Guidelines for writing thesis

(= Literature thesis title, centered, bold, font size 14–18)

First name Last name
Bachelor/ Master thesis
Degree Program in Chemistry
University of Oulu
2021
TABLE OF CONTENTS

1. TYPICAL CONTENT OF THE BACHELOR AND MASTER THESIS ..........3
   1.1. Introduction ........................................................................................................3
   1.2. Theory ..................................................................................................................3
   1.3. Conclusion ..........................................................................................................3
   1.4. References ..........................................................................................................4

2. TEXT FORMATTING IN BACHELOR AND MASTER THESIS .............5
   2.1. Common formatting in Word ................................................................................5
   2.2. Abbreviations, terminology and units ..................................................................5
   2.3. Tables ...................................................................................................................6
   2.4. Figures ..................................................................................................................7
   2.5. Numbering of compounds and equations ...............................................................8
   2.6. Literature references ............................................................................................9
       2.6.1. Number reference ........................................................................................9
       2.6.2. Harvard name reference ..............................................................................9
   2.7. Table of contents ..................................................................................................9

3. LIST OF REFERENCES .........................................................................................11

4. STUDENT TIPS .....................................................................................................13

5. REFERENCES .........................................................................................................13
1. TYPICAL CONTENT OF THE BACHELOR AND MASTER THESIS

Abstract

Introduce briefly (max. one page) the aims and main results of the work. Based on the abstract, the reader gets a clear picture of the content of the work.

Preface (if needed)

In one or two sentences the purpose of the work. Possible acknowledgement of supervisors etc.

List of abbreviations (if needed)

Table of contents

1.1. Introduction

- One or two pages.
- Introduction to the topic of the thesis, background for the research
- Aim of the work and possible research questions.
  - The purpose of the work can be at the end of the introductory paragraph or as a separate paragraph.

1.2. Theory

- Includes issues relevant to the research, divided into chapters.
  - Number of chapters is typically 2-6.
  - First, e.g. theory of the topic, presentation of the molecule structure, description of the equipment, basic properties of these.
  - Definition of concepts is also important.
  - At the end of the thesis research applications.

1.3. Conclusion

- One or two pages.
- Summarizes key research results and findings (compare with the introduction, e.g. whether the research questions are answered).
- Are there any contradictions in the literature?
- What about the gaps in current knowledge? → Looking to the future.

1.4. References

- References in order of occurrence in text or according to Harvard reference style.
- In Bachelor thesis 20 references.
- In Master thesis 40-60 references.
2. TEXT FORMATTING IN BACHELOR AND MASTER THESIS

2.1. Common formatting in Word

- Margins: left 3 cm, right 2.5 cm, top and bottom 2.5 cm.
- Text type: Arial, Calibri or Times New Roman.
- Font size 12.
- Line spacing 1.5.
- Alignment of both edges.
- There is no indentation at the beginning of the paragraph that begins the chapter, but in the new paragraph, the indent on line 1 is 0.5 cm.
- Page numbering at the bottom.
- Main Headings and Subheadings centered in the text or on the left, below is an example of suitable heading formatting:
  1. MAIN HEADING (= Capital letters and bold text)
  1.1 Subheading (= bold text)
  1.1.1 Subheading (= normal text)
- The main heading always starts on a new page.
- Try to avoid individual subheadings (e.g. heading 1.1 can be found, but not heading 1.2.)
- The formatting must be consistent throughout the thesis.
- The tense of the writing should be logical throughout the text.
- The text is generally written in passive tense, following a scientific presentation.
- Use the elapsed time format in passive tense (examined, have been examined, put on, titrated, mixed, measured, etc.) because you are reporting experiments already performed.

2.2. Abbreviations, terminology and units

- If you want to use an abbreviation, first write the whole word followed by the abbreviation in brackets e.g. scanning electron microscope (SEM). After that, you can use only a plain abbreviation.
- If there are many abbreviations in the thesis, it is advisable to draw up a list of abbreviations, which will be placed after the abstract and preface.
- Chemical compounds are named and used as units approved by IUPAC (International Union of Pure and Applied Chemistry). In addition, commonly used names are allowed depending on the context.

2.3. Tables

- Centered.
- Tables are numbered sequentially in the order in which they are mentioned.
- Table title above it.
- The title must be sufficiently descriptive to understand the content of the table.
- If necessary, a smaller font can be used in the table than in the body text, and for a large table, the page layout can be changed to landscape.
- The table is first mentioned in the text (reference to the table, e.g. Table 1) and then the table itself is presented.
- The table is preferably placed on the same page as it is mentioned in the text.
- If necessary, a literature reference is added to the table.
- Below is an example of a table.

Table 1. Recovery of butanoic acid from the liquid phase with different adsorbent materials at room temperature.  

<table>
<thead>
<tr>
<th>Adsorbent</th>
<th>Butanoic acid concentration (g/l)</th>
<th>pH</th>
<th>Reaction time (h)</th>
<th>Adsorption capacity (mg/g)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>F400 activated carbon</td>
<td>8.0</td>
<td>3.5</td>
<td>-</td>
<td>280</td>
<td>17</td>
</tr>
<tr>
<td>MFI zeolite powder</td>
<td>4.0</td>
<td>4.0</td>
<td>48</td>
<td>120</td>
<td>9</td>
</tr>
<tr>
<td>MFI zeolite powder</td>
<td>4.4</td>
<td>5.2</td>
<td>48</td>
<td>70</td>
<td>8</td>
</tr>
<tr>
<td>Amberlite IRA-67 ion-exchange resin</td>
<td>6.6</td>
<td>3.3</td>
<td>4</td>
<td>51</td>
<td>19</td>
</tr>
<tr>
<td>Norit®; Darco® activated carbon</td>
<td>6.6</td>
<td>3.3</td>
<td>4</td>
<td>43</td>
<td>19</td>
</tr>
<tr>
<td>Bendosen activated carbon</td>
<td>1.1</td>
<td>3.0</td>
<td>180</td>
<td>0.30</td>
<td>20</td>
</tr>
</tbody>
</table>

1) Recovery was performed at 9.5 °C.
2.4. Figures

- Centered.
- Figures are numbered sequentially in the order in which they are mentioned.
- Figure title below it centered.
- The title must be sufficiently descriptive to understand the content of the figure.
- The table is preferably placed on the same page as it is mentioned in the text.
- The image is referred to in the text (e.g. Figure 1 is shown ..) and its use must be copyrighted.
  
  o "In general technical drawings, tables and diagrams are not regarded works, but it in accordance with good scientific practice it is customary to ask for permission even in these cases. The original maker and source must be mentioned even if the image does not meet the criteria for literary or artistic works.

  o For further information see opinion 2012:1 of the Copyright Council.

  o Most publishers offer a service with which you can request a permission and it is granted immediately, for example RightsLink. If such a service is available, you are advised to use it. "Excerpt from the Oulu University Library website: theses / copyrights.

  o An example of a figure.

Figure 1. X-ray diffractograms of BFS raw material, supports, and Fe catalysts. (#) ICDD file 00-022-0700 (Mg₆Al₂CO₃(OH)₁₆·4H₂O, hydrotalcite); (¤) ICDD file 01-083-4609 (CaCO₃); (*) ICDD file 04-015-7029 (Fe₂O₃); (+) ICDD file 04-008-8146 (Fe₃O₄).²
2.5. Numbering of compounds and equations

- Compounds are drawn, for example, with the ChemSketch program. The same style and bond length and ring size are used throughout the thesis. It is recommended to set the ACS style as a default for drawing structures in ChemSketch. Default structure can be set from "Set Structure Drawing Style" locating at the “Options Menu”.
- Compounds are numbered sequentially in the order in which they appear, if pictured.
- A well-known compound (benzene, sulfuric acid, etc.) does not need to be numbered unless it is an explicit subject.
- The number is written without brackets if it is related to the common name of the compound.
- E.g. alkene 1, alcohol 2, complex 3, ligand 4.
- The number is written in bold and in brackets if it relates to a compound with an exact (systematic or trivial) name and image.
- Below is an example of naming and numbering compounds in the text, as well as an example of the appropriate size and numbering of the structure.
- Presentation of compound structures does not require image & title.

Various imidazolium-based ionic liquids such as 1-butyl-3-methylimidazolium chloride ([BMIM] Cl) (5), 1-ethyl-3-methylimidazolium acetate ([EMIM] Ac) (6) and 1,3-dimethylimidazolium methylphosphonate ([MMIM] (MeO) HPO2) (7) dissolves starch well.1

![Chemical structures](image-url)
- Mathematical equations and reaction equations are numbered sequentially in the order in which they are mentioned.
- Below is an example of reaction equation (1) and mathematical equation (2)

\[ H_2O_2 \rightarrow H^+ + HO_2^- \]  
\[ pV = nRT \]  

(1)  
(2)

2.6. Literature references

Literature references can use either a numeric reference or a Harvard name reference.

2.6.1. Number reference

- As superscripts, with a sequential number in the order of mention.
- If the same literature reference is referred to again, it will be referred to by the number already given.
- Either to the end of a word or sentence, depending on the context.
- Sometimes also at the end of a chapter.
- It is recommended to use, for example, ProQuest®RefWorks to manage references.

2.6.2. Harvard name reference

- References can also be made to the author's name and year.
- If there are several references to the same subject, they are alphabetically according to the author and placed in chronological order.
- References are written in alphabetical order in the reference list.

2.7. Table of contents

- The table of contents is located at the beginning of the thesis.
- Should be done with the Word command after the titles are in the thesis. When designing headings, you should take advantage of the text styles (Styles) in Word, which you can customize to your own. The table of contents can be updated as writing progresses.
- Titles and Subheadings with the same design as in the thesis itself.
- Appropriate indentation (0.5-1 cm) when moving from one heading level to another.
- Page numbers.
- Line spacing 1–1.5.
- An example of the table of contents can be seen below.³

CONTENTS

PREFACE ........................................................................................................... 2
ABBREVIATIONS ............................................................................................ 3
1. INTRODUCTION .......................................................................................... 5
2. CATALYSTS ................................................................................................ 7
   2.1 Homogeneous catalysts ........................................................................... 9
   2.2 Heterogeneous catalysts ........................................................................ 10
      2.2.1 Supports .......................................................................................... 11
      2.2.2 Preparation of catalysts ................................................................. 11
      2.2.3 Classification of catalysts ............................................................... 13
      2.2.4 Reaction mechanism ..................................................................... 13
      2.2.5 Deactivation and regeneration .................................................... 16
3. CIRCULAR ECONOMY BASED CATALYSTS ......................................... 17
   3.1 Red mud ............................................................................................... 17
   3.2 Blast furnace slag ................................................................................ 20
   3.3 Fly ash .................................................................................................. 22
   3.4 Biochar .................................................................................................. 24
   3.5 Alkali activated materials ..................................................................... 27
4. Catalytic wet peroxide oxidation .................................................................. 33
5. CONCLUSION ............................................................................................. 37
6. REFERENCES ............................................................................................... 38
3. LIST OF REFERENCES

- Start from a new page.
- Sequential numbering.
- Line spacing 1.
- You could use e.g., Mendeley Reference Manager in managing your literature references. Below is an example of reference of journal article.
- Or modify references manually according to instructions below.
- *Reference to a journal publication*: authors last name, first letter of first name, journal name abbreviated and in italics, year in bold, volume in italics, page spacing. Journal abbreviations can be searched on the CAplus Core Journals Coverage list or List of title word abbreviations.
- *Example of a journal reference*:
- *Example reference to a book*:
- *Example reference to a specific chapter in a book*:
- *Example reference to a book with an editor*:
- **E-book reference:** Author (s), book title, Place of publication, publisher, Year of publication, page spacing, [date of reference]. Availability, i.e. web address

- **Example reference to an e-book:**
  
o Harvey, D., *Analytical Chemistry 2.0*, electronic version, **2008**, s.783-827.
  [Date of reference 25.11.2019]
  https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Book%3A_Analytical_Chemistry_2.0_(Harvey)

- **Patent reference:** Inventor, patent, year in bold, patent number.
  

- **Web reference:** the address (URL) of the information, the author, the name of the source (title, in italics), when the information was retrieved. You should also take a copy of important web publications.
  

- An example of the reference list can be seen below.

**REFERENCES**

4. STUDENT TIPS

- Limit the topic so that the number of pages and reference of the bachelor's/master's thesis are met, but not unnecessarily exceeded.
- Keep the whole thesis clear and easy to understand.
- Make sure that each chapter deals with one thing.
- Do not use sentences that are too long and avoid repeating things unnecessarily.
- Open the key terms of your thesis, the so-called professional vocabulary.
- Remember the scientific and correct language expression.
- Use figures, tables, etc. to clarify and lighten the text.
- The facts are presented in the present tense.
- Studies by others in passive imperfect / perfect.
- Get someone to proofread the text!
- When the structure and layout are well done, the text is pleasant to read.

5. REFERENCES