MY REVISION NOTES

HODDER EDUCATION

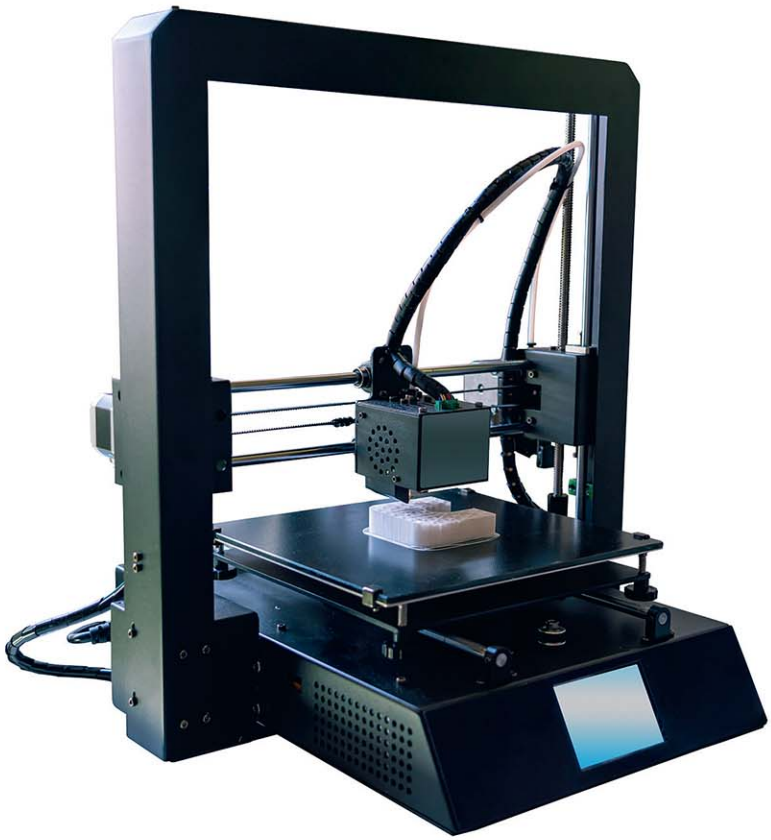
Cambridge National

Level 1/Level 2

ENGINEERING DESIGN

For the J822 specification

- Plan and organise your revision
- Reinforce skills and understanding
- Practise exam-style questions



Andy Topliss

MY REVISION NOTES
Cambridge National Level 1/Level 2
ENGINEERING DESIGN

Boost

HODDER EDUCATION
LEARN MORE

My revision planner

Unit R038: Principles of engineering design

REVISED | TESTED | EXAM READY

Countdown to my exam

6–8 weeks to go

- Start by looking at the specification — make sure you know exactly what material you need to revise and the style of the exam. Use the revision planner on pages 4 and 5 to familiarise yourself with the topics.
- Organise your notes, making sure you have covered everything on the specification. The revision planner will help you group your notes into topics.
- Work out a realistic revision plan that will allow you time for relaxation. Set aside days and times for all the subjects that you need to study, and stick to your timetable.
- Set yourself sensible targets. Break your revision down into focused sessions of around 40 minutes, divided by breaks. These Revision Notes organise the basic facts into short, memorable sections to make revising easier.

REVISED

4–6 weeks to go

- Read through the relevant sections of this book and pay close attention to the exam tips, typical mistakes and key terms. Tick off the topics as you feel confident about them. Highlight those topics you find difficult and look at them again in detail.
- Test your understanding of each topic by working through the 'Check your understanding' questions in this book. Look up the answers at the back of the book.
- Make a note of any problem areas as you revise, and ask your teacher to go over these in class.
- Look at past papers. They are one of the best ways to revise and practise your exam skills. Write or prepare planned answers to the exam-style questions provided in this book. Check your answers at the back of the book.
- Try using different revision methods as you work through the sections. For example, you can make notes using mind maps, spider diagrams or flash cards.
- Track your progress using the revision planner and give yourself a reward when you have achieved your target.

REVISED

One week to go

- Try to fit in at least one more timed practice of an entire past paper and seek feedback from your teacher, comparing your work closely with the mark scheme.
- Check the revision planner to make sure you haven't missed out any topics. Brush up on any areas of difficulty by talking them over with a friend or getting help from your teacher.
- Attend any revision classes put on by your teacher. Remember, your teacher is an expert at preparing people for exams.

REVISED

The day before the exam

- Flick through these Revision Notes for useful reminders, for example the exam tips, typical mistakes, key terms and exam checklists.
- Check the time and place of your exam.
- Make sure you have everything you need — extra pens and pencils, tissues, a watch, bottled water, sweets.
- Allow some time to relax and have an early night to ensure you are fresh and alert for the exam.

REVISED

My exams

Unit R038 paper

Date: .....

Time: .....

Location: .....

Exam breakdown

About the exam

REVISED

Unit R038 of the Cambridge National Level 1/2 in Engineering Design is about developing knowledge, understanding and practical skills that would be used in the engineering design and development sector. This is a compulsory examined unit with a one-hour, 15-minutes paper, which is worth 70 marks.

Question types

REVISED

On your exam paper, there will be a range of different question types, such as:

- multiple choice
- completion of tables
- completion of drawings
- extended-answer questions.

Some questions are a mixture of these question types, ranging from 1 to 4 marks.

Some extended-answer questions may be worth 6 marks. These are assessed against a 'levels' mark scheme. These levels relate to the written quality of your answer. You should write in a structured way with accurate spelling, punctuation and grammar, and use specialist technical terms where you can, to achieve the higher levels.

Each level has a list of required content to achieve that level.

Example of levels of response descriptions	
Level 3 (5–6 marks)	A detailed response that: + shows detailed knowledge and understanding + makes many points, most of which are well developed + is well structured and consistently uses appropriate technical terms + has few, if any, errors in grammar, punctuation and spelling.
Level 2 (3–4 marks)	An adequate response that: + shows good knowledge and understanding + makes some valid points, a few of which may be developed + is reasonably well structured and uses some appropriate technical terms + has occasional errors in grammar, punctuation and spelling.
Level 1 (1–2 marks)	A basic response that: + shows limited knowledge and understanding + makes some basic points, which are rarely developed + has limited coherence and structure, with little or no use of appropriate technical terms + has errors in grammar, punctuation and spelling, which may be noticeable and intrusive.
0 marks = nil response or no response worthy of credit	

Command words

REVISED

When sitting your exam, read each question carefully and identify exactly what is required. You might want to highlight or underline any key words that you think will help you understand what the question is asking for. If you do this, always highlight the command word, as this will help you to plan the content of your answer.

The following table contains the command words that could be used at the start of questions in your exam and explains what each requires you to do.

Command words	What you must do
Analyse	Separate or break down information into parts and identify their characteristics or elements. Explain the pros and cons of a topic or argument and make reasoned comments. Explain the impacts of actions using a logical chain of reasoning.
Annotate	Add information, for example to a table, diagram or graph until it is final. Add all the required or appropriate parts.
Calculate	Provide a numerical answer, showing how it has been worked out.
Choose	Select an answer from the options given.
Circle	Select an answer from the options given.
Compare and contrast	Give an account of the similarities and differences between two or more items or situations.
Complete	Add information, for example to a table, diagram or graph until it is final. Add all the required or appropriate parts.
Create	Produce a visual solution to a problem (for example a mind map, flowchart or visualisation).
Describe	Give an account, including all the relevant characteristics, qualities or events. Give a detailed account of something.
Discuss	Present, analyse and evaluate relevant points (for example for/against an argument).
Draw	Produce a picture or diagram.
Evaluate	Make a reasoned qualitative judgement considering different factors and using available knowledge and/or experience.
Explain	Give reasons for and/or causes of something. Use words or phrases such as 'because', 'therefore' or 'this means that' in answers.
Fill in	Add information, for example to a table, diagram or graph until it is final. Add all the required or appropriate parts.
Identify	Select an answer from the options given. Recognise, name or provide factors or features.
Justify	Give good reasons for offering an opinion or reaching a conclusion.
Label	Add information, for example to a table, diagram or graph until it is final. Add all the required or appropriate parts.
Outline	Provide a short account, summary or description.
State	Give factors or features. Provide short, factual answers.

Key points to remember in the exam

REVISED

- When writing your answer, produce a response that is clear and concise. Try not to waffle.
- Make sure you do not repeat information that is already given in the wording of the question.
- If a question wants you to apply your knowledge and understanding, you need to use examples.
- Look at how many parts there are to a question and make sure you answer all of them.
- Check how many marks your question is worth and match your answers to the number of marks in the question. Mark allocations are provided in square brackets [ ] at the end of each question or part question.
- Try not to miss out any questions. You could pick up a mark with an educated guess.
- You don't have to answer the questions in order. If you don't know the answer straight away, don't spend time being stuck – move on to a question you can do and come back later.

- Write your answers clearly in the spaces provided in the answer booklet.
- If you need more space to complete an answer, use the additional lined pages at the end of the answer booklet and clearly number the question(s) where additional answers have been written.
- Avoid writing anything you want to be marked in the margins and always indicate if you run out of space that your answer continues on additional paper or at the end of the answer booklet.
- The examiner needs to be able to read your answer, so keep your handwriting neat.
- The quality of written communication (QWC) is assessed via the final extended question, so focus on making this answer your best in terms of how you structure and write it.

Revising for your exam

There are lots of different ways to revise for your exam, and you may find some revision methods work better than others. Here are some ideas to help you:

- Mind maps: read through a topic and then, without your notes, put the key points into a mind map. Check to see if you have covered everything, and if not, add the missing knowledge to the mind map. You will then have a concise version of your topic notes. A mind map for drawing types used in engineering could look like Figure A.
- Exam questions: as well as completing the exam-style questions in this book, you can also visit the OCR website where there are lots of past papers and mark schemes. You can use these to test your knowledge. You will also become familiar with the types of questions that could appear on your paper. Try to answer a whole paper in one hour without stopping, so that you get used to the amount of time you have available. This will prepare you for exam conditions.
- Revision cards: simply read a topic and rewrite your notes briefly on small cards. Make sure you include all the main points. You may also wish to put notes on one side of the card and questions and answers on the other.
- Study buddy: revise with a friend and test one another.

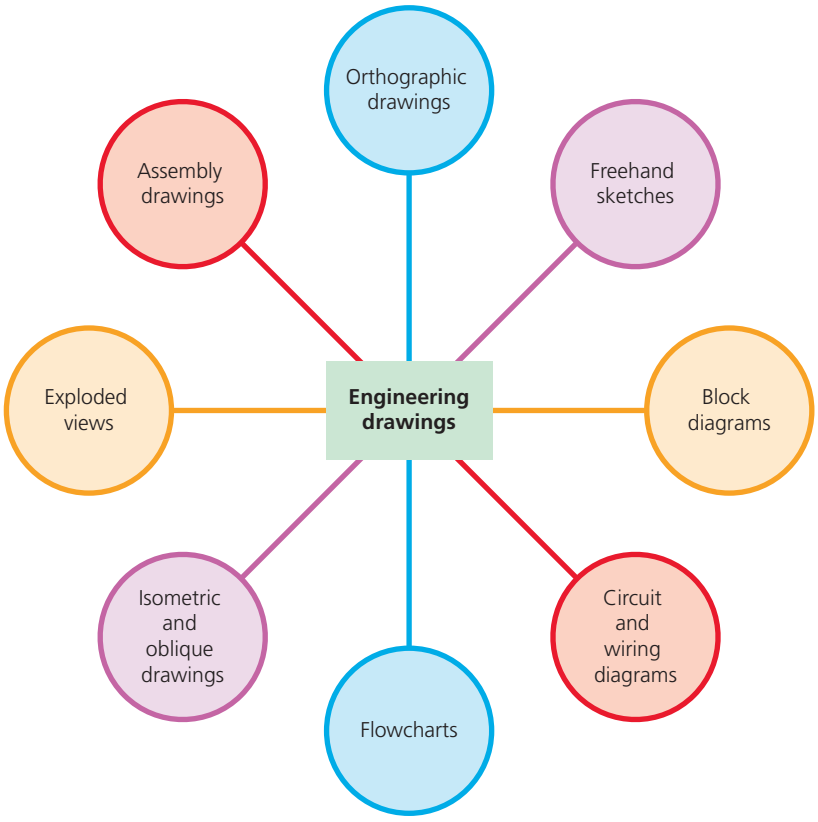


Figure A Example of a mind map

Topic area 1: Designing processes

Ideas do not just appear from thin air but are the result of trying to solve a problem, for example trying to improve something or make it easier to use. Various design processes have been developed to focus on different needs and wants.

In this chapter, you will learn about the design processes used to design products.

1.1 The stages involved in design strategies

REVISED

Design strategies are a series of steps used to plan a design process. They offer useful ways to think of and manage ideas to create solutions.

There are six different types of design strategy, with each focusing on problems in a different way (see Figure 1.1).

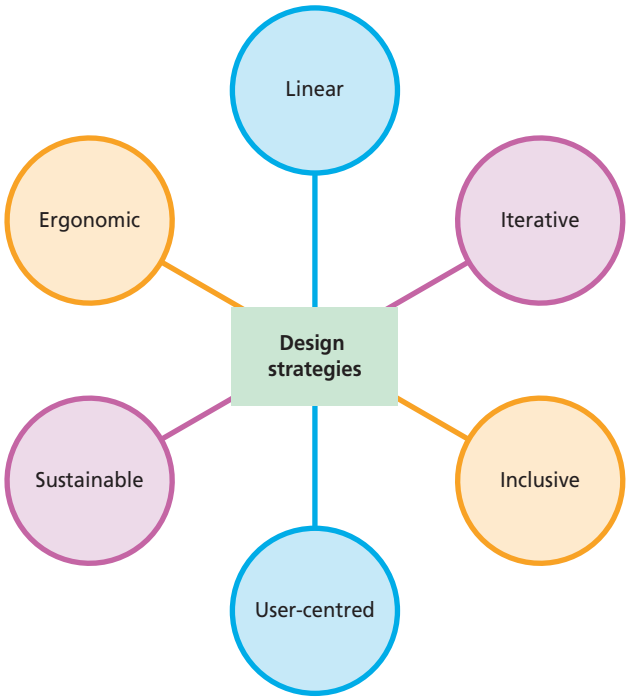


Figure 1.1 Types of design strategy

Different design strategies will be used for different situations, based on the problem to be solved and the specific needs and wants of the users. The choice of design strategy will depend on many factors, including the following:

- The type of product being designed, for example:
  - Will it be mass produced to be used by everyone or used by a limited section of people?
  - Does it need to be recycled?
- Product life cycle, for example:
  - How will the product evolve?
  - What will the product's effect be on the world from its first appearance, in the way it is manufactured and used, to what happens to it when it is no longer used?

Users People who will use the final product

Product life cycle The various stages of a product's evolution, from its beginning to its end

- Human factors – most products are designed for people, so human factors such as hearing, vision, **manual dexterity**, strength and reach may need to be taken into consideration.
- Cost – there is a cost for the time people take to design a product, fully test it and **prototype** a new idea. Other costs of production include materials, manufacturing, labour and factory **overheads**.

Exam tip

Questions on this topic require you to know the definitions of each type of design strategy and their relative advantages and disadvantages.

Manual dexterity The skill of using the hands to carry out a task with precision

Prototype To create a 3D model that demonstrates the functionality of a product

Overheads Costs or expenses, such as lighting, heating and equipment, that are paid out by an organisation

Linear design Development of a product through a series of sequential stages

1.1.1 Linear design

Linear design uses strict controls to manage risk in the design process. Each phase must be fully completed before going on to the next. This allows designers to catch any errors earlier on, when they are least expensive and time consuming to fix. This method is used in traditional engineering organisations, where the design moves from one stage to the next. Each stage typically represents a department or an area within an organisation.

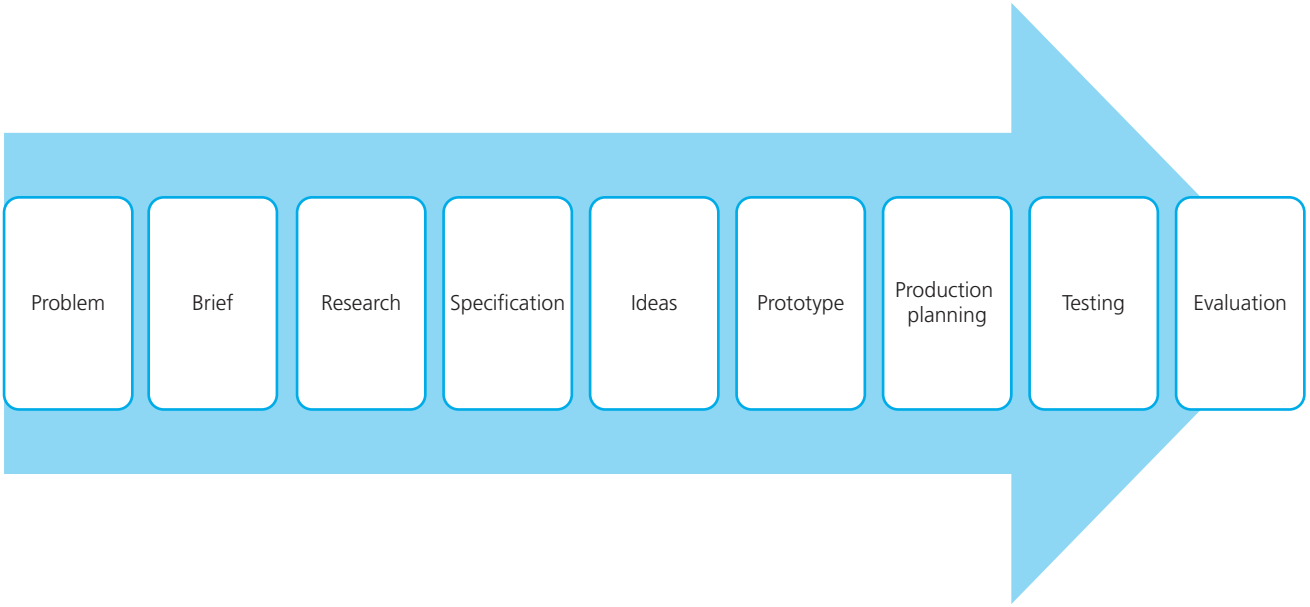


Figure 1.2 Linear design

For example:

- The design department of a steel beam manufacturer will spend a lot of time planning and researching the design and working out the beam's structural properties. It will then design the beam using the ideas from the planning stage.
- The design will then go to the drawing department, where engineering drawings are produced.
- These engineering drawings will pass to the manufacturing department, in order to create a prototype.
- The testing department will test the prototype, and if it functions correctly the final design will pass to the manufacturing production department.

As the design has to go from department to department, it makes it difficult to go back and fix earlier problems.

Figure 1.3 Steel beam manufacturers follow a linear design process

1.1.2 Iterative design

Iterative design is a circular process that models, evaluates and develops designs based on the results of testing. The continual testing gives feedback that can improve a design, sorting out problems as they arise. Figure 1.4 shows the iterative design process for making a drill.

Iterative design
Development of a product through modelling and repeated testing

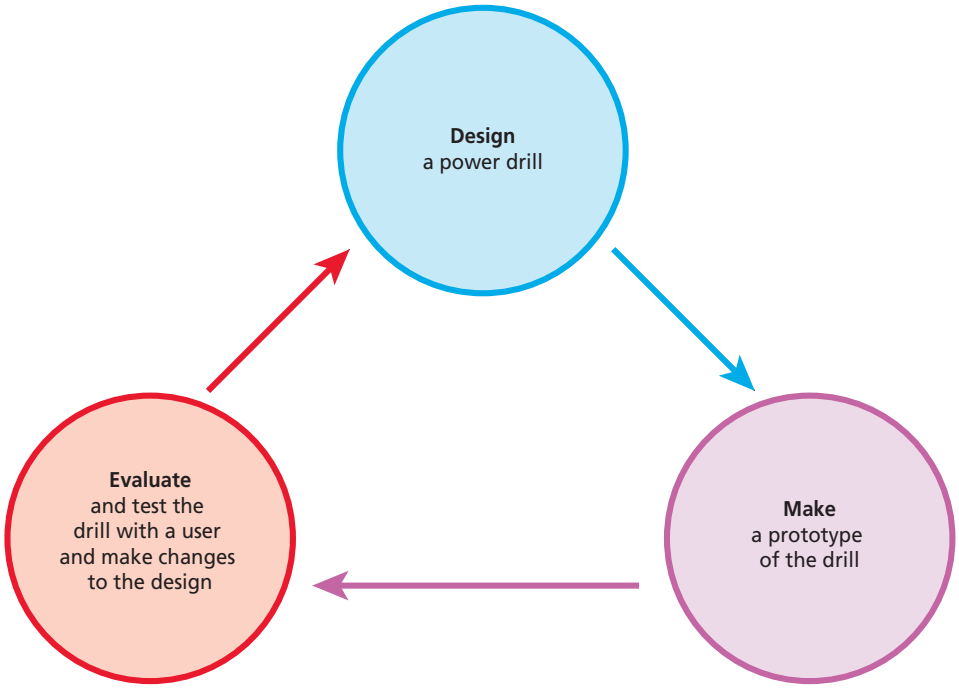


Figure 1.4 Iterative design process for making a drill

1.1.3 Inclusive design

Inclusive design focuses on developing products that can be used by as many people as possible, regardless of their age, ability or background. It aims to enable everyone to participate equally and independently in everyday activities. For example, architects design buildings that allow access by all users, by taking into consideration the different needs of certain individuals, such as children, older people and disabled people.

Inclusive design
Development of a product so that it can be used by as many people as possible, regardless of their age, ability or background

Figure 1.5 This ramp allowing access by disabled users is an example of inclusive design

Figure 1.6 summarises the five focal points for inclusive design and gives an example of each.

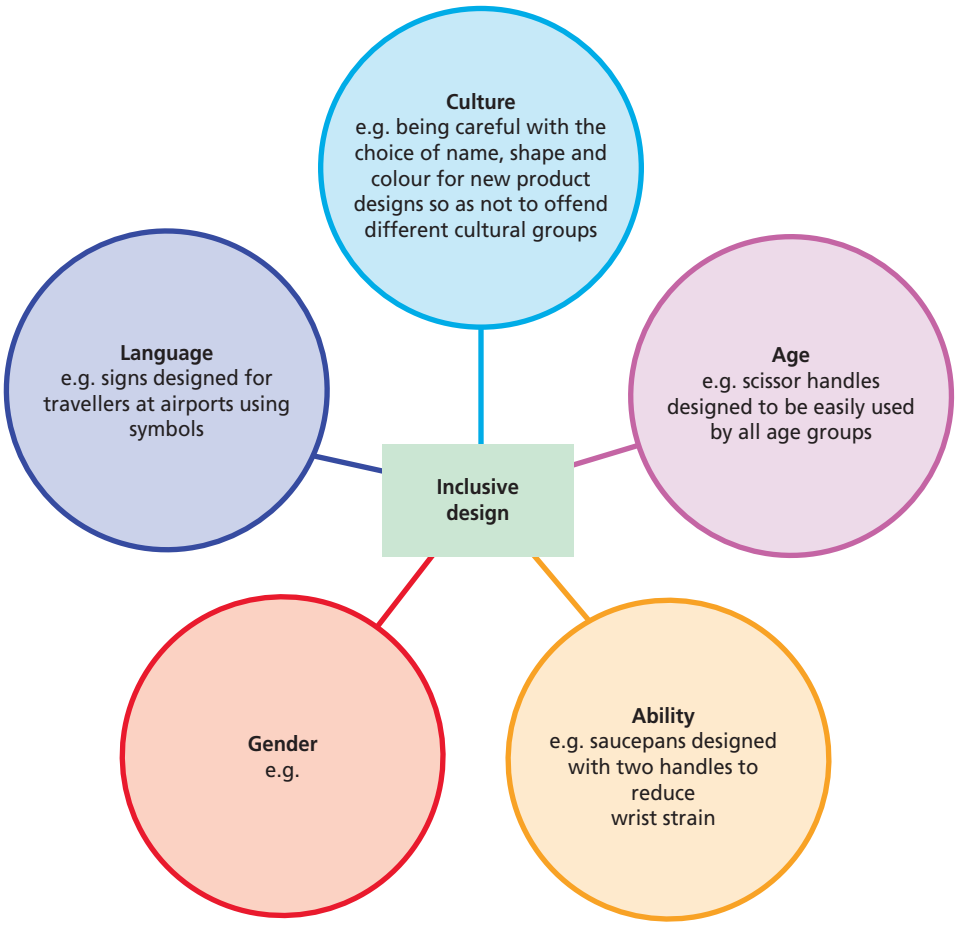


Figure 1.6 Inclusive design

MY **REVISION** NOTES

Cambridge National Level 1/Level 2

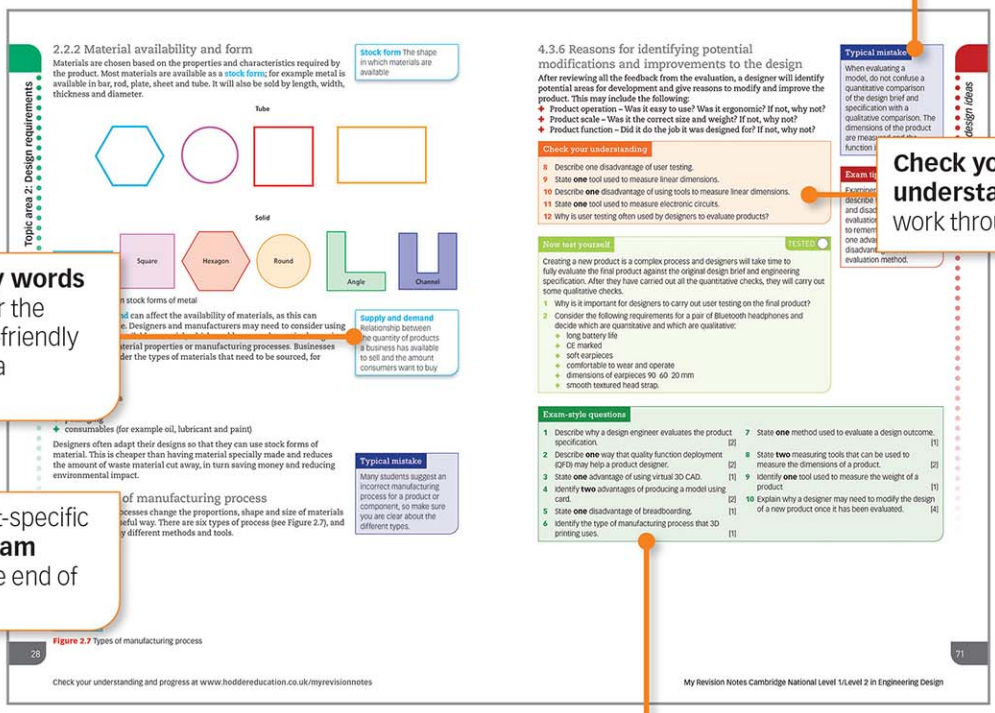
ENGINEERING DESIGN

Target exam success with *My Revision Notes*. Our updated approach to revision will help you learn, practise and apply your skills and understanding. Coverage of key content is combined with practical study tips and effective revision strategies to create a guide you can rely on to build both knowledge and confidence.

***My Revision Notes: Cambridge National Level 1/Level 2 in Engineering Design* will help you:**

Plan and manage your revision with our **topic-by-topic planner** and **exam breakdown** introduction

Avoid **typical mistakes** and enhance your exam answers with **exam tips**



Check your understanding as you work through the course

Understand **key words** you will need for the exam with user-friendly definitions and a **glossary**

Improve subject-specific skills with an **exam checklist** at the end of each chapter

Practise and apply your skills and knowledge with **exam-style questions** and frequent **now test yourself** questions, and answer guidance at the end of the book and online

HODDER EDUCATION

t: 01235 827827

e: education@hachette.co.uk

w: hoddereducation.co.uk

ISBN 978-1-3983-5247-6

FSC