

# Ten Steps to Ph.D. Degree in QTTG

**1. Problem Solving:** Develop and refine your problem solving skills in physics, mathematics, and computer programming.

**6. Verbal skills:** Be able to converse your idea on seminars. Learn to ask (dumb?) questions in front of a lot of people. You can always phrase the question as a clarification, then follow it with your real question.

**7. Networking:** It's important for computational & theoretical people to know people at your level and talk about stuff.

**8. Logical Thinking:** This one could be the hardest. There are always logical inconsistencies in your projects, and you have to think about that at some point.

**2. Prioritizing:** You have two tasks on your hand—an easy one and a hard one. You can do the easy one in a week, but for the hard one you need to rewrite your codes and debug them which need several weeks. You choose to do the hard one, but when you go to your individual meeting with your results of the hard problem, you may find out that is not exactly what you were expected to do, or the situation is changed that this work is not important any more.

**5. Reading skills:** Learn how to browse through papers: read abstract and conclusion first → check the figures → if the paper turns out to be useful for the project, start connecting the equations or trying to reproduce its numerics. At the research level, you rarely need to check books (except for elementary things).

**9. Breadth and depth:** Do both. Look around for many things (not too close), and find out what people want to calculate; in some very specific cases, you should go very deep.

**3. Reliability:** Adviser can always remember what he told you on your individual meetings or group meetings or somewhere else. Nonetheless, you are responsible for keeping track of all tasks he told you to do, and for reminding him of them and actually carrying them out. If you can not do or do not have time for something, you should let the adviser know, not letting it hang in the air.

**4. Writing:** Figure out the logic and report it in your writing.

**10. Independence:** This is the criterion for graduation in QTTG. All people in group must have independence. You should be able to do everything by yourself. And of utmost importance, you should think independently. If you think that adviser made a mistake or put you on a wrong route, you should point out at his mistakes while offering an alternative. The ultimate goal in this step is to develop ability to formulate your own problems.