

GUIDELINES FOR THE PREPARATION OF A MASTERS THESIS

DEPARTMENT OF BIOLOGY
Villanova University

ADOPTED – June 2009

The Master's Thesis is the culmination of research done at the graduate level. It is a unique document, and includes more than a manuscript submitted for publication in a scientific journal that presents information with an economy of words to an audience of informed specialists. In addition to presenting the results and discussing the implications of scientific experiments, the written thesis is an academic exercise to foster the student's intellectual and professional development. Furthermore, the readers of an approved thesis are likely to be relatively inexperienced with the topic, including, for example, students seeking an introduction to a line of investigation in a certain laboratory. For these reasons, a thesis should contain a more complete review and discussion of the related literature and should present methodology and results in more detail than a journal article. Faculty research mentors may vary, however, in their expectations about how much, if any, additional coverage is desirable in the thesis. Check with your mentor and thesis committee to be clear about the expectations for your thesis.

Distribution

The final official version of the thesis is the electronic version submitted to ProQuest. Detailed instructions for the preparation of the electronic document are available at <http://www.etdadmin.com/villanova>. In addition, the Department of Biology also requires one bound hard copy of each thesis for the departmental library. Students should check with their committee members to see if they would also like bound hard copies of the thesis. The cost for binding of these and any personal copies for the student is of \$15.00 per copy (as of 2009) through Falvey Library (<http://www.library.villanova.edu/About/Services/ThesisBinding>).

Before the electronic copy is submitted, however, Graduate Studies requires that the student provides one unbound hard copy of the approved thesis along with two copies of the Approval Form signed by the thesis committee members and the departmental Chair (one for Graduate Studies and the other to be returned to Biology for inclusion in the departmental copy of the bound thesis). These should be presented to the Graduate Studies Office in a folder bearing the the student's name, Villanova ID number, and department. Additional copies of the Approval Form for inclusion in the optional additional bound copies of the thesis should also be submitted to the Graduate Studies Office at this time (**note that the Approval Form is not included in the electronic version of the thesis**). An example of the Approval Form is provided on the Biology website (<http://www.villanova.edu/artsci/assets/documents/biology/Form.MS.AprovalForm.doc>).

Typing, Margins, and Pagination

All hard copies of the thesis must be on white bond paper, 8.5 x 11 inches, and at least 20-pound weight. A left-hand margin of 1.5 inches must be left for binding. Each of the other margins should be 1 inch. The original copy should be printed in 10 or 12 font type, preferably using a *serif* font such as Times New Roman for the body text. (Note that some fonts available on computers may not be compatible with some printers, or with the eventual conversion to PDF format.) The text must be double-spaced except for the Literature Cited section. An example of

the Literature Cited section is attached here. Each page of the thesis is assigned a number, although the number should not appear on the Title Page (see sample Title Page at: http://www.villanova.edu/artsci/assets/documents/academics/graduate/forms/thesis_title.pdf).

Preliminary sections of the thesis (Title Page, Acknowledgments, Biographical Sketch, Table of Contents, List of Figures, and List of Tables), should be numbered consecutively in small Roman Numerals (ii, iii, iv, etc.; the Title Page is page i, but the page number should not appear). Beginning with the Abstract and followed by the first page of the main body of the text, consecutive Arabic numbers (1, 2, 3, etc.) should appear at the bottom of each page. The signed Approval Form should be inserted for hard-copy versions of the thesis as an unnumbered page immediately after the Title Page; this page should be omitted from the Table of Contents of the thesis.

Further details regarding Thesis formatting are provided in the document “Format for Preparation of the Master’s Thesis/Doctoral Dissertation” available at <http://www.villanova.edu/artsci/assets/documents/academics/graduate/FormatForPrepThesisDissertation.pdf>.

Format

The thesis should include, in this order: Title Page, Approval Form (unnumbered; for hard-copy versions only), Acknowledgments, Biographical Sketch, Table of Contents, List of Figures, List of Tables, Abstract (not to exceed 150 words), Introduction, Materials and Methods, Results, Discussion, Literature Cited, and Appendices (optional). The Biographical Sketch should include information about the author’s previous education, honors, and awards. Each section following the Approval Page is to begin on a new page with the section heading centered and in capital letters, e.g., TABLE OF CONTENTS.

The Table of Contents lists all section and subsection headings with initial page numbers. The List of Figures and List of Tables include, in order of appearance in the thesis, the number, descriptive title, and page number of the Figures and Tables, respectively. Figures and tables are referred to in the text by number. Each should be placed within the page in which reference is initially made (using the “text wrapping” functions of a word processor), or immediately following that page of text. If initial reference is made on a single page to more than one figure and/or table, the figures and/or tables should be arranged sequentially immediately following that page.

The four major sections of text (Introduction, Materials and Methods, Results, and Discussion) should ordinarily contain one level of subsections. Each subsection is to begin with a descriptive heading in italics, e.g., *Enzyme Purification*. Italics should also be used for the scientific names of genera and species and for Latin phrases or abbreviations (e.g., *a priori*, *ad hoc*). Subheadings are to be left-justified on a line separate from the text. The Appendices should be headed APPENDIX or APPENDICES depending on whether there is one or more. Each individual Appendix is to be numbered and should begin with a descriptive subsection heading in italics.

Tables and Figures

Figures and tables must contain enough information so that they can stand alone. Tables are numbered with Arabic numerals consecutively as they are referred to in the text. Each table is given a brief descriptive title, and table number and title should appear over the table. Any

necessary explanations should be provided in the legend and/or in footnotes. Tables are footnoted with lower case letter superscripts. An example of a table is attached.

All other illustrations, i.e., graphs, charts, photographs, etc., are figures. Figures are numbered with Arabic numbers consecutively as they are referred to in the text. Each figure is given a brief descriptive title (which will appear in the List of Figures), which is followed by the figure legend. The figure number, title, and legend should appear either below the figure or on a facing page. Figures must be completely labeled, e.g., the axes of graphs, a key to symbols, a definition of abbreviations.

Whether in a Table or Figure, each numerical value should be rounded to the nearest significant digit and assigned the proper unit of measurement. If a measure of variation is available (e.g., range, standard deviation, standard error of the mean), it should be given. Decimal values between -1 and 1 should be preceded by a zero (i.e., 0.9 rather than .9).

Student authors may choose to create figures that include color. Arrangements can be made to print those pages of the thesis on the color laser printer in the Biology departmental office (M147) for inclusion in bound copies of the thesis. Students should use care in selection of colors, keeping in mind that readers of the electronic version of the thesis may wish to print copies using a grayscale printer; by using contrasting intensity as well as hue, authors can insure that all information in figures will remain available.

Literature Citations

Literature citations within the text refer to the item by author and year of publication (for example, "... enhanced protein synthesis (Jones 2007)" or "... as reported by Jones (2007)"). If there are two authors, both should be used; if there are three or more authors the first should be used followed by '*et al.*' In the instance of multiple publications by the same author(s) within one year, the publications are distinguished by lower case letters appended to the year. This, of course, must be done in the in-text reference to the item and in the Literature Cited section.

The Literature Cited section must include all items, but only those items, to which reference is made in the thesis. Entries are listed in alphabetical order by author. Each reference is single spaced with hanging indentation and with double spacing between references. Because details of citation format differ between subdisciplines and between journals in Biology, any standard journal format for literature citations may be used (with the approval of the thesis mentor) as long as (1) this format is followed consistently, and (2) the full article title, unabbreviated name of the journal (or book, report, etc.), and full range of pagination are included in the citation (this facilitates the use of the thesis as a resource document by readers, particularly other students). An example of Literature Cited is attached.

(EXAMPLE)

TABLE 2
INACTIVATION OF INHIBITORY FACTOR BY ANTIBODY ABSORPTION

Serum added	Greatest Dilution with Growth ^a
Absorbed Human Serum ^b	10 ⁻⁸
Untreated Human Serum	10 ⁻⁴
Adult Bovine Serum	10 ⁻³
No Serum	10 ⁻¹⁰

^a Medium containing serum was inoculated with the bacterium and incubated for 7 days; then an aliquot was diluted serially and the dilutions were incubated. The greatest dilution from each series to show growth was recorded, and thus, bacterial concentration after the initial 7-day incubation was inversely proportional to the dilution recorded.

^b The ability of this serum sample, which had been pretreated with the bacterium to absorb specific antibodies, to inhibit bacterial growth was compared with that of other sera.

(EXAMPLE)

LITERATURE CITED

- Adams, R.L.P., J.T. Knowler, and D.P. Leader. 1986. *The Biochemistry of the Nucleic Acids*, Tenth Edition. Chapman and Hall, London.
- Ausio, J., A. Toumadje, R. McParland, R.R. Becker, W.C. Johnson, Jr., and K.E. Van Holde. 1987a. Structural characterization of the trypsin-resistant core in the nuclear sperm-specific protein from *Spisula solidissima*. *Biochemistry* 26:975-985.
- Ausio, J., G. Zhou, and K.E. Van Holde. 1987b. A reexamination of the reported B \rightarrow Z DNA transition in nucleosomes reconstituted with poly(dG-m⁵dC). *Biochemistry* 26:5595-6003.
- Milbrandt, J. 1987. A nerve growth factor-induced gene encodes a possible transcriptional regulatory factor. *Science* 238:797-799.
- Mohan, P.M., A. Basu, S. Basu, K.I. Abraham, and M.J. Modak. 1988. DNA binding domain of *Escherichia coli* DNA polymerase I: Identification of arginine-841 as an essential residue. *Biochemistry* 27:226-232.
- Smith, J.D. 1974. Mutants which allow accumulation of tRNA^{Tyr} precursor molecules. In: *Processing of RNA* (J.J. Dunn, Ed.) pp 1-11. Brookhaven National Laboratory, Upton, NY.