

**CAMBRIDGE NATIONALS**

Moderators' report

# **ENGINEERING DESIGN**

**J831, J841**

**R106-R108 Summer 2022 series**

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## Introduction

Our Lead Moderators' reports are produced to offer constructive feedback on centres' assessment of moderated work, based on what has been observed by the moderation team. These reports include a general commentary of accuracy of internal assessment judgements; identify good practice in relation to evidence collation and presentation and comments on the quality of centre assessment decisions against individual Learning Objectives. This report also highlights areas where requirements have been misinterpreted and provides guidance to centre assessors on requirements for accessing higher mark bands. Where appropriate, the report will also signpost to other sources of information that centre assessors will find helpful.

OCR completes moderation of centre-assessed work in order to quality assure the internal assessment judgements made by assessors within a centre. Where OCR cannot confirm the centre's marks, we may adjust them in order to align them to the national standard. Any adjustments to centre marks are detailed on the Moderation Adjustments report, which can be downloaded from Interchange when results are issued. Centres should also refer to their individual centre report provided after moderation has been completed. In combination, these centre-specific documents and this overall report should help to support centres' internal assessment and moderation practice for future series.

### Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our [website](#).

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## Unit R106 General overview

Most candidates made a very good attempt at this unit, others did not fully address all the requirements of each part of the learning outcomes as set out in the marking criteria. As this unit requires candidates to undertake a practical activity in LO3, direct evidence of this activity being performed is essential. Annotated photographic evidence at key stages can be a very effective means of communicating on-going practical activity. The permitted changes for 2022 also allowed for a commentary to describe each aspect of the process, including appropriate tools and potential safety issues.

Learning outcome assessment marks are not equally distributed across marking sub-criteria within a mark band.

### Comments by LO

#### LO1 – Know how commercial production methods, quality and legislation impact on the design of products and components

Many candidates were able to demonstrate sound knowledge of commercial production methods and how it can impact on product/component design. When addressing manufacturing processes, they were often covered in isolation with limited reference to their impact on the design of any product or component. Ideally, the product/component they are related to should be that researched and analysed in LO2 and LO3. When addressing end of life considerations, many candidates considered product life-cycles and the 6Rs but not always how end of life considerations can influence the design of a product/component. The importance of conformity to legislation and standards was often well addressed. Appropriate standards and regulations were identified, though often, in isolation of any product.

#### LO2 – Be able to research existing products

This LO was not always addressed well by candidates. Strengths and weaknesses of existing products were often perceived solely from images of products and marketing information found from secondary research. Many candidates did not summarise their findings using annotated digital evidence, charts, diagrams, tables, or sketches. Candidates could investigate a range of same type existing products using primary and secondary research tools, with objective criteria. This will allow them to identify unbiased strengths and weaknesses for each product.

#### Assessment for learning



Referencing:

This LO provides an excellent opportunity to develop and demonstrate skills at referencing from secondary sources. [Further guidance on referencing](#) is available from the OCR website.

## LO3 – Be able to analyse an existing product through disassembly

The actual disassembly of an existing product was often well attempted by candidates, but their evidence to meet the requirements of the LO was not always well communicated. Candidates should initially show the manufacturer's instructions for disassembly that they will follow. Where this is not available, candidates could produce their own prior to and during the disassembly. Candidates should then communicate how they use tools and equipment to disassemble an existing product, with understanding of potential hazards and safety considerations. Annotated photographs of key stages during the disassembly and use of appropriate PPE can be an excellent method for communication of this LO, and a risk assessment can show understanding of potential hazards and safety considerations.

The permitted changes for 2022 allowed for wider choice of suitable products for disassembly, for a disassembly to be completed outside of a workshop with a small range of hand tools, and for a written commentary to describe each aspect of the process, including appropriate tools and potential safety issues, in place of annotated photographs or video evidence of disassembly.

A witness statement is requested to corroborate candidate-generated evidence for this LO, it could comment on a candidate's level of independence and competence when following a disassembly procedure.

This LO also provides opportunity for candidates to make synoptic links to learning in R105.

For the final LO, candidates are required to analysis the components of the existing product they disassemble. Candidates were often able to name discrete components and their function. They could describe how they were produced and how they were assembled within the product, but the actual materials that were made from and how they could be maintained was not always clearly understood. For example, rather than suggest a specific materials such as acrylonitrile butadiene styrene (ABS) or high-density polyethylene (HDPE) many candidates identified a component as being made from plastic.

### OCR support

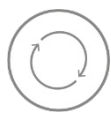


Witness statements:

Full guidance on how to use witness statements can be found in Appendix A of [the Specification Handbook](#).

It is important to remember that they cannot be used as a substitute for direct evidence that the candidate can produce. They should only be used to support and corroborate things like independent and safe working, or the quality of a finished product.

### Assessment for learning



Synoptic teaching and learning:

Candidates are required for this LO to draw upon skills/knowledge/understanding from other units in the specification and it would be useful if this was made explicit within their responses.

## Unit R107 General overview

Candidates produced some very good initial design proposal sketches. Designs were taken forward using a range of IT strategies through to a final proposed solution. Candidates communicated images of their final solution very effectively using 3D computer aided design software however, final proposed solutions were often lacking details that could lead to their manufacture.

### Comments by LO

#### LO1 – Be able to generate design proposals using a range of techniques

Candidates produced a wide range of initial design ideas using an increasing range of 2D and 3D sketching techniques and strategies. As designs became stylised, rendering was added to communicate shade, tone, and texture. It was noted that rendering to express colour was more prevalent than rendering to communicate material characteristics.

Witness statements are requested to corroborate the level of candidate independence when they are producing evidence for this LO

Labels to identify detail and annotations to explain it and other design decisions were used, but opportunities to draw on learning from R105 and R106 were not always developed too well. Candidates could draw on the specification criteria outlined in R105 and the manufacturing processes used to make existing products researched in R106. Many candidates used a range of IT software but not always to modify and enrich their initial design sketches through to a final design to take forward to LO2. The permitted changes for 2022 gave centres the opportunity to simplify the requirement to use software to produce, modify and enrich design. For example, sketches could be scanned into presentation software, and candidates could use the software to add labels, annotations and other enrichments.

#### OCR support



Witness statements:

Full guidance on how to use witness statements can be found in Appendix A of [the Specification Handbook](#).

It is important to remember that they cannot be used as a substitute for direct evidence that the candidate can produce. They should only be used to support and corroborate things like independent and safe working, or the quality of a finished product.

#### Assessment for learning



Synoptic teaching and learning:

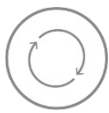
Candidates are required for this LO to draw upon skills/knowledge/understanding from other units in the specification and it would be useful if this was made explicit within their responses.

## LO2 – Know how to develop designs using engineering drawing techniques and annotation

The permitted changes for 2022 allowed for a range of possible adaptations when producing evidence for this LO. Access to IT is not strictly required as engineering drawings can be produced by hand therefore, to assist layout and accuracy, candidates could use graph paper and/or grid paper. CAD software could also be used to produce the 2D and 3D engineering drawings, and centres could reduce the number of drawings, so that candidates only produce x1 2D and x1 3D annotated (dimensions, scale, tolerance) engineering drawings. In general, candidates produced accurate 2D and 3D engineering drawings with significant surface detail to communicate design proposals with appropriate dimensioning to indicate size and position: appropriate annotation, necessary to access the very high marks, such as tolerances, materials, finish, scale, projection, description, etc., were often not communicated.

CAD produced engineering drawings for LO2 cannot also receive marks in LO3.

### Assessment for learning



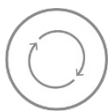
2D and 3D formal drawings:

Refer to the marking criteria and assessment guidance for this LO published in Appendix B of [the Specification Handbook](#) 'Present design ideas using engineering drawing techniques to conform to industry standards.'

## LO3 – Be able to use Computer Aided Design (CAD) software and techniques to produce and communicate design proposals

Candidates produced some excellent CAD final design proposals. CAD drawing applications utilised included presentation drawings, exploded drawings, sectional drawings and engineering drawings. In order to access high marks from MB3, candidates are required to comprehensively communicate their design proposals with details of manufacturing materials and methods.

### Assessment for learning



Use of evidence:

Where there is overlap of content, it is essential that evidence used to satisfy one LO is not credited twice (i.e., double-counted)

In this unit, CAD drawings produced for LO2 and LO3 should be clearly separate for each LO so that they are marked just once.

## Unit R108 General overview

Planning for practical activity and the production of a prototype model are areas where some very good responses were seen. Interpretation of a specification and evaluation of the success of a prototype are areas that demonstrated areas of weakness.

### Comments by LO

#### LO1 – Know how to plan the making of a prototype

Too often candidates were asked to interpret specification criteria headings rather than specification criteria statements. Please note that it is not required for candidates to generate specification criteria themselves, rather interpret specification criteria provided in the assignment brief.

Candidates presented their planning using a range of styles including flow charts, Gantt charts and traditional tables. Good quality planning identified a correct sequence of tasks, a description of each task, the tools, equipment and materials that would be required for the task, health and safety, and quality control considerations. The addition of time allowed for each task was also often considered.

#### Assessment for learning



Planning:

Blank planning templates or tables with appropriate headings can be given to candidates for them to complete.

#### LO2 – Understand safe working practices used when making a prototype

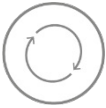
The appropriate use of PPE and explanations of how candidates apply safe working procedures were not always communicated too well. A risk assessment is a requirement for this LO, it can help candidates to recognise potential hazards and understand how to take appropriate precautions to remain safe when they are working with materials, tools, and equipment. Annotated photographs demonstrating application of the risk assessment and safe working practices, including the wearing of appropriate PPE, could provide suitable evidence for this LO.

A witness statement is requested to support the direct evidence produced by candidates in this LO, it could comment on a candidate's level of independence when producing and using a risk assessment, when using a range of hand tools and machines, and when using appropriate PPE.

Candidates are required to clearly demonstrate how they have drawn upon skills/knowledge/understanding from other units in the specification for this LO. This can be through links back to R105, R106 and R107.



## Assessment for learning



Risk assessment:

Risk assessment templates can be given to candidates for them to complete.

## OCR support



Witness statements:

Full guidance on how to use witness statements can be found in Appendix A of [the Specification Handbook](#).

It is important to remember that they cannot be used as a substitute for direct evidence that the candidate can produce. They should only be used to support and corroborate things like independent and safe working, or the quality of a finished product.

## LO3 – Produce a prototype

Candidates used appropriate methods to communicate making activity, e.g., annotated photographs and/or written descriptions, but records of making were often incomplete due to key tasks that were identified in production plans not being explained. Appropriate materials were generally selected to produce prototypes, but many candidates did not communicate a process of materials selection, e.g., why particular materials were chosen and why others had been discarded. It is important to note that photographic evidence of outcome is a requirement in this LO. Photographs of completed outcomes can demonstrate where tools and processes had been used effectively to produce a prototype.

Rapid prototyping was used in several centres though how the machines were set up for use and operated was not always well communicated.

A witness statement is requested to support the direct evidence produced by candidates in this LO, it could comment on a candidate's level of independence when producing a prototype from a production plan.

## LO4 – Be able to evaluate the success of a prototype

The prototype outcome from modelling and making activity was generally evaluated well when compared to the product specification, and many candidates were able to identify appropriate suggestions for improvements with justification. However, evaluations of planning activity and understanding of own strengths and weaknesses in realising a design were areas of weaknesses.

### Assessment for learning



#### Review

This LO provides an excellent opportunity to develop skills at reviewing a plan, prototype and personal performance.

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