thongs, sandals and ballet flats are never allowed.
- Full-length lab coats must be worn at all times.
- Safety glasses must be worn at **all** times in the proper manner (OH&S Regulations).
- No eating, drinking, or smoking.
- Long hair must be tied back.
- Any injury must be reported to the demonstrator and to the laboratory staff.
- No visitors to the lab are allowed.
- Do not run in any part of the chemistry department.
- All accidents must be reported to your demonstrator.
- Any intoxicated student will be required to leave the laboratory immediately.
- No mobile phone use in the laboratory at any time.
Safety Precautions

Notify your demonstrator or the laboratory staff of any incident, hazard, or equipment fault that you become aware of.

- **Fire must be avoided.** Most volatile organic compounds are inflammable and must never be used near a naked flame. Check with your demonstrator before working with solvents.
- **Fire on the bench** can often be extinguished by smothering with a fire blanket or damp rag. Fire extinguishers are provided for use by trained personnel i.e. your demonstrator or laboratory staff.
- **Clothing on fire.** Get the person on the floor as quickly as possible and roll them to smother the fire. (Damage to respiratory passages and eyes may be caused if the person remains standing.) Fire extinguishers must not be used to extinguish burning clothing. A safety shower or fire blanket should be used.
- Chemicals may constitute a hazard because of toxic or corrosive action as well as from fire. In many instances use of a dispenser will be recommended.
- Chemicals on the skin or in the eyes should be removed immediately by washing with plenty of water. Safety shower and eyewash facilities are located throughout the labs.
- If a chemical is spilt on the bench or floor, consult your demonstrator about safe ways of cleaning it up. Ensure chemically contaminated waste is not placed in the general rubbish!
- Chemicals with toxic or irritating vapours will be placed in the fume hoods and must be kept there. Some chemicals that need special care in handling are:
  - strong acids and alkali (bases)
  - bromine, phenols, cyanides, sulfides
  - toxic chlorinated solvents such as dichloromethane
  - highly flammable solvents such as acetone

Your Roles and Responsibilities

Like all other members of Australian society, you have the right to a healthy and safe environment in which to work and study. Monash University has an extensive network of Occupational Health and Safety staff and facilities, whose purpose is to ensure that this goal is achieved.

- As a student at Monash University, you also have certain roles and responsibilities in relation to Occupational Health and Safety, in order to help ensure your own health and safety and that of other students, staff, visitors to the University and the public. These are summarised below.
- A wide range of OHS resources are available to you, some of which are listed below, but you are also encouraged to seek out further information in this area. If you have any questions or concerns about any of this, or about any other OHS issues, please discuss them with any of the contact people listed below.

General

- You must read and understand this given information before undertaking practical classes.
- The School’s academic and technical staff will give you specific information relating to the location of OHS facilities in your lecture theatre or laboratory, and details of practical classes in
which you are involved. You must listen to this information and comply with any health and safety instructions.

- If you are ever unsure of the correct and safe procedure to be followed, ask one of the technical or academic staff. Do not rely on information from other students.

Evacuations

- You should ensure you are aware of the location of fire exits, extinguishers and other emergency facilities in your laboratory or lecture theatre, and of the point at which you should assemble after an evacuation. This information is available from the academic or technical staff in the area, and is clearly signposted.
- You should also ensure that you are aware of the meaning of the different tones produced by the alarm system. Drills will be held regularly to assist with this.
- You have a responsibility to ensure that if an alarm sounds you behave sensibly and do not panic. This includes heeding the alarms tones, listening carefully to all voice announcements, complying with instructions from Wardens, and if necessary evacuating in a calm and orderly fashion and proceeding directly to the nominated assembly point.

First Aid

- You should not provide first aid or emergency medical assistance to any person unless you have received formal First Aid training.
- However, you should be aware that most of the technical staff in your laboratory have been formally trained in First Aid, Asthma Management, etc.
- You should also make sure that you are aware of the location of all emergency facilities in your laboratory (eye-wash stations, safety showers, etc). The technical staff will give you this information at your first laboratory session and facilities are clearly signposted.

Incident Reporting

- In the past, some people have been reluctant to report incidents because they feel they might get someone else into trouble. However, the reporting process is not intended for that purpose! We would prefer you to think of it as a way of letting us know about an issue so we can make sure it is resolved before anyone gets into trouble.
- So, if you witness or are involved in an incident which you feel may have safety or security implications, whether or not anyone was hurt, please report it as soon as practical to one of the contact people listed below.

Key OHS Contact People

- Any of the School's technical staff.
- Dr Boujema Moubaraki, Safety Officer (School of Chemistry, 9905-4798)
- Dr. Craig Forsyth, Radiation Safety Officer (School of Chemistry, 9905-4588)
- Professor Phil Andrews, Head of School (School of Chemistry, Phil.Andrews@monash.edu)
- Debra Bartolo, OH&S Consultant, Faculty of Science (9905-0222)
Laboratory Glassware Guide: Identification and Error

- **Beaker**
- **Erlenmeyer/Conical Flask**
- **Side-arm Filter Flask**
- **Buchner Funnel**
- **Schott Bottle**

- **Short-stemmed Glass Funnel**
- **Long-stemmed Glass Funnel**
- **Watch Glass**
- **Hirsch Funnel**
- **Micro Test Tube**

- **Weighing Vial**
- **Auto Pipette**
- **Bulb-pipette Filler**
- **Plastic Cuvette**

- **Graduated/Measuring Cylinder**
  - Errors:
    - 10 mL ± 0.2 mL
    - 25 mL ± 0.5 mL
    - 100 mL ± 0.75 mL

- **Graduated Pipette**
  - Errors:
    - 2 mL ± 0.02 mL
    - 5 mL ± 0.04 mL
    - 10 mL ± 0.10 mL

- **Standard/Volumetric Flask**
  - Errors:
    - 25 mL ± 0.04 mL
    - 50 mL ± 0.05 mL
    - 100 mL ± 0.08 mL

- **Burette**
  - Error:
    - 25 mL ± 0.05 mL

- **Volumetric/Bulb Pipette**
  - Errors:
    - 5 mL ± 0.015 mL
    - 10 mL ± 0.020 mL
    - 25 mL ± 0.050 mL
Sustainability

Students are often very concerned about using another pair of gloves as they see it as wasteful but the true environmental impact of a lab is in chemical waste produced and energy/water used. Clean gloves will keep you safe so do not skimp! Scaling down a reaction saves on purchase of chemicals, lowers risks during the experiment and reduces disposal costs. These are the sort of positive changes we can make that even improve safety.

Building operations can have significant impacts on the environment, this is especially true for buildings with laboratories, which consume four to five times more energy than buildings without labs. Due to the nature of laboratory-based research, labs use considerably more water and other resources while also generating environmentally harmful waste. For instance, the Green Chemical Futures building uses three times more water than the Hargrave-Andrew Library building, which is a similar sized building.

Many pieces of lab equipment need to operate continuously (e.g. ice machine, NMR), contributing to the high energy demands, but there are numerous opportunities to reduce energy and resource consumption through adapting user behaviour. Simple steps, such as shutting the sash on a fumehood when not working in it, will reduce the total energy required to operate continuously. A fumehood with a fully opened sash costs eight times more to run and produces 25.4 tonnes of CO2 more than a closed sash fumehood per year. It also makes good safety sense to shut the fumehood as the further it is open the easily it is for chemical fumes and particulate matter to escape and circulate in the lab.

Throughout your lab practicals think about how to work in the lab to minimise energy and resource consumption while maintain a safe and effective research environment. These are valuable skills you will take with you into further research and your careers in the lab. Good environmentally sustainable behaviour does not stop at the lab door!

Good Scientific Practice (GSP)

The development of Good Scientific Practice or GSP

For life in the scientific workplace it is essential that you learning Good Scientific Practice or GSP. To help you identify examples of GSP we label some examples with the icon to the right. GSP includes routine things like taking detailed notes and ensuring you use instrument instructions to keep you and the equipment safe. GSP also includes health and safety issues, for example making sure you read and understand the risk assessment as well as understanding your rights and responsibilities when you work in a lab.

GSP also includes understanding what plagiarism is and how to avoid it, accurate reporting of results, sharing data in a timely manner with teammates, recording correctly the correct units and using significant figures as well as learning to write up your data and reports correctly.
How to write about errors

There are a number of errors that need to be discussed in science. These can generally be classified into experimental errors or human errors. Experimental errors include errors due to the inherent limitations of your apparatus, instrument and glassware. For example, it is assumed that a balance is accurate to no more than half the last digit, so if you have a reading of 1.52 g you would say your error is ±0.005 g. High precision glassware will have the error printed on it. Some examples of this can be seen in section (xvii) below. Experimental errors are important to mention and discuss in your discussion.

Human errors include accidental changes to your procedure/method, incorrect procedures (e.g. your followed the wrong procedure) and accidents like spilling/dropping your sample. It is important to record and discuss these errors too but it is important to know when and how to deal with them. For example, it is valid to record that you spilt your sample and had to use another student’s material for analysis. This is a perfectly reasonable step to take (in consultation with your demonstrator).

However, it is not valid to observe that you have an incorrect result (e.g. highly variable titration results) and say it must have been human error or that it might have due to experimental error; you need to suggest how and why an error would cause the variation you are seeing.

Some valid observations might be that you and your partner are getting different results and that is causing the variation. You might report difficulty achieving the same colour at the end point each time. You might report that your results were getting more similar as you progressed and given more time you can see you would have achieved consistent results. These are all valid observations.

Standard Operating Procedures (SOPs)

Standard Operating Procedures are very like instructions but they often tell you more too. For instance, we have included some help on how to report your data and how to clean equipment. SOPs ensure that everyone is using the instrument in a way that gets the best results and keeps the instrument in good working condition as well as safe. Most scientific equipment is very expensive to purchase and maintain so it is critical that you follow SOPs to keep the instruments in working order. Of course using SOPs is Good Scientific Practice.

SOPs allow you to very easily record how you did something because (as long as you stick to the method) you just record which SOP you used. This should include the name and the version number. Make sure to note anything you do that is not included on the SOP.
Writing Practical and Project Reports
Amended from Study and Communication Skills for Chemical Sciences, Overton, Johnson & Scott, OUP, 2014

Here we present some guidance on writing up a full laboratory report. We use the context of an investigation of the hardness of tap water by analysing the concentrations of calcium and magnesium ions by a complexometric titration.

1. Use an appropriate writing style
The principles of writing for a practical report are the same as those for other pieces of scientific writing. The key point to remember is that you are writing for a professional readership and therefore you need to write in a formal, scientific style.

1.1 Choose the right voice
The report should be written in the third person, passive in order to convey the impression that the procedures/results are independent of the operator. If appropriate, the report should enable the reader to repeat the work that you carried out (and obtain the same results). So the phrase: ‘I carried out three titrations…….’ becomes: ‘Three titrations were carried out…….’ Likewise: ‘On the basis of these findings, we concluded that…’ becomes: ‘On the basis of these findings, it was concluded that…’ This is known as writing in the passive voice.

1.2 Write in the past tense
You should describe what was done, or what was concluded. The only exceptions to this are when you are discussing illustrations or data presented in the report and the conclusions you can draw from them. For example: ‘Table 1 shows the titres for the three samples…’ or ‘The conclusion of this report is that the hardness of tap water……’.

1.3 Use appropriate illustrations
Examples of the use of illustrations could be:
- structures of molecules;
- reaction schemes;
- diagrams of apparatus;
- diagrams of atomic and molecular orbitals, bonding interactions;
- spectra from instrumental analysis;
- graphs and tables of results.

There are some key points to remember when including illustrations (see also section 3)
1. Produce your own illustrations, don’t copy and paste a diagram from a website: don’t forget that the rules of plagiarism apply as much to drawings as to the written word.
2. Give each illustration a figure (or table) number and refer to it from the text, don’t just leave it as an ‘add on’.
3. Give each illustration (or table) a title (sometimes called a legend) so that the reader can see what is being shown.
4. The figure number and title are usually placed below the associated figure (Figure 1). Table numbers and titles are usually placed above the associated table (Table 1).
5. All axes on graphs must be labelled with associated units if appropriate (Figure 1).
6. Each figure must be specifically mentioned in the text.
1.4 Take care with units
You should always use SI units unless directed otherwise by your tutor. Most units have an accepted abbreviation, for example, mol for mole, g for gram, s for second. A very common mistake is to leave out the space between a number and its units, for example, 25cm\(^3\) rather than the correct 25 cm\(^3\).

1.5 Do not capitalise names of elements and compounds
Except at the start of a sentence you should never capitalize the name of an element or compound. For example, you would not say ‘take 100 g of Sugar’ so you should not say ‘take 1 g Carbon’ or ‘3 g of Potassium Chloride’.

1.6 Use correct plurals and singular terms
Care should be taken when using the plural or singular versions of terms used in science. So, for example, spectrum is singular, the plural is spectra not spectrums. Note that in modern usage, the term for more than one formula is usually ‘formulas’ rather than the older ‘formulae’.

1.7 And other conventions to watch out for
When latin terms or abbreviations are you should always italicise them, for example, et. al., versus, ab initio, in vitro. Don’t start sentences with numbers, always convert to words or rephrase. So don’t say ‘25 g of sodium chloride…’ Rephrase to ‘A 25 g sample of sodium chloride…’

2. Get the structure right
The usual format of a laboratory report is as follows:
- title;
- introduction;
- methods;
- results;
- discussion;
- conclusion;
- references;
- appendix.

2.1 Title
The title must be brief and informative, so that the reader can see at once what the paper is about. Have a look at the three sample titles below, all of which describe the same investigation.

- An investigation into the temporary and permanent hardness of local tap water by a titrimetric method utilizing the sodium salt of ethylenediaminetetraacetic acid.
- Investigating the hardness of tap water by titration with EDTA.
- How hard is tap water?

Which title provides the key information most efficiently? The first title is unnecessarily long, though it does contain all the essential information. The third title is too brief since it does not give any indication of the basis of the experiment and is too informal. The second title contains all the essential detail for the reader to know whether to read further or not.
2.2 Introduction
The introduction is the section of the report in which you describe the background and aims of the study. You might like to think of this section as addressing four questions.

- What has been done before?
- What still needs to be resolved?
- Why is it important to resolve this question?
- What do I aim to do?

A useful approach to drafting the Introduction is to start by setting out the aims of your study (‘what do I hope to find out?’) as a series of bullet points. Keep this list of aims in front of you while you are researching and writing the background to the study so that you keep clearly focused on the topic and don’t start writing about side issues.

You may need to read published papers on the topic of your investigation so that you can write a brief overview of the research that is underpinning your study. The skill in drafting this part of the introduction lies in writing a succinct summary of the findings of the previous authors and of the experimental evidence supporting those findings. As with all such writing, it is important that you present the material in your own words and fully reference the statements.

The background text is normally presented as a factual account without discussion of the ideas presented in those papers. In most areas of research, there are areas of knowledge that are accepted as agreed and that you can describe as the background to the study. Developing from these, there will be areas where there is still disagreement, or questions remaining to be answered. In the case of disagreements in the published research, you will need to present both sides of the argument. This is best done simply by presenting your synopsis of the two views in sequence. Thus, you might write:

*Derby and Joan [2] concluded, on the basis of laboratory observations, that the main product from the synthesis was the para isomer. However, in a more recent study, Bonnie and Clyde [3] reported that meta isomer was the major product.*

In the case of addressing questions still to be answered, you might phrase your statements as:

*Derby and Joan [2] concluded, on the basis of laboratory observations, that the para isomer was the favoured product of the reaction. However, it is unclear whether this isomer remains the major product when the reaction is carried out under acidic conditions.*

Your description of the background to the study should, therefore, leads the reader to understand the scientific basis of the study and from there be provided with an explanation of what is still not understood and why it is important that it should be understood. On that basis, you can then explain the aims of the study you have undertaken.

It is inevitable that, for many of your practical classes, you will not be aiming to resolve current controversies or discover the solution to a specific question in science. Despite this, it is important
that you can research the background to the study and present it as a synopsis, in your own words, of the scientific knowledge and can set out the aims of your experiment, based on that knowledge.

2.3 Methods
The methods section of the report is where you describe:
- what you did;
- how you did it;
- what you used to do it.

The methods section should be written in such a way that another scientist could repeat your work on the basis of your descriptions, and obtain the same results, but not with excessive detail.

Think of this section in terms of preparing a recipe for baking a cake. When you read a recipe, you need to know:
- what ingredients to use;
- how much of each;
- how to mix them together;
- what type of baking tin to use;
- what oven temperature to bake it at and for how long;
- how to analyse the results (eat it!).

Although you are describing what you did, you should still remember to write in the passive voice: ‘The concentration was determined by...’ rather than ‘I measured the concentration by...’

It is a fine balance between being concise and providing sufficient information. For example. For the titration of tap water with EDTA compare the two following extracts:

25 cm$^3$ aliquots of the tap water were transferred to an Erlenmeyer flask and titrated against 0.05 M EDTA solution using Eriochrome Black T indicator until a permanent blue end point.

A pipette was used to transfer a 25 cm$^3$ aliquot to an Erlenmeyer flask. Eriochrome Black T indicator was added and the flask was swirled. A pipette was rinsed with the 0.05 M EDTA solution provided and then filled to the mark using a small funnel. The tap water was titrated, with constant swirling, until an intense permanent blue colour was formed in the flask.

Both of these passages give enough detail to repeat the procedure but the second one contains too much detail. We assume that the person reading knows how to use a pipette and a burette and the fact that a small funnel was used is not necessary to know.

Chemicals
When listing chemicals or other substances that were used you should give the name of the chemical in full (e.g. sodium hydrogen carbonate) and/or its chemical abbreviation (e.g. NaHCO$_3$), along with the amount used. It is important to be consistent in style used throughout so do not switch between names and chemical abbreviations.
Specialist equipment
When describing the equipment used, the amount of detail you need to give again depends on the degree of specialization. For example, if you are stating that you used 3 g of sodium bicarbonate, you don’t need to give details of the balance used to weigh out the chemical. However, you might have used a specialist piece of equipment for your experiment, for example, a NMR spectrometer. In this case, you should give the details of the equipment such as the manufacturer and the model number.

2.4 Results
The results section is the core of the report. Here, you describe and show what was found along with the analyses of those findings. You should aim to lead the reader through the findings, highlighting the important features. You do not, however, attempt to interpret or explain the results in any way: this section is a factual description.

When writing the results section, you should use your data to tell a story. It is very important that the text you write can stand on its own in terms of communicating the key points. The graphs, tables, and other images are then used to support the description. A common error in students' results sections is for the data simply to be presented as the graphs and tables with little or no explanatory text, leaving the reader with the task of trying to work out what is important. So rather than write…

The results for the analyses are shown in Table 1.

It is much better to write…

From Table 1 it can be seen that there was no significant difference between the hardness of water taken from different points in the city.

In the case of the first extract, it is left up to the reader to draw their conclusions from the data shown in the table. By comparison, extract 2 provides the key summary of the observation, using the data in the table to illustrate the point.

Calculations and levels of accuracy
When using calculators and spreadsheets, be aware of the levels of accuracy of your measurements: often, a calculation performed on a calculator can result in a number with a string of up to 10 digits. For example, when carrying out a titration for our analysis of calcium ions we might only be able to measure the volume to the nearest 0.05 cm³. So an individual measurement might be recorded as 23.05 cm³. However, the mean calculated for all the titres, when using a calculator, might give a figure of 23.942857142 cm³. If you put this number into your results, it implies that you could record the titre down to a precision that is not possible. As a very simple rule, don’t present calculated values to any more significant figures than the original measurements.
Statistics

For many physical or analytical chemistry experiments you will be undertaking several measurements. You may therefore need to give descriptive statistics in your methods. The basic statistics would be measures such as **percentage error**, the **mean**, the number of measurements taken \( (n) \), and the range of the values. For example, if you quote a mean value for a result, you may need also to give the number of tests carried out \( (e.g. \ n = 27) \) and an indication of the spread of the data. The spread of the data is often given in the form of the **standard deviation**, which gives the reader a measure of the confidence that can be placed in the mean value. In the methods, you would state:

*Means are given with the standard deviation … the concentration of calcium ions was 109 ± 5 ppm \( (n = 5) \).*

You may also be employing statistical tests in your analysis of the data, for example to distinguish whether a treatment had an effect on the sample population. For most labs, you are likely to employ routine tests, such as the Student’s \( t \) test. In such cases it is sufficient to state the name of the test and the level of significance that you are accepting, \( e.g. \ p < 0.05 \).

What is the best way of presenting the results?

This is often a question students find hard to answer. There is a strong temptation to adopt the ‘shot-gun’ approach: if you include absolutely everything then you can’t have forgotten anything! However, for the reader this can make interpretation difficult and someone marking your report may conclude that the reason for putting everything in was because you weren’t sure what was important and what wasn’t.

Remember that you are telling a story and so try to identify what the key points are, in sequence. Where possible you should present your results in summary form, rather than long lists of raw measurements (which can be included as an appendix at the end if necessary). If you have taken 20 measurements for a single data point, it may be more appropriate to present the data in summary form as the mean, the standard deviation and the number of measurements, rather than as a table of 20 individual measurements.

*The mean reading was 187 ± 20 mV \( (n = 20) \).*

This statement provides the reader with as much effective information as does the full list of individual measurements and is in a much more digestible form. For a practical report, you may wish to include all the raw data, in which case you can add it as an appendix to the end of the report.

The three main ways of presenting data are as text, in tables and as graphs.
Text
Use statements of specific values in the text when you are referring to only one or two items, so the example used above stating the mean reading is appropriate for presenting in text. If you have a lot of data you will want to tabulate it but otherwise do not be afraid to put numbers within text. When you have synthesised a compound the data that enables you to confirm its identity can be presented within the text of your results section. The usual order that this information is presented in is; yield, melting point, elemental analysis, infra-red absorptions, NMR spectrum and mass spectrum. The infra-red, NMR and mass spectroscopy data should presented in a uniform style which is described here.

Infra-red absorptions should be reported with their wavenumber. The assigned functional group and a description of the peak are added in parenthesis (brackets). Common descriptions of the peaks are wk (weak), str (strong), brd (broad) and shp (sharp). So a typical report might look like this:

IR cm\(^{-1}\) 3393 and 3326 (N-H, str), 1738 (C=O, str)

The information that must be included for NMR data is the delta values, the nuclei involved, the solvent and standard used. The number equivalent nuclei, the multiplicity of the signal, the coupling constant and the assignment of the peak should be included in parenthesis. The symbols used to indicate the multiplicity are s (singlet), d (doublet), t (triplet, q (quadruplet) and m (multiplet). In addition, Br may be used to indicate a broad signal. So a typical report of NMR data may look like this:

\(\delta\)H (400 MHz; CDCl\(_3\)) 8.39 (2H, NH\(_2\), s), 5.15 (1H, CH, s), 4.02 (4H, CH\(_2\), q, \(J = 7.2\) Hz), 1.08 (6H, CH\(_3\), t, \(J = 7.2\) Hz)

For mass spectrum data the mass of each fragment should be listed in descending size order with the relative intensities in parenthesis. Note that that % is usually only included in the first one. The molecular ion may be indicated by M\(^+\). So a typical set of data would be presented like this:

m/z 183 (M\(^+\), 41%), 168(38), 154 (9), 138 (31)

Tables
Tables are very useful for presenting data in an organized form, particularly where you wish to present several variables together to give an overview of a set of results (Table 1). The layout of the table is important to ensure that the contents can be easily read and understood. In particular:

- try to avoid having too many columns, having more than five or six columns can make comparison of the data items difficult and also means that the text may be compressed to fit on the page;
- make sure the rows and columns have clear headings, with units, so that the nature of the data is immediately obvious;
- spread the data out and have clear delineation between rows and columns.
TABLE 1 Results of titration for calcium and magnesium ions.

<table>
<thead>
<tr>
<th>Titre</th>
<th>Ca(^{2+}) only/cm(^3)</th>
<th>Ca(^{2+}) + Mg(^{2+}) /cm(^3)</th>
<th>Mg(^{2+}) only/cm(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.30</td>
<td>21.45</td>
<td>16.15</td>
</tr>
<tr>
<td>2</td>
<td>5.55</td>
<td>21.85</td>
<td>16.30</td>
</tr>
<tr>
<td>3</td>
<td>5.65</td>
<td>21.90</td>
<td>16.25</td>
</tr>
<tr>
<td>4</td>
<td>5.70</td>
<td>22.05</td>
<td>16.35</td>
</tr>
<tr>
<td>5</td>
<td>5.65</td>
<td>22.05</td>
<td>16.40</td>
</tr>
<tr>
<td>Mean</td>
<td>5.57</td>
<td>21.86</td>
<td>16.29</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.14</td>
<td>0.22</td>
<td>0.18</td>
</tr>
</tbody>
</table>

Graphs

There are many different ways of presenting data in graphical form. The types of graph you are most likely to use are:

- bar chart;
- histogram;
- scatter graph;
- line graph.

When using graphs make sure that:

- you have used the appropriate form of graph for displaying your data;
- the data are displayed on the correct axes – the independent variable (the one you are controlling) is on the \(x\)-axis, the dependent variable (the one you are measuring) on the \(y\)-axis;
- the axis scales are appropriate for the spread of the data;
- the data points and the axis labels are large enough to be clearly legible;
- the axes are labelled and the units of measurement given;
- the graph is numbered and has a clear figure legend or title so the reader can appreciate what is being displayed without needing to read the accompanying text (Figure 1);
- you include equation or R value if needed.

FIGURE 1 A line graph illustrating the relationship between concentration and absorbance for a set of standards.
2.5 Discussion
The discussion is the section of the report where you interpret the findings from your experiment and place them in the context of the research literature. When it comes to writing up a practical class or project, this is often the most demanding part of the exercise because you must display your understanding of the work you have done and how it fits into the studies undertaken by other scientists.

A useful starting point for the discussion is to write an introductory paragraph that summarizes the key findings from the results:

*In this investigation into the hardness of tap water sample, it has been shown that…*

This paragraph then provides a good link with the results section and gives you a clear list of the points you need to interpret. There should also be a link back to the aims that you set out in the introduction. Don’t be worried by the fact that this can feel like you are repeating your results again. Don’t be put off by the fact that this seems quite straightforward at first.

Having identified your key findings, you then need to discuss each of them in turn. For an open-ended experiment you may need to refer to the relevant research papers, highlighting their findings and relating them to what you have found. It may be that your findings are different from, or even contradict those, presented in other papers. In such cases you will need to explain why you think this may be so: don’t always fall back on the staple explanation that you probably got something wrong! Whilst that may be true in many cases, there may also be genuine reasons for your experiments having generated different results. Think about reasons for issues such as low yields, yields >100%, impure samples, lack of reproducibility of values, non-linear calibration curves, etc.

2.6 Conclusions
You should remember to round off the discussion with a concluding paragraph that summarizes both the key findings and their interpretation. In class reports, you may also be encouraged to identify what experiments you might do next in order to progress the work. An example of a short conclusion for our experiment might read as follows:

*In these experiments, it has been demonstrated that there is variation in the hardness of water with geographic region. These findings have been discussed in relation to the studies by Smith and Jones [17] who reported that …..

The accuracy of the titration technique was very good but the precision was poor. This was probably due to the difficulty in reading the endpoints accurately. The atomic absorption method gave good accuracy and precision.*

2.7 References
As with all your written work, you must include a full list of the references that you cited in the text. In chemistry we tend to use the referencing systems used by the professional bodies; the Royal Australian Chemical Institute (RACI), the American Chemical Society (ACS) or the Royal Society of Chemistry ((RSC). Whichever system you chose to use what is essential is that you are carefully consistent. A useful guide to citing and referencing can be found here:
2.8 Appendix
The appendix is where you should place things like copies of your lab notebook and annotated spectra. The appendix is the place for things that are important to the report by only need to be referred to at times. You should ensure that anything important in your appendix is accurately referred to in the body of the report. Some common examples are calculations, features on spectra, diagrams, photos and graphs. You will need to make sure you label sections in your appendix so a reader (e.g. marker or another student) can easily follow what you are referring to. If you do not do this the marker will not be able to give you full marks.

3. Write the sections in an appropriate order
Writing a report can often seem a daunting process, particularly if it is for a large piece of project work. Before you put pen to paper (or fingers to keyboard), check again any brief you have been given for the structure of the report so you know exactly what is expected of you.

Some sections of the report should be much easier to write than others. For example, the methods section is simply a factual description of what you did and so this is often a good section to start with.

The next section to tackle is the results. You should think carefully about how you want to present the results first and then produce your schemes, graphs, and tables and carry out any numerical or statistical analyses. When you have the presentation sorted out, the process of writing is fairly straightforward since you are aiming to describe the results that you have in front of you. Don’t forget that you are telling a story in which the story-line is illustrated by the figures and tables.

Having set out the key findings of the experiments in the results section, you are then in a position to consider their interpretation. Take each of your key findings in turn and write about it, making sure you explain the relationship to the aims of your study and interpret them in the context of underlying chemistry and previous knowledge, for example, your lecture notes. Your conclusions section pulls together your key findings.

You may find it easiest to leave the introduction to last. Having written the discussion, you should be in a position to present the background to the work and to set out the aims. As for the discussion, you will need to refer to the relevant chemistry to support your statements. This should lead logically into the aims of the experiment and you can check off the aims against your final conclusions.

Finally, as with all written work, it is always a good idea to put the completed report to one side for a few days and then re-read it, checking that it all ties together and could be understood by someone who had not done the experiments.
Writing an Executive Summary

This document is designed to guide you through the process of writing an executive summary, particularly with how it differs from a traditional discussion.

An executive summary condenses the main message of the report, so that a time poor individual can understand the findings in 1-2 paragraphs. Picture preparing something for your supervisor’s supervisor. It is an exercise in cutting superfluous information. An executive summary should include

- the **purpose** of the report
- the **methods** used to conduct the investigation
- the **results** of the investigation
- the **conclusions** drawn from the investigation

Below is an example that highlights some of the common mistakes that people make when writing executive summaries with advice on how and how to fix or avoid them.

**Background.**

Students in CHM1051 were given the following introduction:

*Recently, farmers in Western Australia have reported unusual colours in some of the lakes located near the local mining areas. A federal task force has been appointed to investigate this environmental issue. Given the time constraints placed on the task force, they have asked that Monash Consulting assist them in analysing the samples they collected.*

The students were also supplied with the following guidance:

*The Cary 60 UV-Vis spectrophotometers will be used for two purposes:*

- **Comparing the absorbance spectra of known transition metal samples to an authentic sample provided by the task force, so as to qualitatively determine the contaminants.**
- **Constructing a calibration curve using standards of known concentrations and plotting graphs of concentration vs. absorbance to quantitatively determine the concentrations of contaminants in the water samples**

The findings should be reported in a professional and succinct manner in an executive summary. This document will guide you through writing what is termed an ‘Executive Summary’.

**An example of a poor executive summary.**

In solution, many metals can be toxic to many animals, including humans. If found in significant quantities, these metals can cause significant health issues ranging from hindered organ activity to the death of the affected organism. In Western Australia, some lakes in the vicinity of local mining operations have been showing signs of discolouration - possibly due to metal contaminants from the local mines. Monash Consulting has been recruited to investigate the potential of this contamination.

To achieve this, Monash Consulting took solutions of likely contaminants (0.2 M nickel (II), 0.1 M chromium (III), 0.2 M cobalt (II) and 0.1 M copper (II)) and analysed their absorbance of light from
300-900 nm. The maxima of these solutions were then compared to the supplied unknown solutions to qualitatively determine their composition (e.g. if the measured maxima for copper and cobalt were present in an unknown solution, it was considered likely this solution was contaminated with these metals).

From here, calibration curves were generated for the four metals in solution. For solutions identified as containing certain metals, their absorbance at a given wavelength (the maxima noted earlier for each metal solution) was obtained and their concentration determined through comparison to the calibration curve.

This lead to the discovery of nickel and cobalt contamination in ‘Sample 1’ and cobalt and copper contamination in ‘Sample 2’. ‘Sample 1’ was found to have concentrations of 0.12 M of both nickel and cobalt and ‘Sample 2’ was found to have concentrations of 0.11 M and 0.05 M of cobalt and copper respectfully. The drinking water guidelines for the concentration of copper and nickel are 2 mg/L and 0.02 mg/L respectively (cobalt not found).

Issues with the executive summary.

1. The introduction is too long and provides information that the client already knows.
   Fix - Removing most of the introduction. A quick reminder of the goal is ideal, but should only be one-two sentences at most.
2. There is too much detail in the methodology.
   Fix - Removing most of the methodology. A simple description is sufficient, with specific details left for further communication if need be. Discussion of specific wavelengths and calibration curves are superfluous.
3. Results buried in a dense paragraph.
   Fix - Condensing the results into a table. IF it is even necessary at all. Consider if all of the data is strictly required. Also, be consistent with units!
4. No recommendations or conclusions.
   Fix - Include a concluding statement. Summarise you outcomes they have paid you for.

An example of a revised executive summary.

Monash Consulting has been recruited to investigate the potential metal contamination of lakes in Western Australia. UV-Vis analysis was used to analyse the unknown solutions supplied for the four most likely metal contaminants (nickel, copper, chromium and cobalt) from the nearby mines. The results for sample 1 and 8 are as follows:

<table>
<thead>
<tr>
<th>Sample number</th>
<th>Metals present</th>
<th>Concentration (M)</th>
<th>Acceptable limits (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nickel</td>
<td>0.12</td>
<td>0.0003</td>
</tr>
<tr>
<td></td>
<td>Cobalt</td>
<td>0.12</td>
<td>Variable.</td>
</tr>
<tr>
<td>8</td>
<td>Cobalt</td>
<td>0.11</td>
<td>Variable.</td>
</tr>
<tr>
<td></td>
<td>Copper</td>
<td>0.05</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Whilst safe drinking levels of cobalt compounds are variable, copper and nickel are generally considered dangerous above 0.3 M and 0.3 mM respectively. Considering both of these limits are reached (especially for nickel), this drinking water should not be considered safe for ingestion or for marine life.
Things to note.

1. It’s quite short!
2. There is no background beyond the task being investigated.
3. The method is only briefly mentioned and, thanks to the table, the data is readily available and easy to interpret.
4. Scientific jargon is kept to a minimum, UV-Vis is as technical as it gets.
5. There is no ‘error’ discussion.
6. The take home message (don’t drink the water!) is clear and succinct.

A Quick Guide to Reflective Writing

You will be well used to writing about chemistry in an objective way. However, it is often useful to reflect on your experiences in the laboratory or on your course in order to evaluate how you are developing, especially in terms of transferable and personal skills and qualities. This type of writing is very different from the usual writing you have been doing and as scientists we often find it quite challenging. You will be asked to write reflective pieces in the course. Here are some tips and some examples.

Reflective writing should
- Capture our response to experiences, opinions, events or new information.
- Describe your response to thoughts and feelings.
- Be a way of thinking
- Explore your learning.
- Be an opportunity to gain self-knowledge.
- Move beyond subject knowledge and skills to focus on personal development.
- Be personal

Example 1

This experiment identified the importance of precision (number of drops) in relation to performing well rounded experiments and obtaining reliable results and observations. Transition metals react in an assortment of ways to produce varying colours and precipitates. This experiment could possibly have been better performed in pairs, so that the working stations were less crowded.

This is a good evaluation of the experiment but is a poor example of reflective writing as it focusses on the practicalities of doing the experiment and on the underlying chemistry.

Example 2

As I’ve never done chemistry before I learnt how to balance equations, perform several experiments at the same time which taught me to manage my time well throughout the experiment.

The experiment would have been better if the experiments took place after the lectures so there would have better understanding of the experiment.

At this writer mentions ‘I’ so there is some attempt to make this personal but it stills focusses on the practicalities.
Example 3

Today laboratory practical highlighted many new skills and practices for myself. As this is my first semester of chemistry, having an individual lab showed that there was much I was capable of and what I still had to learn. Therefore, by having minimal previous experiences in the laboratory, it really showed how I should conduct myself in the lab such as taking great care and being time efficient as well as being totally aware of my surroundings. In terms of skills there are many improvements still to be made such as being clear and concise in stated observations as sometimes I try to state too much and forget to make obvious my intention in the observation. My timekeeping was quite good but I did scramble a bit at the end. Also, I had to work in a team and I found this quite challenging. I quite like to get on on my own so accommodating others was difficult and I think I became quite frustrated. This has highlighted something I need to improve on in the future. Overall, this was a challenging session for me both personally and technically but I look forward to improving over the semester.

This is much better. Although the student reflects on the lab there is also some reflection on the personal development, how they felt, what the personal; rather than technical challenges were.

Learning Skills Unit - Library

The LSU in the library is an excellent place to find assistance for all your studies at Monash University. Learning skills advisers assist students in improving their academic language and approaches to learning, including:

<table>
<thead>
<tr>
<th>academic English</th>
<th>reading strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>study methods and exam preparation</td>
<td>essay, report and thesis writing</td>
</tr>
<tr>
<td>effective listening and note-taking</td>
<td>writing for research projects</td>
</tr>
<tr>
<td>problem-solving and critical thinking</td>
<td>oral communication and presentation</td>
</tr>
</tbody>
</table>

Students with Language Difficulties:

- Contact the LSU personnel at the Hargrave-Andrew Library. These folks can help!
- Get involved with English Connect (http://www.monash.edu/english-connect). English connect have a range of programmes, free for all Monash students, which support students with their spoken and written English.

Monash University Plagiarism and Cheating Policy

Reproduced from https://www.monash.edu/students/academic/policies/academic-integrity

Plagiarism: means to take and use another person’s ideas and or manner of expressing them and to pass them off as your own by failing to give appropriate acknowledgment. This includes material sourced from the internet, staff, other students, and from published and unpublished works.

Collusion: means unauthorised collaboration on assessable written, oral or practical work with Monash University plagiarism and cheating policy another person or persons.

Collusion occurs when you work without the authorisation of the teaching staff to:

- work with one or more people to prepare and produce work
- allow others to copy your work or share your answer to an assessment task
allow someone else to write/edit your work (except for use of a scribe approved by DSS)
write or edit work for another student
offer to complete work or seek payment for completing academic work for other students.

Proofreading compliant with the University's definition is acceptable.

Suspected breaches of academic integrity

If a staff member suspects you have breached the Student Academic Integrity Policy (e.g. by plagiarising, colluding, or assisting somebody else to cheat) they are required to:

- inform you of the suspected breach
- identify the work and its source
- ask you to respond
- report the matter to the Chief Examiner (or nominee).

You will have the opportunity to respond, usually in person. You can request to have a support person with you in the meeting. If you are not able to attend a meeting, you will receive details of the breach, asking for your response within 10 working days.

Possible outcomes

If the staff member believes that a breach took place, they must decide whether the breach was intentional or reckless. The staff member will also inform you of the penalties that may be applied.

**Plagiarism or collusion that is not intentional or reckless:** If it’s found that the breach is not intentional or reckless, you will have to participate in additional academic skills development. To ensure that you have not gained an unfair advantage, other actions may be taken, which could include:

- loss of marks
- remarking to exclude the section of work that breaches academic integrity
- resubmitting of all or part of the work.

The outcome is recorded on a University register for seven years to document that you have been counselled about academic integrity rules.

**Intentional or reckless plagiarism or collusion:** If the breach is found to be intentional or reckless, the matter is reported to the Associate Dean of the faculty. The Associate Dean (or nominee) may deal with the matter or refer it to a faculty discipline panel. For more information on the panel hearing process, see Part 7 of the Monash University (Council) Regulations.

The penalties applied will depend on the seriousness of the offence and whether you have been counselled before. These may include:

- the work not being assessed
- a zero grade for the unit
- suspension
- exclusion from the University.

Where a penalty or disciplinary action is applied, the outcome is recorded and kept for 15 years.
Penalty for Late Submission of Assessment

Unit Chief Examiners of the Faculty of Science must ensure that a penalty for late submission of assignments is applied consistently in all units taught by their school, according to the following:

1. The penalty for assignments submitted late should be 10% of the maximum mark per day late or part thereof.
2. Weekends and holidays should attract the same penalty as week days.
3. No assignment can be accepted for assessment more than a week after the due date except in exceptional circumstances and in consultation with the Unit Coordinator.
4. Small assessment tasks of a value of no more than 5% of the final mark may be exempted from the above rules if deemed appropriate by the unit Chief Examiner.

Students must be informed of this penalty through the Unit Guide and/or the instructions given for each individual assignment.

Remarking of an Assessment Due to an Error

In-semester assessment

1. It is the student's responsibility to check marked assignments upon return. Students are expected to raise with the tutor any queries about their mark as soon as possible but no later than two weeks after their release back to the students.
2. If the matter remains unresolved after discussing it with the tutor, the student must take it to the Unit Coordinator of the relevant campus.
3. If after discussing the issue with the Unit Coordinator of the relevant campus, the student still believes that there is an error in the marking of his/her assignment, the student may then proceed directly with a request for a remark.
4. Requests for a remark must be made in writing to the Year Level Coordinator, documenting the specific grounds for the request. Remark requests must include the corrected work, and, where practical, an identical "clean" copy. The Year Level Coordinator may reject any request considered vexatious or frivolous. The Year Level Coordinator shall, where possible, nominate an independent marker to mark the student work; limitations on suitable markers in the specific field may sometimes prevent this "blind" marking. The second mark stands; remarking can result in an increase or decrease in marks.
5. If a student is still dissatisfied, an appeal should be made to the Head of School, whose decision is final within the School.
6. Schools must keep a record of all formal requests for remarking, indicating the unit, semester, and outcome.
Final examination

1. If a student believes that there is an error in the marking of her/his final examination, the student must contact the Unit Coordinator of the relevant campus no later than two weeks after the release of the results for the unit.

2. If after discussing the matter with the Unit Coordinator of the relevant campus the student still believes that there is an error in the marking of their examination, the student may then proceed directly with a request for a remark according to procedures 4 to 6.

Repeating Failed Units

Students who have failed the same science unit twice are not permitted to attempt the unit for a third time unless the unit is strictly necessary to complete the course requirements. Exemptions to this rule can be made by the Associate Dean (Education) only in exceptional circumstances.

Special Consideration

As a Monash student, you’re required to complete assessment tasks to demonstrate you have achieved the learning outcomes of the units. You normally have one chance to complete each assessment task or exam.

If you can’t complete an assessment task or exam due to exceptional circumstances beyond your control, you may be eligible for special consideration.

If you’re granted special consideration, you may be given an extension, another assessment or a deferred exam, but your original assessment result can’t be changed.

Check your eligibility

You may be eligible if you didn't complete your final exam or assessment, due to exceptional circumstances beyond your control. The reasons may include:

- acute illness
- loss or bereavement
- hardship or trauma.

You may also be eligible for special consideration if you can show your obligation to:

- military service
- jury service
- emergency services such as the Country Fire Authority
- Monash Sport's athlete support program, if you are participating in a key event.

Extensions for assessments

If you think it would help, your first option is to ask your faculty for a short extension for your due date. The faculties listed below have specific information about extensions including how to apply.
Applying for special consideration

If an extension is not an option or won't resolve the issue, you can apply for special consideration.

Assessment tasks and compulsory unit activities

The in-semester application is used for assignments, in-semester tests, lab classes, compulsory tutorials, and continuous assessment tasks such as art folios.

How to apply

You need to apply no later than two University working days after the due date of the affected assessment or activity, by submitting the in-semester assessment form and including any supporting documents to the unit coordinator

Late applications

Late applications may be accepted at the discretion of the faculty but will not, under any circumstances, be accepted after the results have been released.

Viewing of Assessment Work

Procedure

Students wishing to view an examination script or other assessment work held by a school of the Faculty of Science, should send an email to the Campus Unit Coordinator, and in case of their absence, contact the Reception Office of the school responsible for teaching the unit.

Students should note that:

- The viewing will normally be allowed under supervision
- A request for viewing an examination script or other assessment held by the Faculty of Science is independent from a request for remarking. If after viewing the examination or other assessment, the student would like to request a remark, the faculty remarking procedures must be followed.
- A request for remarking must be made no later than two weeks after the release of the results for the unit.
- Exam scripts and other assessment work held by the Faculty are destroyed six months after the return of results for the unit.
Hurdles Policy

The Faculty of Science defines a hurdle requirement in accordance with University policy with the addition of the following, which is specific to the Faculty of Science:

1. Where a hurdle is placed on the final summative assessment of a unit the maximum number of attempts will normally be one. This will be clearly outlined in the unit guides and made available to students at the commencement of the unit. Further attempts beyond one assessment, under exceptional circumstances, are granted only at the discretion of the Associate Dean (Education) and must comply with the University assessment procedures. Normally failure of a hurdle requirement will result in the student either re-enrolling the unit or enrolling into an alternative unit.

2. Where a student fails an assessment, solely because of failure to satisfy the hurdle requirements, the Chief Examiner must return a mark of 48%.

3. Hurdle requirements must be clearly outlined in the Handbook and Unit Guide.

Supplementary Assessment Policy

1. Students can be granted supplementary assessment for up to two failed units in their course of enrolment.

2. Supplementary assessment for a unit is available in the cases outlined below.

2.1 Students enrolled in a single degree course managed by the Faculty of Science, or in a double degree course managed by School of science at Malaysia campus, and

   • The unit is the last unit required to complete all course requirements, or

   • The unit is a science unit, and the student has 30 credit points or less to complete all course requirements (including the unit failed).

2.2 Students enrolled in a double degree course with the Bachelor of Science:

   Supplementary assessment is available for a science unit taken as part of the Bachelor of Science within a double degree course only when the unit is the last unit required to complete all science requirements of the course.

2.3 Special cases:

   In special cases, not covered in 1. and 2., supplementary assessment for a unit may be approved by the Chair of the Board of Examiners on a case-by-case basis where a student experiences a significant impact on their academic progress in the course due to the failed unit.

   If a student is able to enrol in other units or complete other parts of their course requirements while re-enrolling in the failed unit, they are not considered to have experienced a significant impact.
In all three cases:

- The failed unit must have been completed within the last 12 months;
- The final mark of the failed unit must be between 45 and 49; and
- The unit is the only unit failed in the relevant semester.
- In addition, if supplementary assessment for a failed unit is granted,
  - The type and method of supplementary assessment for the unit is determined by the Chief Examiner of the unit; and
  - The maximum final mark and grade awarded for the unit after supplementary assessment has been completed is 50P.

3. Supplementary assessment for a unit is not available in the case(s) outlined below:

3.1. Some lab assessments do not permit supplementary assessment. Where a School has stipulated that supplementary assessment is not available for a lab assessment, this will be clearly indicated in the handbook and unit guide information.