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Physics

How to get a H1 in the Leaving Cert Physics Exam

by **Marina P**

Marina P got a H1 in her higher Leaving Cert Physics paper. Here she shares what she learned.

Personally, I switched to physics about a month into sixth year, after starting with History. I also took Biology, Chemistry and Applied Maths - and this was one of the best decisions I made throughout my Leaving Certificate. This combination of subjects definitely had its advantages, the Chemistry overlapping with particle/modern physics and Applied Maths helping with mechanics. I also, however, have a friend taking it with Art, Music and History and its working just as well for her! If you have an interest in the subject, however small, definitely consider it. The course is a manageable size, and has many upsides, such as the lack of essays! Whether you love the subject, or can't wait to never glance at that textbook again, you can absolutely get something from it and use it to maximize your points.

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How to study Physics?

It's easy to be overwhelmed by the number of chapters on the course, but it is actually made up of only six broader topics: Mechanics, Waves, Light & Sound, Heat & Temperature, Electricity, Modern Physics, and the option (Particle Physics or Applied Electricity). By focusing on these as units, you will have a universal view of the course, without feeling as if you have 40 chapters in a textbook to cover. I know it's tempting, but don't skip any section, as you never know what will come up on the day.

- Notes: I found it easiest to study by **making notes on the textbook** and condensing it as much as possible, then making notes of these notes, until I could whittle down the course to **under 25 pages**. My friends would roll their eyes at my two copies containing rough notes, and then final notes.. No one has the same notes/style of learning, so use what works for you. Whether that's big, clear with long explanations or small, written in abbreviations. **Making my notes look pretty** definitely also helped me actually wanting to write them and learn from them.
- Flashcards: Flashcards are also a great tool that you can look over in those spare moments, and for me, even the action of just making them and writing stuff out one more time helped.
- Podcasts: We're all different types of learners, so **something auditory** may help you too. You can record yourself reading notes, or even record yourself asking a question, leave a pause to answer it and then record the answer.
- Teaching others: Another tip is to teach someone else what you're learning, this could be a study group where you all help each other out, or be you chatting to your mum over a cup of tea.
- Past papers: As with the vast majority, if not all Leaving Certificate subjects, **past papers are your best friend**. Make the most of all the past papers available to you, and even more importantly, the marking schemes! So many things **repeat**, and by knowing the past questions

inside out (do them multiple times if you can) the actual exam will seem much more familiar and doable. Studyclix is a great tool for helping you with this.

- Study by topic: Up until the end of sixth year, I found it most useful to simply do questions topic by topic. Studyclix is great for this, as well as other LC Physics websites online (check the Videos and Notes page on Studyclix). This will ensure that you can apply material from each chapter in an exam-focused way, and you can flag any areas or styles of questions you need to focus on.
- Test yourself: After the mocks, I suggest working through papers under timed conditions and marking these yourself in their entirety. This will get you used to the structure and you can avoid any timing or exam technique slip ups on the day of the exam. Marking your own paper will let you know what the examiner is looking for.

Exam Layout and Timing

The physics exam is three hours long and consists of two sections: Section A which covers the mandatory experiments and Section B which covers a mixture of everything else.

- Section A counts for 30% of your grade, and each question is worth 40 marks. Section B counts for 70% of your grade, and each question is worth 56 marks. How you decide to split up your timing is completely up to you! I suggest doing some past papers and **using trial and error** to find the timing that works best for you.
- If you divide the minutes by the marks exactly this would give you roughly 18 minutes per question in Section A, and 25 minutes for each question in Section B. This, however, leaves you with only one minute to spare for going over and choosing your questions. You might still opt for this as a guideline, especially if you go back and check over your work as you go, but, I preferred to have some time to play with.
- If you allow around 16 minutes per experiment question, and 22 minutes for the others, this leaves you with an extra 22 minutes. You could also keep it simple and use 20 minutes for each question, and give yourself another 10 at the beginning and end. Naturally, some questions will be quicker to finish, and others will take a few minutes longer, but **believe in yourself that it will all balance out.**
- Personally, I liked to **use a lot of time to choose my questions.** For me, it was an investment to only begin after ten or fifteen minutes, but know I wouldn't abandon a question half way through and that I had chosen what is best for me. I would grab three coloured highlighters, and mark what I'm definitely doing, the "maybes" and what was ruled out straight away. I found it hugely satisfying to cross out whole questions, and remembering that there was scope for avoiding the questions that didn't resonate with me (excuse the pun). Trust yourself, even if the person beside you has already asked for graph paper and your exam booklet is still closed, you know what works for you!

- The order you approach the questions is also a personal preference and nothing requires you to answer in the order they are asked. For example, you might like to do question 5 first as relatively straightforward, it puts your mind at ease or you might like to leave it for the end when you're getting tired.

Section A: Mandatory Experiments

In this section, you answer three out of four experiment questions. There will usually be a question on mechanics; light, sound & waves; heat & temperature and electricity

- There is no particular trend, so unfortunately **you have to learn them** all but luckily there's a definite end to what they can ask on this section, so see it as an opportunity to gain marks. Some people like to learn the experiments separately but personally I liked to merge them with all the other material in my notes. There is a limited scope to what they can ask concerning any one experiment, so **know a diagram, brief method, any associated maths and sources of error for each one.**
- Many experiments will require you to draw graphs, so remember what goes on each axis, e.g. whether it is √T or t2 etc. Practice stuff like proportionality and straight lines through the origin, and remember to bring a long ruler! It's also key to **read the question properly,** there have been so many times where I've done a calculation using a formula when asked to use the graph and lost marks so avoid mistakes like these.
- I recommend going over past papers, and as you attempt to complete questions, also ask yourself whether you could answer similar questions for a different experiment.
- Check out the next page for a list of **all the experiments you need to know**:

Mechanics:

• Measure velocity/acceleration/ show that a $\propto$ F / verify the principle of momentum with a ticker tape and timer or using an air track and light gates.
• Calculate g using a free fall apparatus.
• Verify Boyle's law.
• Verify the laws of equilibrium.
• Calculate g using a simple pendulum by showing length $\propto$ period2

Light, Sound & Waves:

• Measure the wavelength of monochromatic light
• Measure the focal length of a concave mirror/ a converging lens.
• Verify Snell's law and find the refractive index of glass.
• Measure the refractive index of a liquid.
• Variation of a stretched string's fundamental frequency with length/ with tension
• Measure the speed of sound in air

Heat:

• Plot a thermometer's calibration curve using a lab mercury thermometer as a standard.
• Measure the specific heat capacity of a metal/of water by an electrical method
• Measure the specific latent heat of fusion of ice/ of vapourisation of water

Electricity:

• Verify Joule's law ($\propto$ I2)
• Measure a wire's resistivity
• Variation of resistance with temperature of a metallic conductor/ a thermistor
• Variation of current with potential difference for a metallic conductor/filament bulb/ semiconductor diode/ copper sulphate solution and copper electrodes

Section B: Other Questions

In this section, there are eight questions and you have to choose five. There's no set trend but in general the questions have shown the following patterns:

- Question 5: Short Questions - This consists of ten short questions, where you answer eight. I always tried to answer all parts in this topic, as your best eight will then be marked and this leaves room for mistakes.
- Question 6: Mechanics - I did Applied Maths, so this was one of my favourite questions but it can definitely vary a lot and be complicated in that sneaky way. **Practice is key here**, and when stuck, always go back to your log tables to see if there are formulae that might be useful. The first thing you cover in fifth year, any definitions will usually be nice and familiar.
- Question 7: Waves, Light & Sound
- Question 8/9: Electricity or Modern Physics
- Question 10 - Choose (a) or (b) depending on what option you covered in class.
- Question 11 - This is often a comprehension, usually based on something topical. STS, Science and Technology in Society can appear anywhere but will definitely appear here. These are the applications of physics, e.g. using a capacitor as a defibrillator, or the Doppler effect in speed guns.
- Question 12 - This is a mixture of shorter questions, where you choose 2 of 4 parts. This is a good place to earn extra marks as if you have extra time you could attempt a third subsection.
- Demonstration Experiments

  As well as the mandatory experiments listed earlier that you complete yourself, your teacher will have performed demonstration experiments for the class. These can be asked about in any question so here's a brief summary of what they could ask about:

- Show that light/sound is a wave
- Demonstrate Archimedes' principle.
- Demonstrate atmospheric pressure.
- Calibrate a thermometer using ice/steam.
- Demonstrate the presence of an electric field.
- Demonstrate that a capacitor stores energy/ the factors that control its capacitance
- Show a current-carrying conductor experiences a force in a magnetic field
- Show that two parallel wires conducting a current will experience a force.
- Demonstrate electromagnetic induction/ Faraday's law/ Lenz's law.
- Rutherford's Gold foil/ The Cockcroft-Walton experiment.

- Definitions - Definitions will be asked anywhere and everywhere, and they were definitely one of the peskiest parts of the exam! I liked composing my definitions out of an amalgamation of past paper answers. You don't want to learn a definition only to realise it doesn't fit the marking scheme. To help you remember them, why not put post-its around your bedroom or on the bathroom sink; create a song or rhyme; or even record yourself saying them and tuning in on the bus.
- Calculations - If I could say one thing, **show your workings**! You can get the right answer and lose on marks because the examiner doesn't know how you got there, or be completely wrong but still gain marks as they can follow where you made a slip and give you what you deserve. A few reminders: use radians for circular motion and simple harmonic motion, and if you have time, follow through your calculations a second time as it's easy to lose marks by e.g. copying something down incorrectly from your calculator.
- Derivations -These are such a forgotten part of the course (I definitely didn't remember they existed many a time) but those few percent can make a difference and are definite marks if you know them. Here is a list of them all:

- ndsin
- SUVAT equations: v = u + at , s = ut + ½at2 , v2 = u2 + 2as
- v = rw
- g = GM/r2
- T2 = 42r3/GM
- v2 = GM/r
- Show simple harmonic motion, a = -2s
- In series, RT = R1 + R2 + R3 and in parallel, 1/RT = 1/R1 + 1/R2 + 1/R3
- F = qvB

Some Final Tips

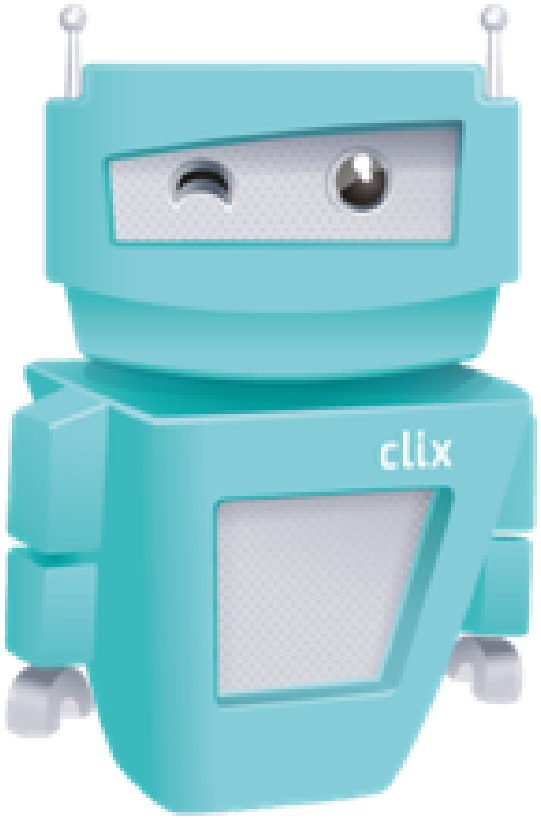
- Make the most of your **log tables**, they can get you lots of marks! You can get the marks for many of the above pesky definitions by defining the terms in a formula. You can also check units in them, find the starting points for derivations, and relationships between variables. Some answers will even be contained in them (e.g. what are two negative leptons bar electrons? The negative muon and negative tau, all found between the covers of the log book). By using them as you study, its familiarity can also jog your memory in the exam.

- Use **acronyms and mnemonics** to aid your revision. For example, I used the phrase "**Granny wears eccentric stuff**" to remember the order of the four fundamental forces in increasing strength: **g**ravitational, **w**eak nuclear, **e**lectromagnetic and **s**trong nuclear. Make the mnemonic personal to you, and draw on humour to make it stick in your head.

- The Physics exam may ask you for many **diagrams** so make sure you've practiced drawing them beforehand. This isn't an art exam so don't worry about making them look too nice. The key is that they're large and clear. Label all your parts and make sure to avoid mistakes like whether an ammeter or voltmeter is in series or parallel.

- Get excited about the subject – it's much easier to study something when you can find a little joy in what you're learning! This could be watching a YouTube documentary such as Brian Cox's A Crash Course in Particle Physics or explaining to your little sibling/cousin/neighbour how a rainbow or mirage is formed and having them think you know everything.

- Write all over your exam paper: highlight, circle, jot points, my personal trademark, writing in bright red GO BACK TO AT END! It's your paper, so use the space as you need it.



Finally, I would like wish you the best of luck in the exam! You will be fine.