OCR
Oxford Cambridge and RSA

Sample Assessment Material (SAM)

…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.

SAMPLE

Section A

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]

SAMPLE

© OCR 2021

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]

SAMPLE

© OCR 2021
Version 2 July 2021

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**?

Ø

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]

SAMPLE

© OCR 2021

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]

SAMPLE

© OCR 2021
Version 2 July 2021

Section B

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

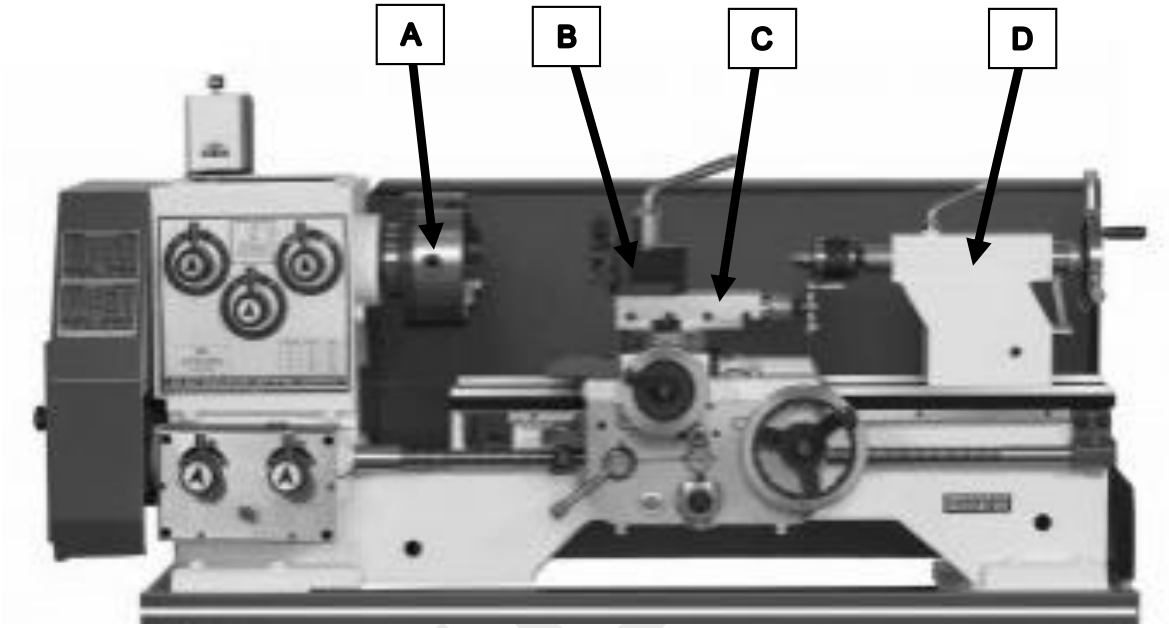


Fig.3

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

A .....

B .....

C .....

D .....

[4]

SAMPLE

© OCR 2021
Version 2 July 2021

(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.

.....

.....

.....

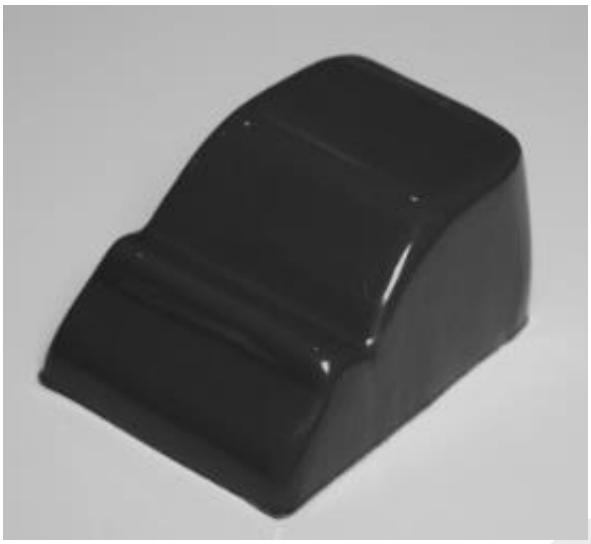
.....**[2]**

SAMPLE

© OCR 2021
Version 2 July 2021

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]

SAMPLE

© OCR 2021
Version 2 July 2021

(c) Describe how the casing would be made using the vacuum forming process.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....**[6]**

SAMPLE

© OCR 2021
Version 2 July 2021

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]**

SAMPLE

© OCR 2021

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.

(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]**

© OCR 2021
Version 2 July 2021

SAMPLE

(d) Identify and explain **one** potential disadvantage of JIT.

.....

.....

.....

.....**[2]**

15 A large engineering company sells products all over the world.
They currently have factories in six countries.
Each country manufactures the complete finished product.
They have decided to move all production to a single new factory based in China.

(a) Identify and explain **three** implications of this decision.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

3 .....

.....

.....

.....

[6]

SAMPLE

© OCR 2021
Version 2 July 2021

(b) Explain **two** reasons why the company would implement a quality system in the new factory.

.....

.....

.....

.....

.....

.....

.....

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

SAMPLE

© OCR 2021
Version 2 July 2021

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]**

SAMPLE

© OCR 2021
Version 2 July 2021

(b) If the design is successful, the company is considering making the parts using either casting or machining.

Discuss the advantages and disadvantages of using casting to make the component, compared to machining.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....**[6]**

END OF QUESTION PAPER

SAMPLE

© OCR 2021

SAMPLE

Copyright Information:

OCR is committed to seeking permission to reproduce all third-party content that it uses in the assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA.

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

© OCR 2021
Version 2 July 2021