

INCLUDED ON THE  
KS4 PERFORMANCE TABLES

*Candidate Style Answers*

OCR Level 1/Level 2

Cambridge National in  
**Engineering Manufacture**

**J823**

For first teaching in 2022 | Version 1

**Unit R014 Principles of engineering manufacture**

[ocr.org.uk/cambridgenationals](https://ocr.org.uk/cambridgenationals)

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## About this resource

We have produced this resource using the [sample question paper and mark scheme](#) Cambridge National in Engineering Manufacture J823.

The aim of the resource is to show you how marks or levels could be given and why. Our senior assessors have provided possible candidate responses and then applied the sample mark scheme, adding commentary.

**Please note this resource does not constitute an indication of grade boundaries or endorsed answers.** In a live series the mark a response gets depends on the process of standardisation, which considers the big picture of the year's scripts. The levels or marks we show in our resource is an estimation of what could be awarded. How levels and marks correspond to grade boundaries is then determined during the Awarding process. This process happens after the marking of scripts and depends on a number of factors including candidate performance across the board.

You can read more about this process in our [guide](#).

## Question 1

1 What type of process is drilling?

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

[1]

## Exemplar 1

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

[1]

1 mark

Retrieval of information is a key skill that candidates need to perform well in exams and especially so with multiple choice questions.

There is a wealth of evidence-based research as well as practical guidance available to help you to help your students improve and practise their retrieval of information.

## Question 2

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]

## Exemplar 1

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

[1]

1 mark

Mistakes that candidates can make when completing multiple choice questions include ticking more than one box, sometimes simply because they have changed an answer but not clearly removed or obscured the first tick.

### Question 3

3 Which of these is a shaping process?

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

[1]

### Exemplar 1

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

[1]

1 mark

Candidates sometimes confuse forging, a forming process, as a shaping process.

Forming processes require a force to be applied. Shaping processes typically require a mould and change of material state achieved either by cooling or curing.

## Question 4

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]

## Exemplar 1

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

[1]

1 mark

The strongest joint will be produced by welding compared to the other joining methods.

## Question 5

5 Which is a ferrous metal?

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

[1]

## Exemplar 1

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

[1]

1 mark

The only ferrous metal in this list is stainless steel.



## Question 6

6 What type of material is tungsten carbide?

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

[1]

## Exemplar 1

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

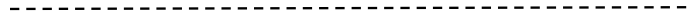
1 mark

[1]

Candidates sometimes believe tungsten carbide is a composite, not a ceramic.

## Question 7

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]

## Exemplar 1

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

[1]

1 mark

The line type shown is used for hidden detail.  
Candidates need to learn and recall the different line types used on engineering drawings.

## Question 8

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]

## Exemplar 1

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

[1]

1 mark

The symbol is used to communicate a diameter (usually along with its associated dimension in millimetres).

Candidates need to learn and recall the symbols used on engineering drawings.

## Question 9

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]

## Exemplar 1

- (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]

1 mark

Candidates need to be able to recall a definition for quality assurance (QA). A common error for this type of question could be mixing up quality assurance (QA) with quality control (QC).

## Question 10

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]

## Exemplar 1

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

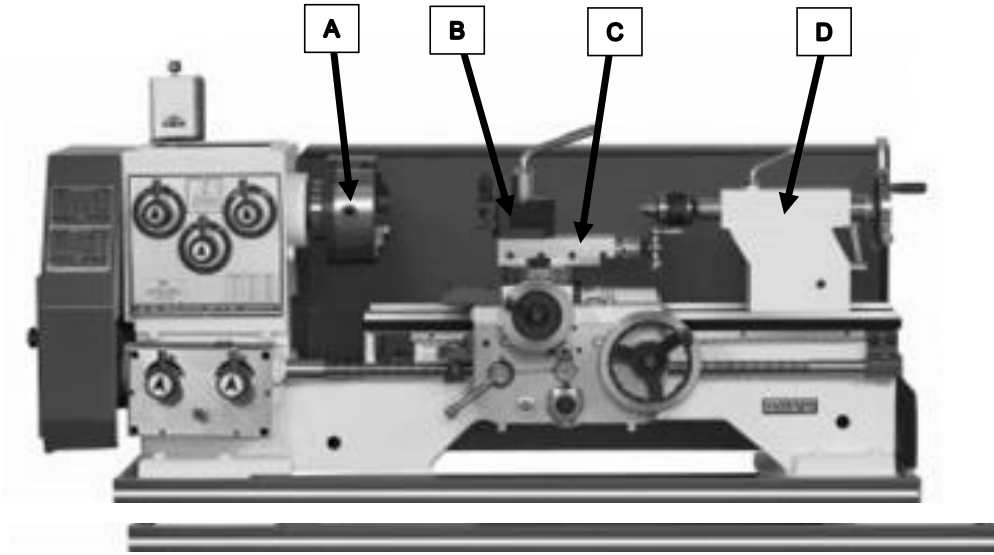
1 mark

[1]

Candidates need to be able to recall the acronyms associated with common engineering terms such as MRP = Material Requirements Planning, SMA – Shape Memory Alloy, JIT = Just In Time, etc.

## Question 11 (a)

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]

*Exemplars continued on the next page*

**Exemplar 1****4 marks**

- A *Chuck* .....
- B *Tool post* .....
- C *Compound rest* .....
- D *Tailstock* .....

**[4]**

This response would gain full marks. Where there are correct alternative names for the parts of the machine these will also be accepted. For example, spindle is another acceptable answer for A and top slide or compound slide for C.

**Exemplar 2****2 marks**

- A *Spindle* .....
- B *Tool post* .....
- C *Tailstock* .....
- D *Top slide* .....

**[4]**

In this 2 mark response the candidate has correctly identified A and B but the correct answers for C and D have been written the wrong way round, so didn't gain any marks.

You can help students to avoid this error by encouraging them to use any available time at the end of the exam to carefully check their answers.

## Question 11 (b)

- (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]

*Exemplars continued on the next page*



## Exemplar 1

4 marks

Safety Precaution 1..... <i>Wear safety goggles.</i> ..... .....	Reason..... <i>To protect eyes from flying debris.</i> ..... .....
Safety Precaution 2..... <i>Use the machine guard.</i> ..... .....	Reason..... <i>To protect against getting entangled in the rotating parts.</i> ..... .....

[4]

Typically, candidates with experience of using a variety of workshop machines will do well with this kind of question by drawing on their practical experiences.

This response gains 4 marks because two different safety precautions are given and for each precaution a corresponding reason for the precaution.

There are a wide range of other acceptable answers including:

- remove the chuck key (1) so this is not thrown out of the lathe when the machine is turned on (1).
- wear safety shoes (1) to protect toes from any dropped parts (1).
- wear an apron (1) to prevent clothes being damaged by sharp edges of swarf (1).

Credit would also be given for other appropriate valid responses. However, credit would not be given if the reason did not match the precaution, or the same reason was given for two different precautions.

Credit would not be given for wearing of gloves as a safety precaution as this is an entanglement hazard on this kind of machine.

Students should also be careful with the syntax of the question; similar questions may ask for precautions other than PPE. With this type of question responses referring to PPE would not gain credit.

**Exemplar 2****2 marks**

Safety Precaution 1..... <i>Wear safety goggles</i> ..... .....	Reason..... <i>To protect against getting</i> <i>entangled in the rotating parts</i> ..... .....
Safety Precaution 2..... <i>Use the machine guard</i> ..... .....	Reason..... <i>To protect eyes from flying</i> <i>debris</i> ..... .....

**[4]**

This response gains 2 marks because although the same precautions and reasons are given as the 4 mark response, the reasons do not match the precautions.

Typically, candidates would also not gain full marks if they:

- gave reasons without giving a precaution
- repeated or gave too similar precautions (e.g. safety glasses and safety goggles)
- gave gloves or other similar entrapment hazard as a precaution.

### Question 11 (c)

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

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

### Exemplar 1

2 marks

*Alloys are made of two different metals. The atoms of one of the metals stops the atoms of the other metals from sliding over each other, this can make the metal stronger.*  
..... [2]

### Exemplar 2

1 mark

*In an alloy the planes of atoms do not slip over each other.*  
..... [2]

This response would achieve the 2 marks available because an explanation with appropriate expansion has been given.

Note that the first sentence - while correct and which undoubtedly helps formulate the response - does not itself gain a mark because it describes an alloy rather than explaining why an alloy might be better to use than a pure metal.

The exact definitions of the command words are given in Appendix B of the specification and students would benefit from being taught the exact meaning of these command words.

Credit would also have been given for:

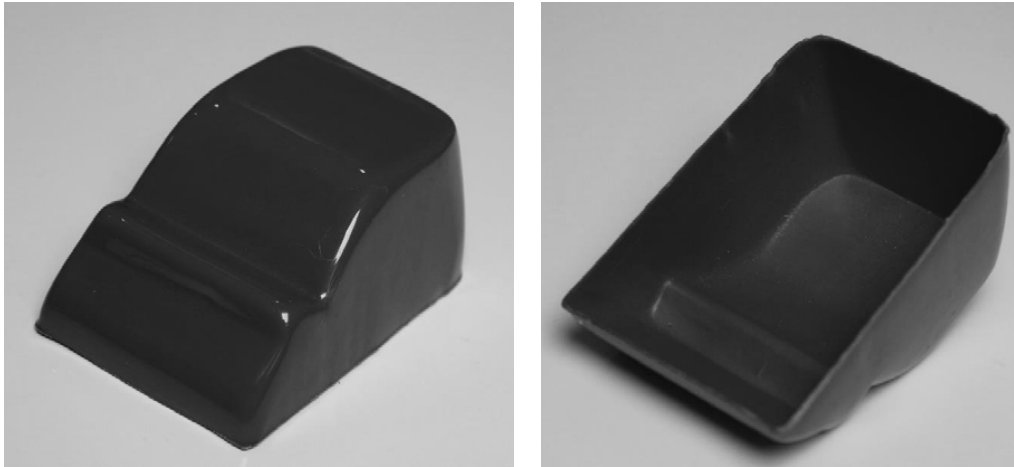
- referring to alloying changing the microstructure of the metal
- use of alternative vocabulary such as the alloying atoms 'planes' of atoms
- other appropriate valid responses.

In general, a single point will not get both marks for a 2 mark question as highlighted in the response opposite.

Adding an explanation of why the planes don't slip, or the effect that reducing slippage of the planes has on the mechanical properties would have gained the second mark.

### Question 12 (a)

- 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]

*Exemplars continued on the next page*

### Exemplar 1

2 marks

*Thermoplastic polymers can be reshaped because they are not cross linked;*  
*thermosetting polymers are cross linked.*  
 .....  
 ..... [2]

### Exemplar 2

1 mark

*Thermoplastic polymers can be reshaped but thermosetting polymers cannot.*  
 .....  
 ..... [2]

This 2 mark response gives a difference between thermoplastics and thermosetting plastics (can/cannot be reshaped) and correctly explains this difference for the second mark (can/cannot be cross linked).

There were a range of other differences between the two polymers that would have gained credit including:

- thermoplastic polymers soften when heated/ thermosetting polymers char when heated
- thermoplastic polymers can be recycled/ thermosetting polymers cannot be recycled.

Credit would also be given for other correct appropriate differences between the two types of polymers - although all of these are related to the same explanation.

This response correctly describes a difference between thermoplastic and thermosetting polymers and so gains 1 mark. It does not get the second mark because this difference has not been explained.

This response again highlights the benefit of teaching students the meaning and use of command words, which are listed and defined in Appendix B of the specification. You could use various strategies to better equip students for using command words including presenting past or sample paper questions/responses but asking what the question rather than the answer would look like. This could be taken further by taking a past/sample paper question and asking the question repeatedly but with the command word changed (e.g. name, give, state, describe, explain) while keeping the stem the same as far as possible.

### Question 12 (b)

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

1 .....

2 .....

[2]

### Exemplar 1

2 marks

1 ABS .....

2 HIPS .....

[2]

### Exemplar 2

1 mark

1 ABS .....

2 ABS .....

[2]

Each of the two correct responses were given credit as were a range of other correct responses:

- PMMA/acrylic
- polycarbonate

or any other correct response or the names of these plastics written in full.

When writing names of polymers in full, if a candidate makes a minor spelling mistake but it is clear what they are trying to write, they would still gain credit. They would not gain credit, however, if they make a mistake in an abbreviation e.g. APS instead of ABS.

This is a 1 mark response as the candidate has simply repeated their answer.



**Exemplar 1****6 marks**

*A mould of the required shape is made. The polymer sheet is clamped to the vacuum former and heated until it becomes flexible. The mould is raised and air is sucked out from underneath the mould. The mould is allowed to cool and the formed casing removed from the mould.*

**[6]**

The candidate has made six clear points that can be picked out from the technical process being described.

As shown in the mark scheme extract below, there are often more valid marking points for this type of question than there are marks available. This highlights the importance of teaching students to write at least several sentences that match the marks available to increase their chances of gaining higher marks.

However, it is also important to note that with this type of extended response question, where marks are given for describing steps of a process, not all steps must be included but the ones that are must be in an appropriate sequence.

Extract from the mark scheme:

Any **six** from:

- a mould is made
- the polymer sheet is clamped to the vacuum former
- the polymer sheet is heated until flexible
- the mould/platen is raised
- the vacuum is turned on/the air is sucked out from underneath the mould
- air pressure pushes the polymer against the mould
- the mould is allowed to cool/removed from the polymer sheet
- the excess material is cut away from the casing







### Question 13 (a)

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

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

#### Exemplar 1

2 marks

*A material that has a property that reacts to changes in its environment and can change back again.*  
.....  
..... [2]

#### Exemplar 2

1 mark

*A material that has a property that reacts to changes in its environment.*  
.....  
..... [2]

This response gains 2 marks as the student has clearly explained two relevant points.

The response gains just 1 mark because only half of the definition is given.

Another example of how candidates could lose marks for this type of response is by not reading the question fully and either naming a smart material or giving a use of a smart material.

### Question 13 (b)

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

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

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

### Exemplar 1

4 marks

Quantum Tunneling Composite (QTC).....  
*QTC can be used in keypads. When pressure is applied to the key, electricity is allowed to flow through the QTC, completing the circuit.*  
..... [2]

Thermochromic pigment .....  
*Thermochromic pigment can be used to make flexible thermometers, which could be stuck to the casing of a machine to indicate if it is overheating.*  
..... [2]

The first mark is given for identifying one use for each of the smart materials and the second mark for explaining that use – so the response would gain 4 marks in total.

## Exemplar 2

2 marks

Quantum Tunneling Composite (QTC).....

*QTC can be used in keypads, pressure sensors and smart clothing.*

.....

..... [2]

Thermochromic pigment .....

*Thermochromic pigment can be used for flexible thermometers, security printing and food packaging.*

..... [2]

Although this response gives four valid uses for QTC and three for thermochromic pigments, only 2 marks are given. These are for identifying uses of both materials.

The explanation marks for both materials are not given because their uses are not explained.



## Exemplar 2

2 marks

*A mould is made in the required shape. The carbon fibre is laid out in the mould  
and allowed to cure. A polymer matrix material is then painted onto the fibre.*

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

In this response, only 2 marks are given, even though the same process steps are given as the 4 mark example above.

The reason for this is the curing step has been included before the impregnation step, and so the steps are out of order.

It is important that if candidates change or add to their answer, they are clear about the order of the steps. Numbering the steps may be a useful way of achieving this.

### Question 14 (a)

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]

### Exemplar 1

2 marks

1 *Injection moulding machines.* .....

2 *Pressure die casting machines.* .....

[2]

### Exemplar 2

1 mark

1 *Laser cutters.* .....

2 *CAM lathes.* .....

[2]

There are a wide range of CAM machines that would have gained credit here, including:

- CAM milling machines/routers
- laser cutters
- presses
- injection moulding machines
- pressure die casting machines
- 3D printers
- robotic welders
- robotic paint sprayers.

Any other valid appropriate response would have gained credit.

Here just 1 mark is given because although the second response is a CAM machine it is the machine given in the stem of the question.

Common other reasons for losing marks in this type of question would be repeating a response or not providing enough responses.





## Exemplar 2

2 marks

1 *The factory would make more products.*

.....

.....

.....

2 *There would be less variation between the products. The machines can be*

*automated.*

.....

.....

[4]

This response gains two of the marks for identifying two reasons. There are no explanations provided to gain the other 2 marks.

### Question 14 (c)

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

.....

.....

.....

..... [2]

#### Exemplar 1

2 marks

*The amount of product or raw materials that need to be stored is reduced so*

*warehousing costs are reduced.*

.....

..... [2]

#### Exemplar 1

1 mark

*Quality defects can be detected quicker.*

.....

.....

..... [2]

As shown in the mark scheme, a reason and corresponding explanation must be given to gain both marks.

Other creditworthy responses include:

- reduced inventory meaning that less money is tied up in inventory
- quality defects can be detected quicker due to less work in progress.

This response gains 2 marks because a reason and explanation of that reason are given. It doesn't matter that the words don't exactly match the mark scheme.

In addition to the reasons and explanations in the mark scheme, credit would also be given for other valid responses.

Here only 1 mark is given because one way is given without a corresponding explanation.

To get the explanation mark, the explanation must correspond to the reason as an explanation on its own will gain no marks.

### Question 14 (d)

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

.....

.....

.....

..... [2]

### Exemplar 1

2 marks

*If raw materials are not delivered because there are not enough lorry drivers the factory won't be able to continue making products.*

.....

..... [2]

The response given gains both marks. As earlier, it doesn't matter that the words don't exactly match the mark scheme.

A maximum of 1 mark would be given just for stating a disadvantage; the additional mark must be for a valid explanation.

Credit would also be given for any other valid reason and explanation.

### Exemplar 2

2 marks

*If raw materials are not delivered because there are not enough lorry drivers there will not be enough starting materials.*

.....

..... [2]

A similar looking response to the 2 mark answer but this only gains 1 mark. The mark is given for the reason but where the candidate has tried to write an explanation, they have simply reworded their reason.

### Question 15 (a)

**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]**

*Exemplars continued on the next page*

### Exemplar 1

### Level 3

- 1 *Product costs are lower because employees are paid less.*  
.....  
.....  
.....
- 2 *Increased employment opportunities in the area of the new plant which may bring economic prosperity to that area.*  
.....  
.....  
.....
- 3 *Workers in other countries may need training to be able to manufacture products to the standards required in other countries.*  
.....  
.....  
.....

[6]

This is a high level response as three implications are given and each one is correctly explained.

There are a range of other implications and associated explanations that would also gain credit including:

- requirement for transportation to market which would have an effect on the environment
- reduced employment opportunities at existing sites which may damage the company's reputation
- increased employment opportunities in the area of the new plant which may bring economic prosperity to that area
- new workers may require training to be able to achieve the international standards required by other countries.

A maximum of 3 marks could be gained for just stating implications without expansion.

## Exemplar 2

## Level 2

- 1 *Product costs are lower and there will be increased employment opportunities in the area of the new plant.*
- 2 *Workers in other countries may need training and there will be reduced employment opportunities at existing sites.*
- 3 *Possible differences in employment conditions and local environmental legislation.*

[6]

This response clearly shows the need for candidates to be able to deconstruct the question and identify all of the command words present. In the example given candidates need to:

**Identify** three implications and  
**Explain** the three implications

While there is plenty of response here and six points from the mark scheme are given, all the response identifies is implications - there is no explanation of the implications. This would be needed to gain more than 3 marks.

### Exemplar 3

### Level 1

1 *Possible differences in employment conditions may damage the company's reputation.*

2 *Employees may have to work longer hours in more dangerous conditions.*

3

[6]

This 2 mark response only identifies and explains one implication. The response then continues with two common mistakes:

- in response number 2, the candidate gives an implication but just uses alternate wording to their first implication and so does not gain credit
- no response for number 3 so it can't gain any credit.



### Question 15 (b)

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

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

### Exemplar 1

4 marks

*To identify problems in production early so production can be stopped to reduce waste and scrap.*  
.....  
*So the product is manufactured to the correct tolerances reducing the number of products returned by customers.*  
.....  
.....  
..... [4]

This response gained all 4 marks. There are several other reasons and associated explanations that would get the marks:

- early intercept of problems in production reducing waste and scrap, which keeps costs down
- to achieve consistency of finished products, giving predictable product performance
- to conform to industry standards/regulations, reducing issues at customer and returns.

Other valid correct reasons would also be given credit.

A maximum of 2 marks are available for reasons and the other 2 marks for explanation of those reasons.

## Exemplar 2

2 marks

*Identify problems in production early.*  
.....  
*To achieve consistency of finished products.*  
.....  
*To conform to industry standards/regulations.*  
.....  
.....  
.....  
.....  
.....  
.....  
..... [4]

The 2 mark response highlights how giving more than two reasons but no explanation limits the marks achievable.

### Question 16 (a)

- 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]**

*Exemplars continued on the next page*

**Exemplar 1****4 marks**

Software divides the CAD model into a series of layers. The printing head  
deposits a layer onto the base plate. More and more layers are added until the  
shape is completed.

[4]

**Exemplar 2****2 marks**

Lots of layers are built up. Until the finished shape is made.

[4]

This response gained 4 marks as multiple descriptive points have been made. There are however a considerable number of points that would gain credit as shown below:

- software divides the CAD model into a series of layers
- which are exported to the 3D printer
- printing head deposits the first layer
- the printing head raises one layer and deposits the second layer
- this process is repeated until the shape is completed
- the product is removed from the base plate
- the product may be finished using abrasive paper to improve the surface quality.

Credit would also be given for any other appropriate response/additional detail, such as naming materials that can be used for this process, for example PLA.

It is however important to note that, as with previous questions of this type, candidates must write their steps in a logical sequence for full marks to be given.

This is clearly a 2 mark response because only two of the marking points are included.

For this 4 mark question, there are seven points for which credit could be given; it could be useful to encourage candidates, when they are completely unsure of an answer, to try and fill the answer space with sensible sentences to try and suggest creditworthy points. However as mentioned earlier, their sentences must be in a logical order.



## Exemplar 1

## Level 3

With casting the final shape is made in a single operation so it will take much less time compared with machining, even though some extra finishing, such as grinding or removing burrs, may be needed when the shape is taken out of the mould. This will make using casting to make the component much quicker and cheaper than machining.

Casting will require less skilled workers to operate machines - this will also make the process much cheaper. Machining could be done using CNC machines which would reduce the number of skilled workers but the initial capital cost of the machines will be very high.

Casting is a shaping process whereas machining is a wasting process. This means that there will be less material wasted. There will also be less swarf which could be a safety hazard and will need to be removed and disposed of.

A disadvantage of casting is the cost of manufacturing the mould and risk of casting defects such as porosity.

[6]

The mark scheme provides a description of what is required to gain marks at each level.

For **Level 3 (5-6 marks)**:

A **thorough** discussion including a **range** of advantages **and** disadvantages of casting compared to machining, showing **detailed** understanding of all the points stated. **Consistently** uses appropriate terminology.

Up to 6 marks for a discussion or detailed explanation of the advantages and disadvantages of casting compared to machining.

The command words for NEA in Appendix B of the specification are useful for defining the meaning of these command words in the context of this external assessment.

The additional guidance column of the mark scheme gives a wide range of indicative content for which credit may be given. For example responses may include reference to:

- shape made in single operation
- reduction in machining time, although dressing/finishing may still be needed
- reduced overall cost of making part
- less waste of material/less swarf for disposal
- less skilled workers needed to operate machines
- cost of mould manufacture
- risk of casting defects, such as porosity.

This list is not exhaustive however and credit would be given for other valid points.

The response given here clearly is Level 3. It discusses both the advantages **and** disadvantages of casting and machining but also provides detailed discussion of the points raised and there is consistent use of appropriate terminology such as: named processes (in addition to those given in the stem of the question), the cost effectiveness of the processes and the labour requirements.

## Exemplar 2

## Level 2

With casting the final shape is made in a single operation so it will take much less time compared with machining. This will make using casting much cheaper than machining to make the component.

Casting will require less skilled workers to operate machines this will also make the process much cheaper.

Casting will produce less waste and swarf.

A disadvantage of casting is the cost of manufacturing the mould.

[6]

This response would achieve Level 2:

### Level 2 (3–4 marks)

An **adequate** discussion including some advantages **and** disadvantages of casting compared to machining, showing understanding of **some** of the points stated.

**Some** use of appropriate terminology

There is adequate discussion, i.e. there is an appropriate number of relevant facts or concepts (most of the points in the indicative content are included) but the response does not include full detail, contextualisation or examples (which can be clearly evidenced as missing by comparison with the 6 mark response).





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