Some thoughts on writing a good senior thesis:

Hopefully, you have already received feedback from your direct supervisor and/or lab sponsor on the rough draft of your introduction you submitted in December (if not, please let me know). By now, you should have a developed outline for the rest of the thesis that includes a "flowchart" of figures and be continuing to work on making figures and writing. Keep up the good work, and don't lose your momentum! Here is a suggested timeline for the preparation of the thesis:

Early February:	Finalize introduction Continue making figures and figure legends Continue writing other sections for which data is available
Early/Mid February:	Complete figures/figure legends Finish writing the methods, results and discussion.
February 18th:	Penultimate draft due to sponsor. Note: Many students will realize that there are still some gaps in the thesis by this date. That's OK. The goal of the penultimate draft is to give your sponsor ample time to provide feedback on your writing and for you to realize what gaps you need to fill.
Late Feb/March:	Revise thesis based on feedback from penultimate draft.
March 13th (or 24th):	A PDF of the final thesis is due to the Concentation Office and your lab sponsor by 3 PM.
March 26th:	One hard copy of the thesis due to the Concentration Office by 3 PM.

Get feedback early! Your sponsor, lab mates, and Tutor in Biochemical Sciences (if CPB or MCB) are all good sources of feedback and advice on the writing process**. Be sure to get feedback at all steps** of the writing process; do not wait until you have a complete draft. It will make your writing more enjoyable and **you will learn a lot more about science writing**. It's tempting to hold back until the draft is more polished, but don't!

In the end, learning something new (however small) that no one ever knew before should be a great reward. Taking the time and effort to write a good thesis that summarizes your work and puts it in perspective will make your thesis a great capstone experience of your undergraduate years.

Here are some additional thoughts about the sections of the thesis:

Most theses are assembled similarly to a scientific paper.

What is the statement of research? The statement of research should name the PI of the lab you performed the research in as well as the direct supervisor(s) with whom you worked. It's also very important to indicate how long you worked on the project (state how many summers of full time work went into the project and how many semesters you were enrolled in a research course like 91r or 99). If you are including data obtained by someone else, indicate that in the statement of research *and* in the text of the thesis. Be sure to name any collaborators and indicate what their contribution to your work was.

What is in an abstract? The abstract should be short (< 1page) and contain a description of the main results and their significance.
What goes in an introduction? A good introduction provides an overview of the current state of the field and puts your experiments in context. At the end of the introduction, describe your experimental aims.
What fits in the Materials and Methods? No results here! Just the protocols, techniques and reagents used.
What goes in the Results and Discussion? Sometimes the results and discussion are separate, sometimes they are one section. This can be dictated by the results themselves or your writing style. This is the meat of the thesis. For each experiment and result, make sure to begin by introducing the purpose of the experiment. Don't forget to include – and describe – controls and statistical analyses of the data. Sometimes, due to time constraints, you might be missing a control or supporting experiment. It's best to point it out here, rather than skirt the issue and let the reviewers point it out as a fault. Readers will appreciate that you acknowledge the limitations of your results.
How do you finish? Make sure to finish with a bang! A short conclusion, which can also describe some future directions, really rounds out the thesis. Don't leave the reader hanging!
What about references? Please use (author, date) formatting for in-text citations (not numbered references). Be sure to include a full list of references at the end, using the format of a major journal in the field (such as *Cell*). Each reference should include the names of authors, title of the paper, journal, year, volume and page numbers – if the reader decides to look up one of your references, don't make finding the reference a challenge. Be consistent in your referencing style – we highly recommend reference management software such as Endnote.

Note: the nature of the projects you worked on might influence the organization of your thesis. For example, a thesis could be divided in two chapters describing two projects. Make sure that the whole thesis is still synthesized at the beginning and the end.

Some thoughts and suggestions:

(1) Keep multiple and redundant backups of your work!

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(3) Seriously, keep multiple and redundant backups of your work. Every year someone forgets to do this and suffers needlessly. Hard drives can and do fail – think of hard drives as temporary storage devices. Email copies of your thesis to yourself, store them on a server or DropBox/Google Drive, or all three.

(4) The library in the Concentration Office maintains a collection of theses written by students in previous years. Reviewing a few theses well help you understand how an undergraduate thesis should be organized and formatted, and what the "scope" of a typical undergraduate thesis is. Lisa and/or Tom are happy to show you the thesis collection, as well as how to use a searchable database of recent theses. You are welcome to send an email or call 617 495-4106 to confirm that one of us is there before stopping by.

(5) Write the thesis in a manner that someone who has taken the foundation courses in your field (such as MCB 52, 54, or SCRB 10) could understand.

(6) You are not expected to have dotted every "i" with your experimental results. Your introduction should put the biological question you are addressing in context, and you should use the results and discussion section(s) to interpret your experimental results: state what your results show, point out the pitfalls, and suggest how to answer the remaining questions.

(7) It can certainly be appropriate to include negative results. Systematically analyzed negative results can make for an excellent thesis.

(8) Keep multiple drafts of your thesis as you go, just in case you need to go back to them. Hard drives are big enough that space should not be an issue!

(9) Assembling figures in software such as Microsoft Powerpoint or Adobe Illustrator works well (making figures in Word can work too, but often generates headaches since Word is not designed for illustrations). Save the figures as PDFs and insert them into either a Word or PDF version of your text. We recommend that you insert the figures in the text at the end of the process, once your text is finished. Should you put the figures at the end or in the text? Readers generally prefer that full page figures be integrated in the text, but ask your mentor what they prefer. Either way is acceptable.

(10) Be sure to properly acknowledge the contributions of others, both in the statement of research and in the text. Data included in your thesis that were obtained by others should be properly acknowledged.

(11) Here are some "comments" that previous thesis reviewers have raised:

- Some students do not include a statement of research. The statement of research is important to help the reader understand how long you worked on the project, who you worked and collaborated with, etc. Don't skip it!
- The text of the thesis should focus on the logic of the experimental plan, not the details of the methods – those go in the methods section.
- Though it seems strange at first, consider using "I" instead of "we" in the text of your thesis (except for the Materials and Methods section). Using "we" makes the reader question whether or not you actually did the work. Use "we" when discussing experiments done in collaboration with others.
- Be sure that you include and discuss experimental controls.
- Many readers comment that students fail to provide statistical analyses of their data. Go through your figures with your supervisor and discuss whether it's appropriate to include statistical analyses of those data.

(12) We purposefully do not include extensive formatting instructions – we want you to focus on the science and writing, not logistics. Here are responses to some frequently asked logistical questions:

- Please double space your thesis and use a margin of 1 inch or 1.25 inches on all sides.
- You do not need to use special paper – standard photocopier paper is fine.
- A note about inkjet printers – over time, the ink can run and/or fade. We recommend you use a laser printer.
- A note about fonts. For the text, use a standard font (Times New Roman 12 pt is great). Many students prefer to use a sans serif font (like Arial) for the figures and figure legends. That's fine - the font you use for the figures does not need to match the font you use for the text, but within any single figure the font should remain consistent.

(13) We suggest 50 pages as a guideline for the length of your thesis. This, however, is a guideline only, and it is fine to go longer than 50 pages. Just ensure that your manuscript is well edited, and is printed in an easily readable typeface.

(14) Many students wait until the last minute to print out the final thesis and panic when they realize how long it can take high-resolution figures to print. To avoid unnecessary stress, we have established a later deadline day for handing in your hard copy, but keep in mind that printing out figures (and even completed portions of the text) can take much longer than anticipated.

(15) Who will read the thesis, and how will it be evaluated? For MCB and CPB concentrators, one reader will be a member of the Board of Tutors and the other an outside expert in the field of your research recommended by your faculty sponsor. For HDRB concentrators, both readers will be faculty working on topics related to your thesis from the greater Boston scientific community. Your faculty sponsor will also evaluate your work. The final grade for 99 is determined by the Head Tutors using the feedback from the readers and a written evaluation of your laboratory work provided by your lab sponsor. Lisa will notify the readers and coordinate sending your thesis out to them.

(16) Honors: A description of how the thesis grade factors into departmental honors is posted (for CPB concentrators, click here; for MCB and concentrators, click here; for HDRB concentrators, click here) and a FAQ describing how Harvard College awards honors is posted here. We will return your thesis evaluations to you in the last week of May.

(17) If you have questions not addressed in this document, please email me or drop in to chat.