

Set assignment

DRAFT

LEVEL 3 CAMBRIDGE ADVANCED NATIONAL (AAQ) IN

ENGINEERING

Extended Certificate H127

For first teaching in 2025

Unit F135: Mechanical product design

Introduction

This is Sample Assessment Material (SAM). It is an example set assignment that we publish alongside a new specification to help illustrate the intended style and structure of our set assignments.

During the lifetime of the qualification, updates to the set assignment template may happen. We always recommend you look at the most recent set of past set assignments where available.

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You can email your thoughts to ProductDevelopment@OCR.org.uk or visit the [OCR feedback page](#) to learn more about how you can help us improve our qualifications.



Designed and tested with teachers and students



Helping young people develop an ethical view of the world



Equality, diversity, inclusion and belonging (EDIB) are part of everything we do

Summary of updates

Date	Version	Page number	Summary of change
July 2023	1 DRAFT	All	Creation of document

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We have a range of support services to help you at every stage, from preparation to delivery.

Our teacher support is designed to make teaching our qualifications straightforward, whether you are an experienced teacher, new to teaching, new to OCR, or not a subject specialist of the qualification you are teaching.

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Contact details are available on the [final page](#) of the SAM.

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As one of the major UK exam boards, OCR is responsible for creating and marking exams taken by over a million students each year. We work with over 10,000 professionals to create, check, mark and moderate our assessments.

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People and planet

OCR is part of Cambridge University Press & Assessment, which has clear commitments to champion sustainability, diversity, trust and respect for our people and planet.

We are committed to supporting a curriculum that helps young people develop an ethical view of the world. This enables them to take social responsibility, understand environmental issues and prepare them for the green jobs of the future.

Our equality, diversity, inclusion and belonging principles are that we:

- are respectful and considerate
- celebrate differences and promote positive attitudes to belonging
- include perspectives that reflect the diverse cultural and lifestyle backgrounds of our society
- challenge prejudicial views and unconscious biases
- promote a safe and supportive approach to learning
- are accessible and fair, creating positive experiences for all
- provide opportunities for everyone to perform at their best
- are contemporary, relevant and equip everyone to live and thrive in a global, diverse world
- create a shared sense of identity in a modern mixed society with one humanity.

To learn more, including our work on accessibility in our assessment materials, visit our [People and planet page](#).



Oxford Cambridge and RSA

OCR-set Assignment

Sample Assessment Material

OCR Level 3 Cambridge Advanced National (AAQ) in Engineering
(Extended Certificate)

Unit F135: Mechanical product design

Scenario Title: Toaster redesign

This is a sample OCR-set assignment which should only be used for practice.

This assignment **must not** be used for live assessment of students.

The live assignments will be available on our secure website, 'Teach Cambridge'.

The OCR administrative codes linked to this unit are:

- unit entry code F135
- certification code H127

The regulated qualification number linked to this unit is:

TBC

Duration

About 12 hours of supervised time (GLH)
(work that **must** be completed under teacher supervised conditions)

All this material **can** be photocopied. Any photocopying will be done under the terms of the Copyright Designs and Patents Act 1988 solely for the purposes of assessment.

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Information and instructions for Teachers

Using this assignment

This assignment provides a scenario and set of related tasks that reflect how mechanical design engineers might analyse an existing product and suggest changes to meet the needs of a design brief.

The assignment:

- Is written so that students have the opportunity to meet the requirements of all assessment criteria for the unit.
- Will tell students if their evidence must be in a specific format. If the task does not specify a format, students can choose the format to use.
- **Must** be completed under teacher supervision. Any exceptions to this will be stated in the assessment guidance.

You **must**:

- Use an OCR-set assignment for summative assessment of students.
- Familiarise yourself with the assessment criteria and assessment guidance for the tasks. These are given at the end of each student task. They are also with the unit content in **Section 4** of the Specification. Assessment guidance is only given where additional information is needed. There might not be assessment guidance for each criterion.
- Make sure students understand that the assessment criteria and assessment guidance tell them in detail what they need to do in each task.
- Read and understand **all** the rules and guidance in **Section 6** of the Specification **before** your students start the set assignments.
- Make sure that your students complete the tasks and that you assess the task fully in line with the rules and guidance in **Section 6** of the Specification.
- Give your students the Engineering **Student guide to NEA assignments before** they start the assignments.

You **must not**:

- Use live OCR-set assignments for practice or formative assessment. This sample assessment material **can** be used for practice or formative assessment.
- Use this sample assessment material for live assessment of students.
- Allow group work for **any** task in this assignment.
- Change any part of the OCR-set assignments or assessment criteria.

Information for delivering tasks

Task	Requirements
All	<ul style="list-style-type: none">• There is no requirement for any electrical components to be included in the redesign work.
Task 1	<ul style="list-style-type: none">• The product does not need to be identical to the example pictured in the scenario.• Any product(s) purchased for the purpose of this task must be able to be disassembled.• There is no requirement for any permanent fixings to be taken apart as part of any disassembly.

Pages 1-4 are for teachers only. Please do **not** give **Pages 1-4** to your students.

You can give **any** or **all** of the pages **that follow** to your students.

Tasks for students and assessment criteria

OCR Level 3 Cambridge Advanced National (AAQ) in Engineering (Extended Certificate)

Unit F135: Mechanical Product Design

Scenario Title: Toaster redesign

Scenario

You work for a product design company as a mechanical product designer. A client has asked you to redesign an existing product.

The product is a budget two-slice toaster. An example of a two-slice toaster is shown below. The two-slice toaster that you are using may look slightly different to this one.

Note you do not need to include any of the electrical components from the two-slice toaster in your redesign work.



Task 1

Product Analysis

Topic Area 1 is assessed in this task.

Before you can consider the redesign of a product you must have a thorough understanding of exactly what the product does, how it works, and the materials and processes used in its manufacture.

The client has provided an example of the product they want redesigned. You will investigate the function of the product and its operating principles, including the safe disassembly of the product into its main components.

The task is:

To complete a product analysis of a toaster including:

- a record of the disassembly process so that a third party could reassemble the product.
- analyse **two** different non-standard components and use your knowledge of engineering materials and processes to:
 - identify the materials they are made from, and the processes used to manufacture them.
 - identify **two** design features of these components that make the manufacture or assembly easier.

Your evidence **must** include:

- A written summary of the product function and operating principles
- A record of the disassembly of the product including notes, sketches or photographs
- Written material about the analysis of the two different non-standard components selected

Use the assessment criteria below to tell you what you need to do in more detail

Pass	Merit	Distinction
P1: Describe the function(s) of the product.	M1: Explain how the operating principles enable the product to function.	
P2: Safely disassemble an engineered product into its main components.	M2: Produce information about how to methodically disassemble the product.	D1: Produce clear guidance to allow reassembly of the product by a third party.
P3: Identify the materials used to make two different non-standard components.		D2: Analyse the materials and processes used for two non-standard components, including how you were able to identify them.
P4: Identify two DFMA related design features from the components in P3 .		
P5: Identify suitable manufacturing processes		

used to make two different non-standard components.		
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Assessment Guidance

This assessment guidance gives you information to meet the assessment criteria. There might not be additional assessment guidance for each criterion. It is only given where it is needed. You must read this guidance before you complete your evidence.

Assessment Criteria	Assessment guidance
P2	<ul style="list-style-type: none"> Permanent fixings do not need to be taken apart as part of any disassembly. You also do not need to disassemble any of the electrical or electronic components. Guidance on the main components will be given in the advice section of each assignment.
P3	<ul style="list-style-type: none"> The non-standard components selected need to be made using different materials and different processes
P4	
P5	
D2	<ul style="list-style-type: none"> Students must consider the design requirements.

Advice:

- You should read any user documentation provided by the product manufacturer.
- Any operation of the product should be carried out safely.
- The main components in a toaster vary depending on the model. For example, the main components may include: the outer casing, controls (e.g. a lever, button and switch), crumb tray, top and base plates, toast shelf / rack, insulation / radiation shields, and the inner housing assembly.

Task 2

Product redesign

Topic Area 2 is assessed in this task.

The client would like you to develop a design proposal for an improved version of their toaster.

They have developed a design brief based on their own market research.

The requirements for the redesigned toaster are that it **must**:

- have capacity for up to four slices of bread
- have a switch to select one, two, three or four slice operation
- be easy to maintain and repair.

The client has asked that you concentrate on the overall design concept. They would like to see:

- the research you have done into existing products
- redesign options you have considered, and
- a final design proposal.

Details of electrical circuits or internal mechanisms are **not** required.

The task is:

Produce a design proposal that satisfies the client's design brief, using your product analysis and research and following the stages of the design process.

You will need to:

- Create **three** different design ideas for each requirement from the client brief and communicate these using annotated freehand sketching and notes.
- Develop **one** idea into a final design presentation drawing and proposal.

Your evidence **must** include:

- A written summary of your research into similar products
- Notes, sketches and drawings detailing **three** design ideas and your final design drawing and proposal
- Any written material needed to support your work (e.g. analysing options, justifying choices, etc...).

Use the assessment criteria below to tell you what you need to do in more detail.

Pass	Merit	Distinction
P6: Summarise research into similar existing products.		
P7: Create three different design ideas for each of the requirements of the design brief, using annotated freehand sketches.	M3: Analyse how effectively the different design ideas fulfil the requirements of the design brief.	D3: Justify the selection of one idea for each requirement for further development.
P8: Draw detailed annotated freehand sketches to communicate the development of a final design that meets the requirements of the design brief.		
P9: Draw a 3D presentation line drawing of the final design from P8 .	M4: Use rendering, colour, appropriate labelling and annotation to enhance the 3D presentation drawing of the final design (P9).	
P10: Select two different, appropriate materials for use in the manufacture of the product.	M5: Justify the selection of two materials in terms of their qualities, for use in the manufacture of the product.	
P11: Select two different, appropriate processes for the manufacture of the product.		D4: Justify the selection of the two processes in terms of their characteristics, for use in the manufacture of the product.
	M6: Analyse how effectively the final design fulfils the requirements of the design brief.	D5: Recommend further appropriate improvements to the final design.

Assessment Guidance

This assessment guidance gives you information to meet the assessment criteria. There might not be additional assessment guidance for each criterion. It is only given where it is needed. You must read this guidance before you complete your evidence.

Assessment Criteria	Assessment guidance
P7	<ul style="list-style-type: none"> The emphasis here is on creating different design ideas rather than drawing skills although drawings need to be of sufficient quality to communicate the ideas effectively. Students can produce three product designs, each of which has different ideas for each of the requirements, or they can produce separate ideas for each of the requirements (for example, three sets of three thumbnails per requirement) The different design ideas should have different geometric forms
M3	
P8	<ul style="list-style-type: none"> The emphasis here is on the quality of the drawings and communication of the final design idea as well as the suitability of the final design.
P9	<ul style="list-style-type: none"> The emphasis here is on drawing skills and communication skills rather than the quality of the final design or its suitability to meet the requirements from the brief.
M4	
P10	<ul style="list-style-type: none"> Students must include notes to indicate the selection and use of two different materials.
P11	<ul style="list-style-type: none"> Students must include notes to indicate the selection and use of two different processes.
M6	<ul style="list-style-type: none"> The qualities refers to those listed in the unit under section 2.1.3 Material and process selection
D4	<ul style="list-style-type: none"> The characteristics refers to those listed in the unit under section 2.1.3 Material and process selection

NEA Command Words

The table below shows the command words that may be used in the NEA assignments and/or assessment criteria.

Command Word	Meaning
Adapt	<ul style="list-style-type: none"> Change to make suitable for a new use or purpose
Analyse	<ul style="list-style-type: none"> 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
Assess	<ul style="list-style-type: none"> Offer a reasoned judgement of the standard or quality of situations or skills. The reasoned judgement is informed by relevant facts
Calculate	<ul style="list-style-type: none"> Get a numerical answer, showing how it has been worked out
Classify	<ul style="list-style-type: none"> Arrange in categories according to shared qualities or characteristics
Compare	<ul style="list-style-type: none"> Give an account of the similarities and differences between two or more items, situations or actions
Conclude	<ul style="list-style-type: none"> Judge or decide something
Describe	<ul style="list-style-type: none"> Give an account that includes all the relevant characteristics, qualities, or events
Discuss (how/whether/etc)	<ul style="list-style-type: none"> Present, analyse and evaluate relevant points (for example, for/against an argument) to make a reasoned judgement
Evaluate	<ul style="list-style-type: none"> Make a reasoned qualitative judgement considering different factors and using available knowledge/experience
Examine	<ul style="list-style-type: none"> To look at, inspect, or scrutinise carefully, or in detail
Explain	<ul style="list-style-type: none"> Give reasons for and/or causes of something Make something clear by describing and/or giving information
Interpret	<ul style="list-style-type: none"> Translate information into recognisable form Convey one's understanding to others, e.g. in a performance
Investigate	<ul style="list-style-type: none"> Inquire into (a situation or problem)
Justify	<ul style="list-style-type: none"> Give valid reasons for offering an opinion or reaching a conclusion
Research	<ul style="list-style-type: none"> Do detailed study in order to discover (new) information or reach a (new) understanding
Summarise	<ul style="list-style-type: none"> Express the most important facts or ideas about something in a short and clear form

We might also use other command words but these will be:

- commonly used words whose meaning will be made clear from the context in which they are used (e.g. create, improve, plan)
- subject specific words drawn from the unit content.

OCR would like to acknowledge the following: Page 5 *Toaster stock image* – *Science Photo Library* /Gettyimages.com

Sample

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