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Engineering – Higher Level

How to get a H1 in the Leaving Cert
Engineering Exam



by **Gráinne E.**

Gráinne Enright is an electronic engineer and teacher. Gráinne has corrected state exams and written mock papers, and has mentored and patented prize winning technical projects in the Young Scientist competition.

Leaving Cert Engineering is a mixture of theory and practical work. It involves quite a bit of metalwork and metals-related theory, but also includes other areas such as plastics, mechanisms, robotics and electronics. The practical side is composed of a Practical Exam, which usually takes place in May, and a Project, which runs from October to March. The Theory Exam takes place in June. The Theory Exam contains quite a bit of choice in the exam paper topics and long questions.

Contents

How to Get Great Results	3
The Theory Exam – How to Do Well	4
The Short Questions (Question 1 - Section A)	7
How to Do Well in the Practical Exam (25%).....	10
How to Do Well in the Project (25%)	12
Summary of the Top Tips.....	17



How to Get Great Results

You can get great results if you spend your time on where the marks are going. Look at the diagram below. The size of the boxes shows the importance of each area:

- 50% of all your marks are won or lost in the Theory Exam. So, you could say you should spend 50% of your time on theory, and practicing exam questions.
- Just 18% of your marks are going for your built project. You need to make sure you do a good job, but be careful not spend too much time on it.
- The project folder (Folio) document is worth an extra 6.6% - this is almost as much as a whole long exam question, so it's worth doing a good job here too.
- You can get up to 25% by doing a good practical exam - that's a lot - and the same marks as your project. So, it's well worth putting effort into getting prepared for this practical exam. More on this later.
- The biggest block of marks - 41.6% - is going for the Core Topics in the Theory Exam - so you really need to do well here in order to get a good result.

Where you Get Your Marks in Higher-Level Engineering					
THEORY EXAM 50% (Exam in June)			PRACTICAL 25% (Exam in May)	PROJECT 25% (October to March)	
Core Topics Short Qs	Special Topic Long Question	Core Topics Long Questions CHOICE: Pick 4 questions from 7	Use tools, drawings and pre-built components to manufacture parts and an assembly.	Build a Working Model of your project	Write Folio document
8.3%	8.3%	33.3%	25%	18.3%	6.6%



The Theory Exam – How to Do Well

The Theory Exam is really important, because it is 50% of your marks.

Top Tips for Revising & the Exam

- ✓ Do lots and lots of previous higher-level exam questions.
- ✓ Do practice questions on the Special Topic.
- ✓ Understand the choices you have in the exam paper. Take your teacher's advice on what choices to focus on and what ones to avoid. This depends on your strengths and on what you've studied in class.
- ✓ Read through the full exam paper. Time yourself for each question.

Get to Know the Topics and the Choices in the Exam

The diagram on the next page shows you how the higher-level exam is structured and what kind of choices you have. There is a lot of choice, and you can use this to your advantage. You must do the Short Questions and the Special Topic long question, but you only have to answer four out of the seven Core Topic long questions.

With some long questions there is a choice within the question as well - for example, there may be two (c) sub-questions - on completely different topics - and you can choose which (c) sub-question to do. You can see these choices on the next page.

Higher-Level Exam Paper - Structure and Choices

Instructions: Answer Question 1 (Section A and Section B) and four other questions

Question	Type	Choice / Instructions	Sub-questions	Topics	%
1. Section A	Short Questions	Answer 10 out of 13 Qs	(a) to (m)	All Core Topics	8.3%
1. Section B	Long Question	Answer all parts	(n) to (r)	Special Topic (see below)	8.3%
Instructions: Answer 4 out of the 7 long questions below:					
2.	Long Question	Answer all parts	(a), (b), (c)	Materials Testing	8.3%
3.	Long Question	Answer all parts	(a), (b), (c)	Ferrous Metals, Heat Treatment, Furnaces, Iron-Carbon System	8.3%
4.	Long Question	Answer all parts	(a), (b), (c)	Non-Ferrous Metals, Alloys, Thermal Equilibrium Diagram	8.3%
5.	Long Question	Answer (a) and (b)	(a), (b)	Welding	5.5%
		Answer (c) OR	(c)	Welding	2.8%
		Alt (c)	Alt (c)	Robotics	2.8%



6.	Long Question	Answer all parts	(a), (b), (c)	Polymers	8.3%
7.	Long Question	Answer (a) and (b)	(a), (b)	Machining, metrology	5.5%
		Answer (c) OR Alt (c)	(c)	Machining	2.8%
			Alt (c)	CNC Machines	2.8%
8.	Long Question	Answer (a) and (b)	(a), (b)	Mechanisms, Design, Pneumatics	5.5%
		Answer (c) OR Alt (c)	(c)	Mechanisms, Design, Pneumatics	2.8%
			Alt (c)	Electronic Circuits	2.8%



The Short Questions (Question 1 - Section A)

- There are 13 short questions and you have to answer 10. The short questions cover all the core topics on the course / book. However, the good thing is the questions and the answers are not long or complicated. So, **the best way to revise for the higher-level short questions is just to do lots of them.** You'll soon begin to see the kinds of questions that come up, and you'll start to get good at them.
- If you know the answer, it is quick to write down. If you don't know the answer, you can look it up on Studyclix (show marking scheme), look it up in the book, or ask your teacher - and you'll know it for next time.
- The short questions include a wide variety of questions on non-metalwork-related areas, such as inventors, computers, electrical and electronic devices, mechanisms, forces, pneumatics, robots, materials, corrosion, plastics, manufacturing, mining, safety. The answers to these questions are not difficult though, so it is worth making sure you have collected this information, revised it and done practice short questions.



Special Topic Question (Question 1 - Section B)

- The Special Topic (also called 'Prescribed Topic') is one long question in your exam, usually split into 4 or 5 parts. It is a different topic and a different document every year. The teacher will cover it with you in class. The Special Topic document usually has summary points at the end - these are really great for revising. There is often further information available too, such as slides and videos.
- There won't be any previous exam questions to practice on (because it's a different topic every year), but your teacher will set you questions on it, and there will be a question in the mock paper on it, so you'll get an idea where you are by doing those.

Core Long Questions (Questions 2 to 8)

- Remember most of the marks in your exam come from the **Core Topics** - **so that's where you need to spend most of your time revising**. Again, the best way is to do lots of previous higher-level exam questions. **Exam paper booklets and Studyclix are perfect aids for this!**
- First, practice all seven exam long questions from a number of previous exam papers, to see which you are strongest at, and where you need to study more.
- If you haven't covered certain topics in class, you are unlikely to want to choose those topics in the exam. You can choose not to study certain topics for the exam long questions - because in previous years there has always been a choice of topics in those questions. However, you are taking a risk if you do not study all areas for the exam. Take your teacher's advice on this.



Time Yourself in the Exam

- First read through the entire paper so that your brain knows what's coming up, and so you get a first idea about which four long questions you might like to do.
- Allow yourself slightly under 30 minutes to answer each long question or section (this will leave you a few minutes at the end).

Time to answer each Higher-Level Section / Long Question	
Question 1 Section A - Short Questions	< 30 minutes
Question 1 Section B - Special Topic	< 30 minutes
FOUR Long Questions from Questions 2 to 8	< 30 minutes each

- If you run over time on a section, move on to the next section, you may be able to come back to them later.
- Start with the short questions - Q.1 Section A – to ease yourself into the exam.
- Do the Special Topic question. Be careful about any OR words in the instructions - only do the parts you need to.
- Look at all remaining long questions again (Questions 2 to 8). Decide and mark which four questions you are going to do.
- Use all the time you have, do not leave early. If you have time at the end, go back to any skipped questions, and check previous answers. If you still have time left, do another long question, as you will be marked on your best answers.



How to Do Well in the Practical Exam (25%)

The practical exam is worth 25%. It is composed of two parts listed below.

Parts to the Practical Exam		
	Description	When
Pre-Practical Work	Make components needed for the Practical Exam, based on a set of drawings and specifications.	To be complete by a date in April
Practical Exam	6 hours to manufacture an assembly, based on given drawings and specifications.	Take place on a set date in May.

Pre-Practical Work (manufacturing some components)

- You can do these in class so no exam pressure.
- But make sure you start these early, and make sure they are ready well in advance of the required date. Do not leave till the last week! You may make mistakes on them and have to start all over from scratch.
- Needs to be complete before a set date in April.
- The better you manufacture these components, the better and easier the Practical Exam will go for you.
- Double check all the drawings and measurements, mark-out, and check the marking out before you use any tools on it, and again after using the tools.
- Get your finishes smooth.
- Do not use machines and tools other than those you are allowed to.

Prep for the Practical Exam (well before May!)

- Look at previous years' higher-level practical exams. Make sure you understand the drawings and instructions.



- Make the objects from previous years' higher-level practical exams in class.
- Make sure you have all parts and tools and equipment needed for the practical - according to the list provided.

The Practical Exam (6 hours in May)

- Read the drawings and instructions very carefully.
- Decide what order to make the parts in, taking into account the materials and tools needed, and how they need to fit together in a final assembly.
- Make a plan for your time, including:
 - ✓ Time to mark out and make each component
 - ✓ Time to create the final assembly (and any sub-assemblies) and for final polishing and finishing
- Measure twice! Check your marking out before and after using tools.
- Think about how the examiners are going to mark your practical exam:
 - ✓ Marks will be going for each part - so make sure you make all parts.
 - ✓ Marks will be going for the main features on each part - e.g. holes, slots, profiles, lathe work, bench work.
 - ✓ Marks are going for the final assembly, and if it functions, and for the overall quality of finish and polish.
 - ✓ For example: if there were four main parts, 20% of the marks may go for each part, and the final 20% may go for the final assembly and the overall finish. This can vary, however.



How to Do Well in the Project (25%)

The higher-level practical project is worth 25%. You receive a Project Brief (short document) in October, and you need to deliver two things usually in early April.

Parts of the Project		
Project Element	% of Total Subject Marks	
A Built Design / Working Model	18.3%	To be complete by a certain date in April.
A Project Folder (Folio) document	6.6%	

The higher-level project is different than the ordinary-level project. In the higher-level project, the focus is not just on manufacture, but you need to do and show your own research and design ideas and production planning and drawings, and write up evidence of these in your project folder.

Plan It Out

A key to doing well in the project is to plan it out at the start. This is because:

- It will take you longer to do things than you think.
- There are more stages to the project, and more sections in the Project Folder (Folio) than you think.
- You have to have a plan in your Project Folder anyway.
- It's your project, the teacher is not going to do it for you.

Tips for Planning and Running your Project

- ✓ Start early in the year and plan to finish well before the deadline.
- ✓ Use a template for your Project Folder. Keep a rough version and fill it in as you go along, every week / month. Type it up neatly later and make sure you have good drawings to transfer into



the final version.

✓ Check in with your teacher often, ask for advice on:

1. Ask to review your plan, what stage / activity you should be doing now.
2. Ask to review your design ideas and how you're going to manufacture it, your choice of materials, components and processes.
3. Ask to review your Project Folder as you are compiling it.
4. Ask to review your Project Model as you are building it.

✓ Try to keep your design as simple as possible, while still meeting the brief - you need to be able to make it easily within the time and the resources that you have available. You also need time to write up a good project folder.

Here's one idea of how a project might be planned out.

Example of planning out your Project	
October / November	<ul style="list-style-type: none"> ● Decide if you are doing Higher Level or Ordinary Level. Discuss this well with your teacher. ● Get a template for your Project Folder (Folio) document. ● Fill in the Project Brief and the Analysis section (rough) ● Do out a project plan for the whole project ● Ask your teacher to review it ● Do some research into existing solutions and write up
December / January	<ul style="list-style-type: none"> ● Draw and write up some possible design ideas, what kinds of components, materials, and processes you would need to use,



	<p>how feasible to build.</p> <ul style="list-style-type: none">• Do some hand sketches of different designs initially for speed.• Choose a design to progress with, giving good reasons. Review with your teacher.• Make out a list of parts and start doing your production drawings on a CAD system, such as SolidWorks.
February	<ul style="list-style-type: none">• Start building the project. Start with the trickiest and riskiest parts first, e.g. any electronics or mechanisms.• Assemble the project, test it out, fix it, and improve it.• Ensure there is a high standard finish on the parts and assembly.
March	<ul style="list-style-type: none">• Write up the final Project Folder with good presentation, language, and good drawings.



Before you complete or build your design, check your design against the type of checklist that the examiner will be using below. Check it again while building it.

Checklist - what Examiners will be looking for in your Built Project (Model)

- ✓ Is it / does it do what was asked for in the project brief?
- ✓ Did it observe the constraints specified in the project brief (e.g. not using bought-in parts, sizes, voltages, any other restrictions in the project brief).
- ✓ Does it show creativity in the design process? Was a prototype mocked-up?
- ✓ Does it use a good range of appropriate materials in the design?
- ✓ Does the design use good, appropriate component parts?
- ✓ Does it show a good use of different processes used to manufacture it and assemble it?
- ✓ Did it use CNC processes in the manufacturing?
- ✓ Does it show a good level of skill in the manufacture and assembly?
- ✓ Does it show a high quality of manufacture / assembly and a high quality of finish?
- ✓ Does it show that health and safety were taken in to account?
- ✓ Does it work?



As you are doing your Project Folder, check it against the type of checklist that the examiner will be using below.

Checklist - what Examiners will be looking for in your higher-level Project Folder

- ✓ Is it presented well, easy to read, sections in a logical order?
- ✓ Does it have an 'Analysis' section with a description of your understanding of the project brief, and more detail about what else might be required, what else might be important in the design, more detailed requirements for the project?
- ✓ Does it have an 'Investigation of Solutions' section(s)? Does it describe the research you carried out?
- ✓ Does it include clear and good reasons why you decided on your final design?
- ✓ Does it show that you considered safety impacts in your design?
- ✓ Does it include a plan (schedule) for the project, showing the time planned for each stage (e.g. investigation, design, building, testing, improvements, final folio)?
- ✓ Does it include detailed list of components and manufacturing and assembly drawings for your design? Does it include a description of how to make, finish and assemble the parts?
- ✓ Does the project folder include CAD-produced drawings?
- ✓ Does the project folder describe how you tested the product against the project brief / requirements? Does it describe what didn't work initially and what had to be changed?
- ✓ Does it evaluate the built product – what worked well, what could have been different?
- ✓ Does it include an evaluation of the overall project, e.g. what stages had enough time and worked well, what you would do differently next time?



Summary of the Top Tips

- ✓ Remember where you get your marks in Leaving Cert Engineering - see below - and plan and prepare accordingly.
- ✓ Concentrate on your theory exam - 50% is going for this.
- ✓ Do lots and lots of previous higher-level exam questions.
- ✓ Understand the options you have in the exam paper
- ✓ Time yourself for each section and each long question in the exam.
- ✓ Build all the components needed for the Practical Exam well before the deadline.
- ✓ Practice for the Practical Exam by building from previous years' Practical Exams.
- ✓ Start your Project early, plan it out, and finish well on time. Test your design and your built item against the checklist provided above.
- ✓ Use a project folder (folio) template and fill out all the sections. Test your project folder against the checklist provided above.





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

