I'm disappointed with my results in the mid-session test in first year physics.

You are not alone: each year, many students do badly on their first physics test.

Knowing that many students did badly is only a little consolation: doing badly is bad. Failing is worse. Further, your aim should be to do well, not just to pass: the skills and knowledge you gain in Physics 1 will be important for higher year subjects in various schools, and they will be assumed by the lecturers of those subjects. So let's treat the disappointing result as a message to get off your backside, and make some resolutions about doing things differently.

Why did I do badly?

- **The exam was difficult.** Well, the exam was not difficult for a physics exam. Perhaps you are one of those students who finds physics difficult. But lots of things in life are difficult and successful people are those who overcome difficulties. Treat physics as a challenge.
- **I'm having trouble adapting to university study and life.** This is a common problem. First, your university teachers expect you to take much more responsibility for your own behaviour and study plan. You are an adult with adult responsibilities for your own life. There are some suggestions below.

  Second, your university courses go much more quickly than your high school courses, with little or no repetition. If you miss something, it's your responsibility to catch up.

  Third, when you were at school, you were one of the brightest few students in the class. At university, your class is made up of such students. The standard is a lot higher.
- **The exam was nothing like a high school physics exam.** True. Thank you. The NSW high school physics syllabus requires relatively little quantitative and analytical understanding. It can be passed with a good knowledge of social studies, history and facts. At university the physics exams concentrate on physics and its applications. Almost a completely different subject.
- **Did I work hard enough?** Professionals usually work 40 to 50 or more hours per week. If you are a full time student, you should be working this much each week. Say 10-13 hours per week for Physics, take out the class hours, and that is 4 to 7 hours of study or homework per week, and more in the weeks when you don't have a lab class. Make those hours count. Sure it's fun to hang out with your friends on the lawn, but don't do too much of that. Take your timetable and, in most but not all of the blank spaces, write "Study!". What work can you do in the train or the bus?
- **Poor exam technique.** See http://www.phys.unsw.edu.au/~jw/exam.html for some tips.
- **My life is a mess.** The UNSW Counselling Service http://www.counselling.unsw.edu.au/ has an excellent reputation for helping students with problems large and small.

What's physics about? What do you have to do to do well in it? (And why do I have to do it anyway?)

Physics involves observing phenomena that happen in the world, understanding the physical principles that underlie them, asking or responding to quantitative questions about them, posing those questions in a way that allows you to analyse them (usually this means translating them into mathematical language) analysing and solving them (usually this means solving some maths) translating the solution back into the language of the problem and understanding its implications in the world.

Usually, solving the mathematics is relatively easy: solving simultaneous equations, using geometry or trigonometry, solving simple differential equations. The hard parts are seeing what physics is

relevant, posing the questions in physical and mathematical language and understanding what the results mean.

These skills are difficult to teach. In one sense we don't actually teach you: the best we can do is to give you the necessary background skills, show you how we do it, and leave you to learn it yourself by doing. Like riding a bicycle: watching it done and having it explained helps, but you really need to do it-and to fall over a few times.

These skills are immensely useful, and they underlie not only the technological side of modern life, but other areas as well. They are central to engineering.

You'll need some talent and possibly a lot of hard work. If you don't have any talent for this and are not prepared to work, perhaps you should give up the idea of a career in physical sciences, engineering or computing. However, most of you in fact do have what it takes, and the rest of this document aims to help you.

Guidelines and suggestions for study in physics.

- **Prepare sufficiently so that you understand the lecture in real time.** There's little point sitting in a lecture being confused and making notes that you hope you will understand later.

  Try reading ahead. You know the order of the syllabus, so you can read the relevant chapter of your text book before the lecture: you'll be surprised at how much benefit you get from a couple of hours of painless reading each week. The technical terms will not be new in the lecture, and you will have already read the material, in someone else's words, at your own pace. (The text is big and awkward to read in the train. Perhaps it is worth photocopying a chapter so you can hold it in one hand?)

- **Really concentrate in lectures.** If you have downloaded lecture notes beforehand, it's easy to think that you 'have' all the information. But buying a textbook doesn't mean that you have understood the subject. Listen carefully, and make your own notes, too. Forcing yourself to make notes means that you have to think what you will note down, and helps keep you awake and focussed.

- **Consolidate afterwards.** Did you understand it? If parts were unclear, go back to the textbook and read carefully. You might also read the whole chapter from the text after your lecture - it ought to make more sense at this reading. If you think you did understand, then you should be able to do the tutorial problems. So do them soon after the relevant lecture (more about this below).

- **Make a summary.** A very useful way of consolidating is to make a summary of what you have learned. Revise as you go and beat the end of session rush! At each stage, check that you understand the material. It's not enough to understand why one step follows from the preceding one: you must understand the strategy of the development. This summary will of course be of great use in doing the tutorial problems and when you come to end-of-session revision. And perhaps beyond: the author of this document has on his shelf a row of exercise books - the summaries he made of his undergraduate courses. Further, in areas that he doesn't use regularly, such as statistics, he still consults them occasionally.

- **Follow tips and links.** The lecturer may suggest observations that you can make outside the lecture, or even little experiments that you can do yourself. So do it: relating the material to the world outside and your own observations will make the material more real. Physics is about the world. Most of the material in the first year syllabus has applications that you can see all around you. Your trip to uni in the morning is full of mechanics experiments, usually involving electric, magnetic and thermal effects. Almost everything you see or hear can be an experiment in waves. The air you breathe and the water you drink are fluid experiments, everything you touch is a combination of mechanics and materials science.

If your lecturer suggests web sites (there may be links on your course home page), then have a look.

Tutorials and practice.

- **Homework problems are where you learn.** Tutorial problems are like parts of exam questions. Doing them is rehearsing for the exam. No, they are not completely similar to the problems you did in lectures: if they were you'd be able to copy what the lecturer did and you'd learn nothing. There will be some similarity, but the tut problems do require you to think for yourself. You should have an honest try at every problem. If you want more, there are lots more at the end of each chapter in the text.

  Don't ever give up before (i) drawing a diagram (including before and after parts for many types of question); (ii) writing the unknowns and the given information in physical or mathematical form; (iii) writing equations that describe aspects of the problem and/or laws and principles that apply to it; (iv) really thinking about it, asking what work you have done could be relevant and, if necessary, going to your notes or to the text. And if you give up, ask your tutor for help with that problem in class.

- **Try working in a team.** Get a 'study buddy', or form a tutorial team for doing homework. Working together is more fun, and you'll be able to help each other. The one who does the helping benefits at least as much as the one who is helped, because explaining improves your understanding. (And you can complain about your lecturer, which might be therapeutic!)

- **Trial exam.** Early in the session, do the 'feedback test' on the web. Look at the marking scheme to see how it is marked. Close to the test, do a few past papers, perhaps under simulated exam conditions.

Make a study plan and stick to it.

It is really important to do well in this subject. Make a plan for what you are going to do, commit to it and tell your parents and friends. Ask them to remind you if you seem to be getting back into old habits.

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