

INCLUDED ON THE
KS4 PERFORMANCE TABLES

Teacher guide

OCR Level 1/Level 2

Cambridge National in
Engineering Manufacture

J823

For first teaching in 2022 | Version 1

**Exploring our exams: a guide to our Sample Assessment
Material**

ocr.org.uk/cambridgenationals

Introduction

The SAM is an example exam paper that we publish alongside a new specification to help illustrate its intended style and structure when a qualification is first launched. We wanted to share the story of our assessment approach with you so when you look through the paper you will find we have pointed out certain features and explained the decisions we have made.

Resources to help support in teaching different areas of content can be found on the Cambridge National in Engineering Manufacture webpage under '[Planning and teaching](#)'.

Our exam papers are developed with our accessibility principles in mind. The document '[Understanding the Assessment](#)' tells you a little more about the principles and rationale underpinning our approach for the qualifications. The 'Command Words' are in both '[Understanding the Assessment](#)' and the [specification](#). These tell you what we mean by each command word and how students should approach the question and understand its demand.

You said, we did

During the development of this qualification, **we talked extensively with teachers, subject experts** and our senior assessment teams to influence its structure, content and assessment materials. We then shared our final materials to make sure that they met the identified needs.

You told us that you wanted **to keep the exam as close to the current exam** for the existing Cambridge National in Engineering Manufacture, so that's what we have tried to do, by retaining the tone and feel.

You told us that **you would like the exam to start with multiple choice questions** to help students settle, so that's why Section A is made up of multiple choice questions.

You told us that you wanted **the exam to be as short as possible** to keep students focused, so we have used the principle of a mark per minute.



Sample Assessment Material (SAM)

All students will sit the exam at the same time on the same day.

The time allowed is designed to give students approximately one minute per mark.

...day ... Month Year – Morning/Afternoon

OCR Level 1/Level 2 Cambridge Nationals in Engineering Manufacture

R014: Principles of engineering manufacture

Time allowed: 1 hour 15 minutes

You must have:

- No extra materials are needed

You can use:

- A calculator



Write clearly in black ink. **Do not write in the barcodes.**

Centre number

--	--	--	--	--	--

Candidate number

--	--	--	--	--

First name(s) _____

Last name _____

INSTRUCTIONS

- Use black ink.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer **all** the questions.

INFORMATION

- The total mark for this paper is **70**.
- The marks for each question are shown in brackets [].
- This document has **16** pages.

ADVICE

- Read each question carefully before you start your answer.

This exam will always be set and marked by us. Exams will be available in January and June each year. The exam must be taken as terminal assessment. This means that the result from the exam taken in the final assessment series before certification will be the one that counts towards the student's overall grade.

If students require additional answer space, lined pages may be available at the end of the answer booklet in a live question paper. Remember the question number(s) must be clearly shown.

The exam will always have 70 marks. Section A will have 10 marks and Section B will have 60 marks.

Section A

Students should use a tick (✓) in the box to show their response to MCQs.

Put a tick (✓) in the box next to the **one** correct answer for each question.

1 What type of process is drilling?

- (a) Forming
- (b) Joining
- (c) Shaping
- (d) Wasting

[1]

2 Which of these means the ability of a material to return to its original shape after being stretched or squeezed?

- (a) Ductility
- (b) Elasticity
- (c) Malleability
- (d) Sustainability

[1]

3 Which of these is a shaping process?

- (a) Filing
- (b) Forging
- (c) Injection moulding
- (d) Shearing

[1]

Section A has 10 compulsory multiple-choice questions (MCQs).

Each question in this section is worth 1 mark. MCQs will test a range of knowledge from across the unit content.

4 You are joining together two pieces of low carbon steel. Which of these methods will produce the strongest joint?

- (a) Brazing
- (b) Mechanical fastening using self-tapping screws
- (c) MAG welding
- (d) Riveting using pop rivets

[1]

5 Which is a ferrous metal?

- (a) Aluminium alloy
- (b) Brass
- (c) Copper
- (d) Stainless steel

[1]

6 What type of material is tungsten carbide?

- (a) Ceramic
- (b) Composite
- (c) Metal
- (d) Polymer

[1]

MCQs will always have four response options listed in alphabetical or numerical order. The four response options will consist of the correct answer and three distractors.

Turn over

7 On an orthographic drawing, what is the meaning of the type of line shown in Fig.1?

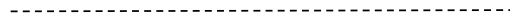


Fig.1

- (a) Centre line
- (b) Hidden detail
- (c) Leader line
- (d) Outline

[1]

8 On an orthographic drawing, what is the meaning of the symbol shown in Fig.2?



Fig.2

- (a) Diameter
- (b) Knurl
- (c) Radius
- (d) Thread size

[1]

9 What does quality assurance mean?

- (a) Checking products after production to make sure that they are the correct size
- (b) Giving a guarantee to customers that all parts in a product are made from sustainable materials
- (c) Putting in place procedures to make sure that products are made correctly and defect free
- (d) Replacing any product that does not satisfy a customer's needs

[1]

The number of marks assigned to a question will always be given at the end of the question and will always be right aligned.

Where appropriate we will embolden key information in a question to make it clearer.

10 In inventory management, what does **MRP** stand for?

- (a) Manufacturing Required Processes
- (b) Manufacturing Resource Program
- (c) Material Requirements Planning
- (d) Materials Resources Processes

[1]

Turn over

Section B

11 You have been asked to turn a metal component using a centre lathe. See Fig.3.

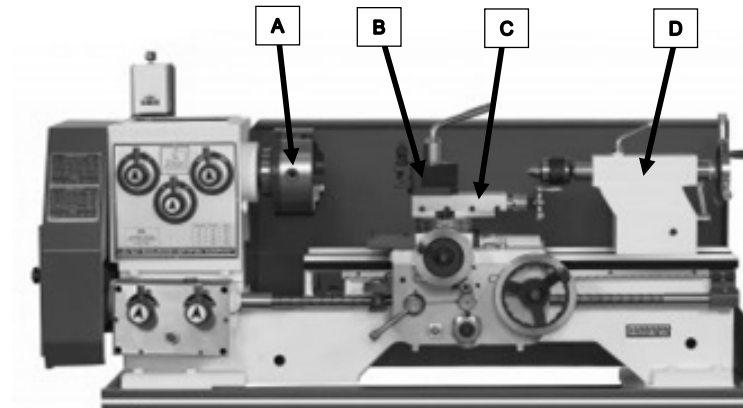


Fig.3

(a) Identify the **four** parts of a centre lathe that have been labelled in **Fig.3**.

- A
- B
- C
- D

[4]

Section B contains a number of mandatory questions that are divided into sub-questions. Question types include:

- short answer
- closed response
- shorter response in context
- extended response.

These allow us to assess the following Performance Objectives:

- PO1 – Recall knowledge and show understanding
- PO2 – Apply knowledge and understanding
- PO3 – Analyse and evaluate knowledge, understanding and performance.

Sub-content topic areas will be sampled across exam papers, over time.

- (b) State **two** safety precautions that you would take when using a lathe. For **each** safety precaution, give a **different** reason why it is needed.

Safety Precaution 1.....	Reason.....
Safety Precaution 2.....	Reason.....

[4]

- (c) Explain why an alloy might be better than a pure metal to make an engineered product.

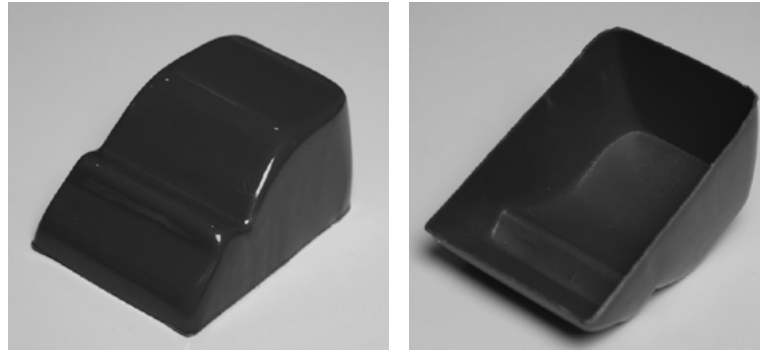
.....
.....
.....
.....

[2]

Where students need to answer in a table it will be centered on the page.

Turn over

- 12 Refer to **Fig.4**. You are making the casing as part of a prototype for a toy.
The casing must be made from polymer using a vacuum former.



View from top

View of underside

Fig.4

- (a) Explain **one** difference between thermoplastic and thermosetting polymers.

.....

 [2]

- (b) Identify **two** polymers that could be used successfully in the vacuum forming process.

1
 2
 [2]

Questions may include images to help students. Images will always be in grey scale.

The number of answers needed will always be written as a word in bold.

13 (a) Explain what is meant by a smart material.
.....
.....
.....
..... [2]

(b) Identify and explain **one** use of **each** of these smart materials.

Quantum Tunneling Composite (QTC).....
.....
..... [2]

Thermochromic pigment
.....
..... [2]

(c) The composite material Carbon Reinforced Polymer (CRP) is used to make the frames for high performance racing bicycles.

Describe how you would make the frames from CRP.
.....
.....
.....
.....
.....
..... [4]

Appendix B in the Specification contains a glossary of Command Words that will be used in our exams. The glossary tells you what we mean by each command word.

14 An engineering company are going to mass produce engine parts for cars. They are going to use Computer Aided Manufacturing (CAM) machines and Just in Time (JIT) manufacturing.

Where contexts are used, information will be concise and specific to the question.

(a) CAM lathes are widely used in engineering.

Name **two** other types of CAM machine.

1

2

[2]

(b) Identify and explain **two** reasons why CAM machines are better than manual machines for making parts in large quantities.

1

.....

.....

.....

2

.....

.....

.....

[4]

(c) Identify and explain **one** way in which JIT can improve the performance of the company.

.....

.....

.....

..... [2]

Turn over

- 16 You are making the part shown in **Fig. 5**.
The part will be made as a one-off by sand casting, to evaluate the design.

You have been given CAD drawings and a CAD model of the part.
The overall length of the part is 200 mm and it is made from an aluminum alloy.

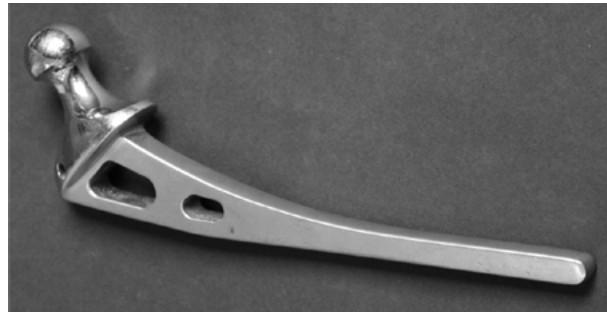


Fig. 5

- (a) To make a pattern for the mould that will be used for casting, you have decided to 3D print the part shown in **Fig. 5**.

Describe how a part is made from a CAD model using the 3D printing process.

.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on
01223 553998

Alternatively, you can email us on
support@ocr.org.uk

For more information visit

 **ocr.org.uk/qualifications/resource-finder**

 **ocr.org.uk**

 **/ocrexams**

 **/ocrexams**

 **/company/ocr**

 **/ocrexams**



OCR is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored. © OCR 2022 Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered office The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA. Registered company number 3484466. OCR is an exempt charity.

OCR operates academic and vocational qualifications regulated by Ofqual, Qualifications Wales and CCEA as listed in their qualifications registers including A Levels, GCSEs, Cambridge Technicals and Cambridge Nationals.

Though we make every effort to check our resources, there may be contradictions between published support and the specification, so it is important that you always use information in the latest specification. We indicate any specification changes within the document itself, change the version number and provide a summary of the changes. If you do notice a discrepancy between the specification and a resource, please [contact us](#). You can copy and distribute this resource freely if you keep the OCR logo and this small print intact and you acknowledge OCR as the originator of the resource.

OCR acknowledges the use of the following content: N/A

Whether you already offer OCR qualifications, are new to OCR or are thinking about switching, you can request more information using our [Expression of Interest form](#).

Please [get in touch](#) if you want to discuss the accessibility of resources we offer to support you in delivering our qualifications.

We really value your feedback

Click to send us an autogenerated email about this resource. Add comments if you want to. Let us know how we can improve this resource or what else you need. Your email address will not be used or shared for any marketing purposes.



Please note – web links are correct at date of publication but other websites may change over time. If you have any problems with a link you may want to navigate to that organisation's website for a direct search.