Introduction

- Name
- Department
- MSc or PhD (year of study)
- Learning and teaching level ........
- Expectations and motivations
Outline

- Learning outcomes
- Major concerns on marking
- TA’s expectations and Student’s expectations
- Concerns about plagiarism
- Marking the lab reports (criteria/marking schemes)
- Providing Feedback
- Sample reports and marking exercise
- Quiz
Learning Outcomes

By the end of this workshop, you will be able to

- Evaluate the students more effectively
- Be consistent and accurate in marking
- Maintain professional relationship with students
- Manage the situation where students disagree with your evaluation
- Learn about keeping the evaluation’s record
- Learn more about the student’s expectations and TA’s expectations
Marking

Exams
- Test
- Quiz

Labs
- Quiz
- Lab reports

Tutorials
- Assignments
- Problem set
- GLP
  - Formal reports
  - Short reports
Common Questions/Concerns on Marking

• Fairness
• Consistency
• Time management
• Evaluation criteria
• Student’s concerns
• Plagiarism (no reference and matching information)
Before You Start Lab

- **Meeting with Instructor:** Depending on the course, this meeting can be as simple as knowing the lab timings and getting a basic outline for the laboratory component of the class, or a very detailed meeting explaining how every mark is to be given, if a certain mean and distribution is expected for each lab section, and how feedback is to be given to each student on every assignment.

- **Weekly Meeting:** There could be weekly meeting where you are given a brief overview of upcoming lab and/or some critical points about the lab. This could be conducted by the lab technician as well.

- **Grading Criteria:** Get the detailed criteria for instructor. If the criteria haven’t been provided, prepare a detailed one.

- **Book Keeping:** Come up with the idea about how to keep the record of all the grading.

- **Know the Details:** You should know the details of what the lab is about, especially before individual lab.
On the First Day (Orientation)

- **Course Expectations:** The first time you meet with your students, make sure they understand the course outline.

- **Students Expectations:** It is extremely important for you to let them know what you expect from them and what they can expect from you. Poor expectations management is one of the leading causes of problems in a lab.

- **Evaluation Criteria:** Make sure students understand the criteria (whatever criteria you are going to adopt). Provide the class with a copy of the criteria (if possible) that clearly indicates grading process stepwise.

- **Policies:** They should be very clear about the policies on late reports, missed labs and make up work.

- **Safety Concerns:** Highlight the potential safety concerns about the lab, the safety equipment in the lab and the steps to take in case of any emergency. Be sure that you are responsible for students' safety.
Fundamental Concerns

- **Personal Contact Information:** Office location, office hours, contact information e.g. email address and/or office phone.

- **Materials needs:** Lab manual, fall 2015 available in the University bookstore. Student lab notebooks, lab coats, safety glasses, available in University bookstore.

- **Report submission:** If the students don’t hand in the reports during the lab, clearly state when and what time are they due, e.g. any report not in the appropriate report box (location) by this time will be considered as late submission and will lose 10% off the maximum mark possible. No report will be accepted after _______ am/pm.

- **Conflict of interest:** If you think that you have some personal concerns with the student that might influence on you grading, have someone else to mark him/her.
Copying from Lab Mates

- **Individual reports:** Lab reports are individual unless directed otherwise.

- **No copying:** The students working in pairs can share the data but not the discussion part and this is considered as plagiarism.

- **Pay close attention:** Combine the student’s reports in the same group and mark them together, this way you can keep track of if they are copying information from their partners.

- **This is quiet possible:** Be careful, this is possible in partners as well as non-partners. I am a witness ------

- **Reporting the incidence:** Bring this to the attention of instructor if you find any case of information matching.
Grading the lab

- **When to grade them by**: The most important things to consider are when you are planning to mark and when you need to grade them by?

- **How long will it take**: The other big concern is how long will it take to grade them? It is better to mark them at once.

- **How to mark**: Think and decide before you start marking.

- **How to be consistent**: You need to think about how to be consistent, after you start marking. One way could be to mark one question at a time.

- **Where to get the help**: This can involve using a detailed marking scheme.
Format: Formal report

Structure and Content of a Laboratory Report:

- The purpose of a lab report is to communicate experiment in a clear, systematic and standardized way. Primarily, a lab report should communicate the following things:

**Why did I bother?** Why did I do this experiment and why is it important?

**How did I do it?** How did I carry out this experiment (this should be detailed enough so that the experiment could be replicated precisely)?

**What did I find?** What were the results of your study and how are those results meaningful?

**So what?** What do your findings mean in terms of your hypotheses and what theoretical contribution do they make?
Format: Formal report

- **Title:** It is better to include a title page with name, date of experiment, partner’s name (if any), and lab sections.
- **Abstract:** It is good to have abstract (150 words) but not necessary.
- **Objectives:** Could be separate or combined with introduction
- **Introduction:** Why did I bother? Provide rationale to whatever you did or used during the lab.
- **Experimental:** Materials, design and procedure, this should be detailed enough so that the experiment could be replicated precisely.
- **Results:** List data in tables whenever possible. Each table must have a title and carry units for each column. Show one sample calculation for each step in the analysis, carrying the units through the calculations.
- **Discussion:** A brief explanation (a couple of paragraphs) outlining the important facets and details of your experimental results.
- **Conclusions:** A few final sentence(s) stating the outcome(s) of the experiment written in the context of the objectives of the experiment.
- **References:** It is very important to cite the source where you got the information to complete your report. Including manual, a book and scientific journal. It could be in different format.
Format: Informal report

- Mainly the data reporting
- Calculations and final results: different trials, average and accuracy
- Critical questions about the experiment
- Sources of errors during the experiment
- Suggestions about improving the yield
Rubric/Marking Scheme

- No standard
- Use any style (with instructor’s consent)
- Should have details information about marking
- Make sure the students must know the criteria
<table>
<thead>
<tr>
<th>Section &amp; Total Mark</th>
<th>Section Content</th>
<th>Typical Mistake Description</th>
<th>Mistake Symbols &amp; Penalty</th>
<th>Marks Deducted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. OBJECTIVE AND BACKGROUND</td>
<td>• The objective of the experiment &lt;br&gt; • Relevant background theory (briefly) &lt;br&gt; • An indication of the importance of the work</td>
<td>The <strong>objective</strong> is not clearly stated. &lt;br&gt; The <strong>symbols</strong> are not defined. &lt;br&gt; <strong>Equations</strong> are incorrectly written or not explained. &lt;br&gt; <strong>Background</strong> information is missing.</td>
<td>(O) -1</td>
<td>(B) -1</td>
</tr>
<tr>
<td>Total Mark = 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. PROCEDURE AND OBSERVATIONS</td>
<td>• Use diagram(s) to describe the apparatus/equipment &lt;br&gt; • Indicate the experimental strategy and the procedure followed to obtain the data so that others can assess the validity of the results. &lt;br&gt; • Present all relevant data in table form, with title and column headings. &lt;br&gt; • All observations MUST include proper units.</td>
<td>The <strong>apparatus and/or procedure</strong> are not clearly described. &lt;br&gt; <strong>Diagrams</strong> are not labeled and/or numbered. &lt;br&gt; There are <strong>incorrect statements</strong>. &lt;br&gt; Important <strong>information</strong> and/or details on data acquisition and analysis are missing.</td>
<td>(AP) - 0.5 &lt;br&gt; (D) - 0.5 &lt;br&gt; (IS) - 1 &lt;br&gt; (I) - 0.5</td>
<td></td>
</tr>
<tr>
<td>Total Mark = 4</td>
<td></td>
<td>Past tense is not used. &lt;br&gt; <strong>Passive voice</strong> is not used. &lt;br&gt; Observations are stated with improper or missing <strong>units</strong>.</td>
<td>(PT) - 0.5 &lt;br&gt; (PV) - 0.5 &lt;br&gt; (U) - 0.5</td>
<td></td>
</tr>
<tr>
<td>3. CALCULATIONS, GRAPHS AND RESULTS</td>
<td>• Describe the method(s) of analysis of the experimental observations. &lt;br&gt; • Give all the intermediate and final results. &lt;br&gt; • Show all relevant tables and graphs illustrating results. &lt;br&gt; • Provide appropriate error analysis unless instructed otherwise.</td>
<td>The data <strong>tables</strong> are not properly <strong>titled</strong> and/or <strong>numbered</strong>. &lt;br&gt; The data are shown with improper or missing <strong>units</strong>. &lt;br&gt; <strong>Graphs</strong> are not <strong>titled</strong> and/or <strong>numbered</strong>. &lt;br&gt; <strong>Axes of the graphs</strong> are not labeled and/or units are incorrect or missing. &lt;br&gt; Incorrect type of graph is used or information on the graph is not clearly labeled. &lt;br&gt; <strong>Calculations</strong> are not clearly explained step by step, or even worse, they are missing. &lt;br&gt; There is a clear <strong>contradiction</strong> between the observed <strong>data</strong> and the <strong>results</strong>. &lt;br&gt; The results are given with an incorrect number of <strong>significant digits</strong>.</td>
<td>(TTN) - 0.5 &lt;br&gt; (U) - 0.5 &lt;br&gt; (GTN) – 0.5 &lt;br&gt; (AG) – 0.5 &lt;br&gt; (IG) – 0.5 &lt;br&gt; (C) – 0.5 &lt;br&gt; (CDR) – 1 &lt;br&gt; (SD) – 0.5</td>
<td></td>
</tr>
<tr>
<td>Total Mark = 5</td>
<td></td>
<td>Percentage <strong>error/uncertainty</strong> is missing.</td>
<td>(EU) – 0.5</td>
<td></td>
</tr>
<tr>
<td>4. DISCUSSION OF RESULTS AND CONCLUSIONS</td>
<td>• Discuss the results (range, trends, sources of errors)</td>
<td>This section is only a <strong>restatement</strong> of the results from the previous section without commenting on the expected key points.</td>
<td>(RR) – 1 &lt;br&gt; (ITA) – 1</td>
<td></td>
</tr>
<tr>
<td>Total Mark = 5</td>
<td></td>
<td>Incorrect or trivial arguments are used (e.g., sources of error are not sufficiently explained or trivial explanations are offered, such as “old equipment” or “human error” are blamed for the poor accuracy). Suggestions for improving the experiment are missing, are <strong>insufficient</strong> or <strong>inconsequential</strong>.</td>
<td>(SI) – 1 &lt;br&gt; (RR) – 0.5 &lt;br&gt; (CNS) – 0.5 &lt;br&gt; (NC) – 0.5</td>
<td></td>
</tr>
<tr>
<td>5. REFERENCES AND GRAMMAR</td>
<td>• State complete references to any books, articles, websites, etc. from which you obtained information used in your report. &lt;br&gt; • Indicate, in the appropriate places in the body of the report, where these references are being used. &lt;br&gt; • A paper without any references will not be accepted</td>
<td><strong>Incomplete references</strong> to the books or any other sources used in the report.</td>
<td>(IR) – 0.5</td>
<td></td>
</tr>
<tr>
<td>Total Mark = 2</td>
<td></td>
<td>The <strong>references</strong> do <strong>not point</strong> to the place in the report where the sources were used.</td>
<td>(RNP) – 0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>New sections do not start on a <strong>new page</strong>.</td>
<td>(NP) – 0.5 &lt;br&gt; (TGF) – 0.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If done by hand, observations, <strong>tables, graphs and formulas</strong> are not neatly done.</td>
<td>(DS) – 0.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Did not allow at least <strong>two spaces</strong> between text and tables or figures.</td>
<td>(TV) – 0.25</td>
<td></td>
</tr>
</tbody>
</table>
Feedback

• **Give Points for critical thinking and analysis:** When you are marking, it is very important that you provide students with good feedback.

• **Return labs with useful feedback:** From the perspective of a student wanting to understand why their marks are likely lower than they would like (a few seem to complain about getting marks that are too high), this is where a combination of the additive method and your comments are your best friends. So return labs promptly with useful feedback. Feedback could be on the report sheet or on a separate sheet.

• **Provide constructive criticism:** Don’t overwhelm the students with criticism, too many comments on a page can be daunting. Instead, pinpoint a few key issues for each point.
Addressing Concerns on your marking

- **Students:** Give them a proper consideration and try to clarify. If the student still disagree and you believe your marking is fair, instruct the student to contact the appropriate person (most likely the course director). You should do the same immediately and explain to them the situation. It is important that they hear your side of the story.

- **Instructor:** From the perspective of a course director that is unhappy with your marking, this will most likely result from student complaints, an unacceptable class average, or untimely grading. The best thing to do here is to avoid these issues in the first place with proactive communication and proper planning.

- **Maintaining Records:** Keeping records is your best tool. The students have a right to dispute their grading for 1 year.
Accuracy/Fairness in Marking

- Get a baseline Impression: Read through several reports before you begin marking. This allow you to get a baseline impression for the class before grading individual reports.

- Repeated Mistakes: Take off marks once for the repeated mistake (wrong calculation can lead to wrong conclusion).

- Group marking: Combine the reports from the students working in same group and mark them together.

- Avoid looking at Names: It is very important not be biased when marking. One way is not to look their names on the title page. The other way could be to ask students to put their name at the last page of the report instead of first.
Consistency in Marking

- Read through several before you start marking
- Read and understand the question well and be sure what you are looking for?
- Mark one question/part at one time
- Look for the relevant points
- Using an excel sheet: Create an excel sheet for the calculation part (template)
# Laboratory Techniques Marking Aid

## Part A
Thermometer and It’s Calibration

| Temperature of water and Ice Mixture | 1.2°C |
| Temperature of boiling water        | 98.6°C |
| Atmospheric Pressure                | 762.8 mm Hg |
| True Corrected temperature of boiling water | 100.1°C |
| Percent relative error of thermometer | 1.50% |
| Actual Pressure                     | 101.7 kPa (1 kPa = 7.50 mm Hg) |
| Relative Error                      | (760 mm Hg - 762.8 mm Hg) x (0.037 °C/mm Hg) = -0.102°C |

True corrected temperature of boiling water = 100.1°C - above value

Relative Error = |(100.1 - 98.6)| x 100

## Part B
Using the Balance to Calibrate Your 10 mL Pipette

| Temperature of water used in pipette | 25.1°C |
| Corrected temperature (from calibration curve) | 24.6°C |
| Mass of Erlenmeyer plus water (g) | Trial 1 | 47.8819 | Trial 2 | 50.227 | Trial 3 | 48.5305 |
| Mass of Erlenmeyer (g) | 38.6754 | 40.425 | 40.1341 |
| Mass of water (g) | 9.2065 | 9.8045 | 8.3964 |
| Volume delivered by pipette (mL) | 9.2315 | 9.8311 | 8.4192 |

Mean volume delivered by 10 mL pipette = 9.1606 mL

## Part C
Density Measurements

<table>
<thead>
<tr>
<th>Object</th>
<th>Mass (g)</th>
<th>Volume (mL)</th>
<th>Density</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>9.9</td>
<td>10.12</td>
<td>0.98</td>
<td>2</td>
</tr>
<tr>
<td>Ethanol</td>
<td>15.3</td>
<td>20.5</td>
<td>0.746</td>
<td>2</td>
</tr>
<tr>
<td>Tall Shiny Metal</td>
<td>64.8</td>
<td>8.3</td>
<td>7.81</td>
<td>1</td>
</tr>
<tr>
<td>Short Golden Metal</td>
<td>98.9</td>
<td>12.1</td>
<td>8.17</td>
<td>1</td>
</tr>
<tr>
<td>Short Dull Metal</td>
<td>25.4</td>
<td>9.51</td>
<td>2.67</td>
<td>1.5</td>
</tr>
<tr>
<td>Final mark</td>
<td>22.5/26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final mark</td>
<td>11.25/13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hard vs Soft skills

- **Experiment vs Data Presenting:** Doing it by your hands vs presenting your data are two different things and need equal attention.

- **Carelessness:** The marks do not reflect their abilities but being careless the students lose a bunch of marks.

- **Time management:** Leaving the things for the last moment and making a mess. Doing it well in advance allows to address all the concerns.

- **No Favours:** Some students are very good in the lab but mess up their reports. They need not to be favoured at all as they need to work on their presentation skills. You might encourage the students to improve their presenting skills by mentioning that.
Advance Techniques

- Not to overwhelm the students/TA, 1 formal report is enough (used to have 2 formal reports in Chemistry). Multiple formal reports is a lot more work with TA/Gas and students as well.

- Alternative could be to ask the questions that need critical thinking (not just looking into the manual but thinking more critically).

- Open ended questions i.e. beyond the manual; this is why they at the University not high school.

- Depending on their level, problem based analysis/work.

- Assign more marks for each section and divide the sum by a number. This highlights the minor mistakes and helps students pay close attention to minor things in their future reports.
Sample lab report

- Report 1
- Report 2
- Report 3