Guidelines of Master´s thesis in MSc Degree programme in Drug Discovery and Development
- 45 ECTS
(Loosely adapted with permission from Karolinska Institute, Sweden)

One of the most important things in completing the Master´s degree is a Master´s thesis, also called a pro gradu -thesis.

The Master´s thesis of the Master´s Degree Programme in Drug Discovery and Development is divided into two individual courses, which in total this makes 45 ECTS, and in practice it takes the whole last year of master´s studies:
- DRUG0014 Master´s Thesis Research Project and Seminars, 25 ECTS
- DRUG0015 Master´s Thesis Research Report, 20 ECTS

The Research Project part should be planned so that it will not take more than five to six months of full time (8 h/day) work. In addition to practical work project, the Research Project also includes participation in seminars and a mid-phase check-out meeting. A thesis seminar with oral presentations will be held at the end of the study year in spring. Usually the Research Project is conducted in a research group as an independent sub-project among the research projects of the group. The student should also participate in group meetings, seminars, journal clubs and other relevant activities of the research team.

The aim of the Master´s thesis is to demonstrate that the student masters his/her field of science, understands the research methodology as well as the relevant literature, and is capable of scientific thinking and presenting the obtained new data to the scientific community. A Master´s Thesis has to be a proper scientific research project, which generates new information. For example, a simple optimization of an existing method or production of a reagent is not considered as an academic research. However, the amount of results (or e.g. results supporting the hypothesis) is not the main focus of the Research Project, but the emphasis is on the overall performance of the research work including writing and presenting the data. Thesis should naturally be closely linked to drug discovery and development research. The language of the Thesis is English, and the student shall write the Thesis independently.

1 Projects

The Master´s Thesis can be conducted in any of the research groups at the Turku campus, as well as in a company or in a research group in another university/research institute. It is the student’s duty to find a research project of interest. Projects can be found from the websites below, but students are also encouraged to use their own contacts with teachers of the courses
- Pharmaceutical/biotech companies, www.finbio.net/en
It is recommended that the students start actively looking for thesis possibilities during the first year of Master’s studies. Ideal time to conduct the experimental part and writing depends naturally on the timing of other courses, and thesis work should not clash with too many other studies. Usually the best time for the Master’s thesis is the second year of Master’s studies.

The Master’s Thesis is a public document. This should be kept in mind when planning the thesis work in a company or in a research group which is working with topics that are confidential (e.g. for patent applications). The student has to agree with the research group that the obtained results can be used as well as published in the thesis. In some cases it is usually still possible to keep the details/name of the studied molecule/gene/compound/sequence classified.

2 Important persons, their duties and responsibilities

Formal Examiner

Formal Examiner is the responsible Professor of the subject, Markku Koulu or Ullamari Pesonen, or a lecturer/teacher nominated by them, e.g. Sanna Soini.

Formal Examiner accepts the supervisors and the Project Plan, acts as a chairperson of the Pro Seminar, organizes the mid-phase check-out meeting, acts as chairperson and evaluator of the thesis seminar and finally evaluates the press release. Formal Examiner also sums up the sub grades of different parts of the thesis project and presents the final grade of the MSc thesis to the Head of the Institute of Biomedicine.

Formal Examiner makes the final decision that the planned work fulfils the quality and scope of a Master’s Thesis. While accepting the project plan, the Formal Examiner also accepts the suitability of the thesis. Formal Examiner also supervises that the empirical part and the reporting (i.e. writing the thesis) are extensive enough to comprise a Master’s Thesis.

Supervisors

The Responsible Supervisor for the Master’s Thesis Research Project should be a Professor/Senior Researcher or a Post-Doc supported by a Professor/Senior Researcher. If the project is done in the Faculty, then there can be a PhD student acting as a Second Supervisor taking much of the daily practical supervision although the responsibility stays with the Responsible Supervisor. For projects performed outside of the Faculty of Medicine, a faculty affiliated Second Supervisor is required to serve as a contact person, to assist in project design, and to support during the work if needed.

At the beginning of the project Supervisors and student mutually agree on the rights and responsibilities of both parties by signing a Supervision plan (Appendix 1).

It is a duty of the Responsible Supervisor to make sure that the topic is suitable for the Master’s Thesis. The supervisors participate in the preparation of the research plan, helps and guides with the practical experiments and data analysis and follows the progress of the work.
In addition, it is important that the supervisor encourages the student to use her/his initiative during the Research Project. Already during the planning stage, the Responsible Supervisor should go through the evaluation criteria of the thesis work together with the student.

The Supervisors have to follow the progress of the thesis work with regular discussions with the student, and make sure that the prepared thesis will fulfil the required criteria. Regular feedback on the student’s performance during the Research Project is very important for the learning experience. The Responsible Supervisor should provide oral feedback and assess the progress together with the students before three months has passed since the beginning of the project. Both the Responsible Supervisor and a student will sign a form, stating that the feedback session took place (Appendix 2). The student presents the signed form to the Formal Examiner at a mandatory mid-phase check-out meeting.

The Supervisors shall inform the student about the safety regulations and protocols that are in use at the research group and that the student is expected to follow these regulations. The Supervisors make sure that the student has all the required material, equipment, computers and computer programs available. He/she should read the thesis manuscript, give feedback and advice, and also correct the factual errors. However, the Supervisors should not write the thesis or any chapters of it, nor do any experiments or data analysis for the student, but he/she has to make sure that the experiments and analyses are properly conducted with the most suitable methods available.

The Responsible Supervisor also grades the project activities of the student according to the assessment criteria that can be found in Appendix 3. The assessment form should be submitted to the Formal Examiner before the thesis is given to the Scientific Reviewer. All the students are also encouraged to present the summarized results to the research group at the end of the practical part of the project.

Scientific Reviewer

Each submitted report will be assigned to a Scientific Reviewer for detailed evaluation based on the assessment criteria in the evaluation form which are available in the Appendix 4. To secure equal assessment for the MSc reports, Scientific Reviewer should always be an experienced, but an objective expert in the field of the thesis study. Scientific Reviewer may consult the Supervisor during the evaluation, but he/she has the right to make the final decision about the grade of the report. Scientific Reviewer will be decided by Formal Examiner and then be nominated by the Head of the Institute of Biomedicine.

Fellow student (peer review)

A fellow student will be appointed to act as a peer reviewer for each student. The tasks of the fellow student are to read the Project Plan and the Report, give constructive remarks during peer feedback and ask questions at the Pro Seminar and at the Master’s Thesis Seminar.

For the Pro Seminar the fellow student will do the peer reviewing of the Project Plan before the seminar and act as an opponent in the seminar by asking questions after the presentation.

Before the final submission of the Master’s Thesis Project Report the fellow student will again do the peer reviewing. (NB: This does not necessarily need to be the same student pair than for the Pro Seminar.) The fellow student will focus on layout, structure and to note
obvious errors (if any). A mandatory peer-feedback, in groups of two, will take place at a time and place decided by the students. It will be beneficial for both to get the feedback well before the final submission. The same student pair will do the opponent task during the oral presentations in the final seminars, then focusing on the interpretation and conclusions based on the data.

**Programme Coordinator**

Master’s Degree Programme Coordinator helps the Formal Examiner to organize the Pro Seminar and Thesis Seminar. Coordinator also collects and keeps the signed Supervision Plan Project Plan and evaluation forms. H/She acts as an administrative contact person for students, examiners, reviewers and supervisors, and coordinates the graduation process of the students after the Master’s thesis has been finished.

### 3 Project Plan

The student will write a Project Plan for the thesis. This is an important obligatory part of the studies. While writing the Project Plan the student will familiarize him/herself with the research questions, previous work done in the project, research methods, aims of the work and expectations about the results. It is very important that the project is planned in relation to the time and resources available (five to six months of full-day work).

A well-written Project Plan is also very helpful when writing the Master’s Thesis. The Project Plan and the Supervision Plan shall be returned to the Formal Examiner, who will accept the Project Plan and the Master’s Thesis Research Project before the practical work begins.

The Project Plan should be about 10-12 pages in length and should include the following parts:

1. Title page
   a) Name and email of the student
   b) Name, telephone number, email and affiliation of supervisor(s)
   c) Site of research
   d) Project title
2. Abstract: short but comprehensive description of the project
3. List of used abbreviations
4. Table of contents including page numbers
5. Scientific background of the researched project: description of the research area and the review of the most important literature
6. Aims, hypotheses and goals
7. Experimental design including evaluation of statistical methods and time table: if thesis is part of the larger research project, the detailed description of the students responsibilities
8. Ethical and confidentiality (if needed) issues
9. Expected outcomes and significance of research
10. References

See below (starting from page 6) more detailed technical instructions for different sub-parts, fonts, margins etc., since they are similar to the Master’s Thesis Research Report.
Project plan shall be written independently, but the Supervisor should help the student to find the required information and accept the Project Plan before it is given to the Formal Examiner.

When the research project is conducted in a big research group, it is sometimes useful to define which parts of the project will be fully independently performed by the student, or when the student participates in the research efforts as a team member, which can be the case in large animal experiments, for example. When described in the Project Plan, the amount of the required experimental work for the student is easier to estimate.

All special conditions and exceptions, such as working in a company and confidentiality issues shall also be mentioned in the Project Plan. Details about the possible confidentiality will be included in the plan to make sure that the student, the supervisor(s) and Formal Examiner have all understood and accepted this matter.

Any major changes in the plan (such as time table or new Supervisor) should be informed to the Formal Examiner without delay, and if necessary, new Project Plan shall be written.

However, it is good to keep in mind that the Project Plan is always only a plan, because the research work is usually full of surprises. The first pieces of new data even in the very beginning of the project may lead to completely new discoveries and also changes in the original project plan. However, the Supervisor should always take care that the Master’s Thesis Research Project of the student is not compromised.

**Research Project Seminar/Pro Seminar**

Each student must present, defend and discuss about his/her research plan publicly in Research Project Seminar, or so called Pro Seminar. The Pro Seminars are organised in the beginning of the autumn semester in September. Formal Examiner will organize the Pro Seminar with the help of the Programme Coordinator and will act as a chairperson there.

Each student will give a short, 10-15 minutes presentation about the planned research; aims, required methodology, experimental set up and expected results. The presentation will be followed by questions from a fellow student, who has done peer-reviewing of the Project Plan. In addition to the peer-reviewing student, the audience (other fellow students, lecturers, professors, supervisors) will be requested to actively participate in the discussion after the presentations. Based on the feedback and suggestions from the Pro Seminar, the student may need to revise the Project Plan before the experimental work can begin.

**Important:** The Project Plan should be written and accepted before the empirical work of Master’s Thesis Research Project can be started. If the student will start the Master’s Thesis Research Project already during the first study year, the Project Plan can and must be accepted without a Pro Seminar. In such cases, the student will attend in the next possible Pro Seminar, and present the current state of the ongoing Master’s Thesis Research Project and changes which have been made in the Project Plan since it has been accepted.
4 Student duties and responsibilities

When the topic has been selected by the student and the supervisor(s) and the Project Plan accepted by the Formal Examiner, the student is committed to work with the thesis according to the time-table agreed in the Project Plan.

The student has the responsibility to make sure he/she learns the skills needed to conduct the required experiments, make sure that the work proceeds and the thesis is finished within the agreed time limits. Usually when the student works full-time with the thesis, the time used for experimental study is 4-5 months and 1-2 months for writing. The student has to follow the working hours and work routines which are used in the laboratory of the Supervisor. Moreover, he/she has to accept the confidentiality agreements of the laboratory and follow them even after the work in the laboratory is completed.

The student is entitled to get all the required supervision for experimental work, analysis and presentation of the data. H/She has a right to do all the experiments without any payments; the Supervisor or the research group is responsible for covering the costs of the experiments. The student and the Supervisor must agree on the rights to use the acquired data in the possible future publications of the research group.

The student is entitled to perform his/her research as agreed in the Supervision Plan (Appendix 1). If the Research Project/Supervisor is not following plan, the student should immediately contact the Formal Examiner and/or the Programme Coordinator to explain the situation.

5 Master´s thesis

Implementation
The empirical details should be brought up during the planning of the thesis and thoroughly discussed with the Supervisor and the Formal Examiner. They should also be written in the Project Plan and repeatedly refined in the discussions between the student and the Supervisor during the experimental work.

The laboratory notebook is a very important part of the thesis work. Student shall make notes of all the details related to the experimental work, including detailed protocols of the experiments, recipes for prepared solutions, used formulas and calculations, possible sources of error, used databases etc. Based on the notes, another researcher of similar level skills should be able to repeat the experiment. If requested, the student has to give the notebook to the Formal Examiner, as it can also be used to estimate the time spent for doing the thesis. The laboratory notebooks are very important part of the documentation of research and their importance is getting even bigger because they can be used to validate the performed experiments. This validation may play a big role e.g. in patenting or solving plagiarism accusations.

When the thesis is completed, in most cases the notebooks belong to the research project/Supervisor, and are open for everyone, unless some confidentiality agreements exist.
Writing the Master’s Thesis Research Report

The Master’s Thesis Research Report should be written in the form of a research publication. It is highly recommended to start writing parts of the report some time before finishing the experiments/data collection. A stringent format of the written report is necessary for fair grading.

The instructions for the report are modified from the technical guidelines for manuscripts intended for submission into the Journal of Cell Biology. http://jcb.rupress.org/site/misc/ifora.xhtml

The length of the report should be approximately 15 000 words, excluding the references and figure and table legends. If the student wants to exceed, or alternatively lower, the amount of words, s/he should consider very carefully is it necessary.

The reports is written with Times or Arial font size 12 for all text, line spacing 1,5. For making the binding easier, the left margin should be 4 cm, all other margins minimun of 2 cm.

The report consists of the following parts:
1. Title page (separate model page, Appendix A)
2. Abstract page (separate model page, Appendix B)
3. Table of contents (separate suggested model page, Appendix C)
4. Introduction
5. Results (including figures, tables and figure legends)
6. Discussion
7. Materials and methods
8. Acknowledgements
9. Abbreviations list
10. References
11. Appendices/Supplementary Material

The first draft of the thesis should be written in good time even if the final text will change a lot after the first draft. It is worthwhile to give even a relatively preliminary thesis draft for a fellow student or to a Supervisor for reading to get valuable comments. If the writing seems very difficult to start, it is advisable to contact the coordinator, or the Head of Studies (Sanna Soini) and/or the Supervisor. The Master’s Thesis is not necessarily a Nobel Prize winning piece of science, but just a small series of experiments, which, however, are very important to show the student’s competence for scientific work and for obtaining the degree!

**Title page**
The thesis title should be short and informative, and should not contain any abbreviations (for example, Epithelial-Mesenchymal Transition should not be abbreviated to EMT). However, commonly used gene or protein acronyms are acceptable (see Abbreviations list below). The total length of the title should not exceed 100 characters (including spaces), and it does not need to be the same than title of the Project plan.

**Abstract page**
The abstract is a single paragraph with the maximal length of 250 words, written in line spacing 1. The abstract should be comprehensible to readers before they have read the paper,
and nonstandard abbreviations should be avoided where possible (as for the title). The abstract should contain the description of the research problem, the materials and methods used, the most important results and conclusions. The abstract has to be an independent unit/chapter and it should not contain any references or refer to the actual thesis. Usually the abstract is written as the last part of the work. For Finnish speaking students the abstract shall also be translated in Finnish.

**Introduction**
Introduction gives the reader background about the research topic. It should only contain topics that are related to the thesis, but it gives the student a possibility to concentrate on certain topics in a more detailed manner than what is usually done in research articles. Therefore the introduction of the Master’s Thesis should be longer than in normal research publication.

Introduction starts with the general introduction and ends with the summary and conclusions about the current knowledge on the research topic. This part very clearly reveals how well the student masters his/her research area. The literature review is usually written in the present tense.

In the introduction the student should also present the motivation why the research project was done. Based on the problems raised in the current literature, the introduction presents the research questions which the thesis aims to solve, and also the hypothesis to be tested. This section includes the general introduction to the research problematics, background theories and detailed presentation of the aims in the performed work. This part does not need to be exhaustive, but rather a clear presentation of the major aims and their explanations if required.

**Results**
The results are often depicted as figures and tables. Number of those is not limited to the instructions of Journal of Cell Biology. The figure is usually a more visual way of presenting the data and therefore preferred over the tables. The text will explain the central meaning of the figures and tables. Figures and tables are numbered and should be placed as near as possible to that text part where they are discussed. Each figure needs to have a figure legend which is placed below the figure and should contain so much information that the figure can be understood without reading the text chapter. When needed, the figures should contain a scale bar (microscopic pictures), molecular weight markers (gel electrophoresis) etc. The table legends are placed above the table and also here the legend should contain enough information so that the table can be understood independently without reading the text. Clarifying footnotes may be appended to the tables. Footnotes are marked as superscripts in the table and then explained as footnotes below the table. Results section does not normally contain references, unless the used literature has direct links to results. The results section is usually written in the imperfect tense.

**Discussion**
This is the most important part of the thesis, which distinguishes the outstanding thesis from a regular good thesis. The aim of the discussion is to present the new results in light of the previous findings of the field and in relation to the questions presented in the introduction. It should not only repeat the obtained results with the references to literature, but the current data should be linked to a more general framework. This is the section which measures how
well the student understands the meaning and importance of his/her work, and can present opinions and conclusions about his/her own work and relate the new data with the already known scientific facts and details, impact on the society and/or human health.

The results are compared with earlier research work dealing with similar types of problems and questions to be able to generate larger complexes of new information. Basic textbooks should not be used as references, but earlier publications about similar topics and research questions. If the obtained data does not fit with the previously published findings, the possible sources of error should be carefully examined and evaluated. If this examination shows that the sources of error cannot explain the unexpected observations, it is important to bring up the new solutions and their more general importance. If the discussion section is extensive, it can end with a summary, where the key results and their conclusions are clearly and concisely presented. The discussion is usually written in the present tense.

Materials and methods
This section accurately describes the materials and methods used in the thesis. The guideline is that it is possible to repeat the work according to the description. The novel, previously unpublished features of analyses and/or statistical methods have to be written with special precision. With the routine methods it is enough to describe the main principles and give a reference to the original description of the method or for example to a used computer programme. The section may include pictures and diagrams, which are especially useful if they make the text more readable, like timelines and flow charts. This is usually the section which is written first as it is the straightforward description of the performed research. Materials and methods section is usually written in the imperfect tense.

Acknowledgements
Acknowledgements section should present colleagues and collaborators who have participated in the planning and execution of the work.

Abbreviations List
According to JBC, a term that does not appear on the JCB standard abbreviations list must be used at least three times in a report to qualify as an abbreviation. Supply a list of nonstandard abbreviations used in the report, in alphabetical order, giving each abbreviation followed by its spelled-out version. The nonstandard abbreviations should also be spelled out on first mention in the text, and follow it with the abbreviated form in parentheses. Thereafter, the abbreviated form shall be used, but if the term is used less than three times, no abbreviation shall be used.

References
The list of the literature has to contain all the cited publications in the thesis. The reference list should not contain publications which are not used in the text and vice versa, the text should not contain citations which are not listed in the references. The citations to scientific articles, book chapters and text books are done according to the Journal of Cell Biology.

It is good to keep in mind that in all the scientific writing (thesis, articles etc.) it is very important to follow the instructions given about the references. Unfinished list of references can create and an impression that the whole work is done in a sloppy manner!
There are several excellent citation managing softwares available, e.g. through the University of Turku library services students can use www-based Refworks (http://www.refworks.com/) and EndNoteWeb http://www.myendnoteweb.com.

Appendices
Thesis may also include appendices, such as recipes for reagents and solutions, parts of instrument manuals or kit protocols, experimental original data values or figures and other relevant details.

6 Press release

As part of the written report, the student will write a press release of 2000 - 2500 characters long, aimed at the general public without advanced knowledge in biomedicine. The text should be brief, focused and structured as a typical press release found in national newspapers. The brief instructions for writing the press release can be found via this link. The press release is written in English. However, the students who have conducted their secondary education in Finnish may write the press release in Finnish. The press release will be graded by the Formal Examiner and will count 0 to 3 points towards the total grade of the thesis (Appendix 6).

7 Thesis Seminar

The oral presentations will take place at the end of study year in April/May. The students will present the results of the project in a Thesis Seminar. Each student prepares for a presentation session with visual support, followed by discussion with questions from the peer-reviewing fellow student (opponent), the Formal Examiner, Supervisor(s), and other guests. The presentation and the discussion should not exceed 20 minutes. The Scientific reviewers are invited to attend the Thesis seminar. All students are requested to actively participate in the discussion after the talks. The Formal Examiner will evaluate the oral presentation and the competence of the student to answer questions related to the project (Appendix 5).

8 Reviewing and grading

Peer reviewing
Before the final submission of the Master´s Thesis Project Report each student will send the Report by email to fellow student who will do the peer reviewing. A mandatory peer-feedback, in groups of two, will take place at a time and place decided by the students. It will be beneficial for both to get the feedback well before the final submission. Each student will act as a peer-reviewer on Reports with focus on layout, structure and to note obvious errors (if any). The same student pair will do the opponent task during the oral presentations in the final seminars, then focusing on the interpretation and conclusions based on the data.
Grading process
In the Thesis grading process, both the Research Project and the Master’s Thesis Research Report are evaluated. The grading of the MSc thesis project is based on combined evaluation by the Supervisor(s), Scientific reviewer and Formal Examiner.

The Supervisor grades the Research Project according to the assessment criteria that can be found in Appendix 3. The assessment form should be submitted to the Formal Examiner before the thesis is given to the Scientific Reviewer.

When the Master’s Thesis Research Report is ready, it is given to the Formal Examiner to be presented to the Head of the Institute of Biomedicine, who will appoint the Scientific Reviewer (Appendix 7). Scientific Reviewer will do the detailed evaluation based on the assessment criteria in the evaluation form, Appendix 4. The evaluation form shall be submitted to the Formal Examiner at the latest one month after the report is sent to the Scientific Reviewer.

Oral and written feedback
Scientific Reviewer should also be available for oral feedback session regarding the written report. In order for the feedback to empower the student’s learning, the following guideline for the feedback session can be used:

- First, the student performs a short self-assessment in which the student evaluates/grades his/her written report.
- Second, the Scientific Reviewer summarizes the positive points followed by two or three items for improvement.

The date, time and place for the oral feedback should be decided jointly between the Scientific Reviewer and the student. The feedback session is highly recommended and can be organized via Skype or phone if physical meeting is difficult to arrange.

In addition, the Scientific Reviewer will also write a clear, justified and concise written feedback. If necessary, based on the grading of the Scientific Reviewer grading it may be decided that the student needs to revise the written report and re-submit it to the Formal Examiner as a final version.

The student has a right to see the grade with its justifications before the final grading is accepted. The student will approve the grading by signing the grading form. In the case of disagreement, another Scientific Reviewer may be appointed by the Head of the Institute of Biomedicine.

The accepted theses will be graded with the latin grades: approbatur (a), lubenter approbatur (b), non sine laude approbatur (n), cum laude approbatur (c), magna cum laude approbatur (m), eximia cum laude approbatur (e) or laudatur (l). Laudatur is only used when the thesis is exceptionally outstanding in relation to the time used to the compiling of the thesis.

General review criteria
1. Quality and meticulousness of the work. How the topic is presented? Is the central literature included and properly cited? Are the hypotheses clear and scientifically valid?
2. How suitable were the methods used? Laborious, difficult, appropriate for the purpose? Were the methods further developed during the thesis? Was the material suitable for the topic? Is there enough data collected, all the necessary repeats done? Here it should be noted that evaluation should be based on the student’s ability to develop and use the provided methods and materials, not to evaluate the supervisor’s ability to choose the methods. It is also good to keep in mind, that student can not always affect the amount of data collected, e.g. some experiments can be very expensive and all the required repeats can not be performed.

3. The clarity of the results including the tables, figures and statistical presentations.

4. The coherence of the discussion. How the conclusions are drawn from the obtained data and linked to the previous research? How the possible sources of error are evaluated and discussed?

5. How well the abstract describes the central methods, results and conclusions?

6. Language and presentation style.

7. How well the research problem is generally presented, including the errors and flaws which the student has or has not noticed.

8. The maturity and the originality of the thesis.

The Scientific Reviewer(s) should also pay attention to the following details:
1. How much time was used in relation how extensive the thesis is?
2. How independently the student did planning and the practical laboratory work?
3. How independently the writing was performed?

9 Maturity test

Before the thesis can be accepted, the student must pass the so called maturity test. It is a written essay about the topic of the Master´s thesis. By doing the maturity test the student shows that he/she masters his/her field of research and is capable of presenting his/her speciality in writing, as well as act as an expert in the community.

The maturity test is held and examined by the Formal Examiner or a person appointed by him/her. The maturity test is written in English, and the language should be fluent, grammatically as correct as possible with a proper academic style. The length of the essay is about 600 - 800 words. The essay itself has to be a structured, continuous text divided in chapters. The contents should follow the topic and end with conclusions. It should be so clearly written that even a person without previous knowledge of the topic is able to understand it.

The test is written as a 4 hour exam, organized individually for the student in electronic exam service (not as a homework). It is graded as passed or failed. In the case of failing the test, it needs to be rewritten before the Master´s Thesis can be accepted and the ECTS registered.
NB! Those students who have conducted their secondary education, but not their BSc or other previous academic degree in Finnish, must write the maturity test in Finnish, and the text will be sent for language check before the maturity test can be approved.

10 Plagiarism

“What is meant by plagiarism is borrowing material that another person has produced in a way that is against the general research ethical principles and presenting it as one’s own. Plagiarism is an increasing problem in university studies.”

The University of Turku attained Ethical Guidelines for Learning ratified by the Rector on the 5th September 2013. These guidelines help define what ethical behaviour means in everyday studies and work. For example, the University Act requires ethical action, but the limits of good ethical practices might be difficult to conceive without proper guidelines.

The guidelines highlight respect for the work of others and yourself, loyalty towards the working community and focus on the common basic objective of promoting learning.

The fourth paragraph of student guidelines is essential concerning FairUTU practices: “My achievements in study are based on real knowledge.” There are sub-paragraphs that explain this more concretely:

- I do my assignments and final theses myself and I do not take advantage of other people’s work without permission.
- I report the sources I have used and I do not take as my own information from the internet, other students or from anywhere else.
- I do not give my own work to another student for fraudulent use nor do I use my earlier achievements as a basis for new ones without references.
- When engaged in group or pair work, I describe the way work is distributed honestly and in a way that supports the evaluation.

**What does this mean?**
All forms of plagiarism, e.g. copying from the sources without proper reference indication, are regarded as falsification.

The definition of plagiarism, and how to avoid it (from Åbo Akademi University – more information: http://web.abo.fi/lc/material/cheating_plagiarism.pdf):

A distinction is made between the incautious use of material and actual plagiarism.

**Incautious use of material**
Incautious use of material refers to a situation where a student unintentionally presents material produced by another person as his/her own work. The criteria for incautious use of
material is met in cases of misunderstanding the nature of the work task, negligence or perceptible inexperience in the correct use of quotations and/or other referencing techniques by the student.

**Plagiarism**

Plagiarism refers to a situation where a student intentionally presents material produced by another person as his/her own work. The criteria for plagiarism is met in cases where a student knows or should know that the reproduced material has been created by another person, or where the student has neglected to follow the teacher’s instructions for avoiding incautious use of material.

In other words, *an act of plagiarism refers to a case where you copy the works or texts of others from books, articles, the internet or other sources with the intention of presenting them as your own.*

This is cheating and can result in failing the course (and even in being dismissed from the university). In essays and written assignments, sources are often used as a basis for creating new knowledge. When referring to or quoting a source, this must be appropriately marked, that is, a reference should be given.

In order to avoid careless use, these instructions should be followed:
- Always give the source, regardless of whether you refer to somebody else’s text, that is, summarize in your own words what somebody else has written, or whether you quote the text directly.

- When quoting somebody, remember to write this as a direct quote; that is, apart from giving the reference, you must place the quote within citation marks or mark the quote in some other way. It is also considered plagiarism if you only give the source, but do not mark the text as a direct quote. You also have to quote your source correctly, that is, word by word – if you leave out or add words you must mark this with square brackets.

- Do not keep your source text open in front of you when you rewrite the text; it will make it easier for you to actually use your own words. It is important that you **rewrite to a sufficient extent** in order for the text not be considered as somebody else’s.

- If you make a direct translation of somebody else’s text, you must give the source and also note that you have made a direct translation. (A direct translation remains the intellectual property of the original author.)

- If you create links to the material of others on the web, you must say where the link leads to.

- When reading material for an essay or for a thesis, remember to constantly write notes as to where you take the information from that you might be going to use in your essay or thesis.

**Making references**

In avoiding plagiarism or careless use, the most important thing is to know how to mark quotes and make references. The very important thing is consistency in the way in which you make your references and bibliography - use the same system throughout your work.

**Figures**
Pictures, charts and tables are sometimes too complicated to be redrawn for essays, reports or MSc or PhD theses. In these cases the student should always ask a permission from the copyright holder to use the original picture. Usually this is a straightforward procedure and the instructions can be found on the web site of the journal or the book in question. After the permission is granted, the picture can be used in the report/thesis with the reference and text: "reprinted/reproduced with the permission of the copyright holder". Those pictures which are redrawn according to material already published (books/journals/websites), should be clearly modified and the source mentioned in the figure legend with the text “adapted from/modified from + reference information”.

**Turnitin**

Electrical plagiarism detection, Turnitin Originality Check, is a part of the quality system of education and research at the University of Turku.

From 1 January 2013 onwards, dissertations applying for permission for preliminary examination must be attached with a certificate which states that an originality check has been made by the supervisor. From 1 August 2013 onwards, the originality of Bachelor’s and Master’s theses will be checked in a similar manner during preliminary examination.

Dissertations and Master’s theses are checked so that the texts are saved in the system as reference material. Bachelor’s theses are not saved in the system.

### Time table and roles of Drug Discovery and Development MSc thesis project, 45 ECTS

<table>
<thead>
<tr>
<th>Time table (provisional)</th>
<th>Student</th>
<th>Supervisor(s)</th>
<th>Scientific Reviewer</th>
<th>Formal Examiner</th>
<th>Fellow student (peer review)</th>
</tr>
</thead>
</table>
| Before the start of the project | • Seeking of the research subject and group.  
• Writing of the research plan (8-10 pages)  
• Concluding the Supervision Plan together with the supervisor(s) | • Helping to find suitable literature  
• Helping with the research plan  
• Paying special attention to the given time frame (5 to 6 months)  
• Concluding the Supervision Plan together with the student | | | |
| Pro seminar (September) | • Defending the research plan in pro seminar (10 - 15 min). | • Taking part to the pro seminar as a supervisor (Attendance recommended) | | Chairperson of the pro seminar | Taking part to the pro seminars and acting as an opponent |
| Project work | • Executing experiments | • Hands on guiding | | | |
| Mandatory mid-phase evaluation (October-November) | • Oral feedback and self-reflection of the project together with the supervisor | • Oral feedback for the student (the evaluation is mandatory and the presence of supervisor is verified by signing) | | Organizing a mid-phase check-out meeting for the entire class | |
| December – January | • The end of experimental phase. Writing of the Research Report (Scientific article structure, 30-40 pages) | • Supervising of the writing process  
• Assessing the project activities  
• Giving oral feedback | | | |
| At the beginning of April | • Submitting the written Research Report for peer review | | | Peer reviewing of fellow student’s written report (prior to giving the report to evaluation) | |
| April/May (thesis seminars) | • Oral presentation | • Attendance recommended | • Attendance recommended | • Grading the oral presentation:  
Active participation to the thesis seminar and acting as an opponent (making questions, giving feedback) | |
| Beginning of May | • The deadline for the Research Report (submission to evaluation)  
• Writing the press release  
• Self-assessment of the Report and arranging the feedback session with the examiner | • Approves the submission of the Project Report for evaluation (Responsible Supervisor)  
• Giving oral feedback | • Grading the written report:  
Giving oral feedback | • Grading the press release | |
Master’s Thesis Title

Master’s Thesis
University of Turku
MSc Degree Programme in
Drug Discovery and Development
Completion month and year

My Name

Supervisors
Pharmacology, Drug Development and Therapeutics

The originality of this thesis has been verified in accordance with the University of Turku quality assurance system using the Turnitin OriginalityCheck service.
Abstract page must be included in each Master’s thesis which will be accepted at the University of Turku. Abstract page will follow the title page, and its aim is to give a summary of the performed work to those interested in the topic. In addition to the page which will be part of the thesis, a separate, identical abstract page will be included to be published separately.

Bibliographic information on the top of the page will include:
- The name of the university and the institute
- Last and first name of the author in CAPITAL letters
- Name of the thesis
- Type of the work (MSc). Page number and appendices.
- Subject
- Completion month and year

The height of the bibliographic information part is 6 cm.

The abstract shall be written under the bibliographic information. It should be written in simple scientific style, with the presumption that the reader has some knowledge about the topic. The abstract must be understandable on its own, without a need to read the entire thesis. It shall be written as whole sentences, using established terms. References and quotations are not allowed, or any information, which is not included in the thesis. The abstract must be clear and concise, 120-250 words in length, with font size of 12 p and line spacing of one. One empty line is left between paragraphs without indentation.

The abstract should include:
- topic of the thesis
- aims of the research
- research materials and methods
- most important results
- conclusions and suggested further studies or actions to be taken
- key words (2-4)

For example Medical Subject Headings (MeSH) can be used to select the keywords.
1 INTRODUCTION ................................................................. 1
2 RESULTS .............................................................................. 8
  2.1 Antibody production ....................................................... 8
  2.2 Receptor activation ....................................................... 9
  2.3 Expression analysis ..................................................... 12
    2.3.1 Microscopy .......................................................... 12
    2.3.2 Western blotting .................................................. 13
3 DISCUSSION ...................................................................... 16
  etc...etc...

Table of Contents:
- starts from the Introduction
- page numbering starts also from the Introduction
- use indentation according to the numbering
- use full stop as a leader......
- line spacing is 1,5
Selecting the Research Project
Writing the Project Plan
Working with the Research Project
Writing the Research Report
Research Report Review
Peer Review
Writing the Press Release