OCR
Oxford Cambridge and RSA

Cambridge **NATIONALS LEVEL 1/2**

Cambridge NATIONALS

ENGINEERING MANUFACTURE

Combined feedback on the June 2017 exam paper (including selected exemplar candidate answers and commentary)

Unit R109 – Engineering materials, processes and production

Version 1

ocr.org.uk/engineering

CONTENTS

INTRODUCTION

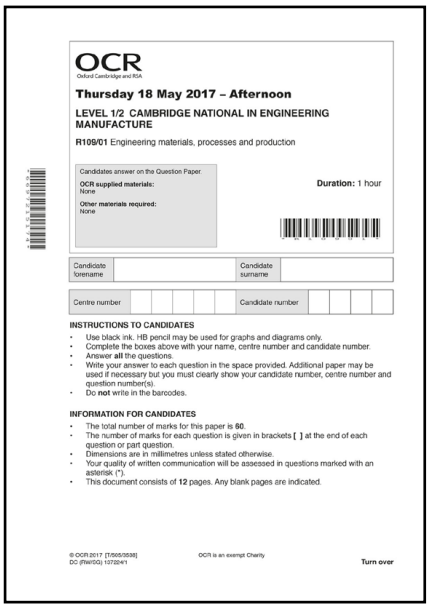
This resource brings together the questions from the June 2017 examined unit (Unit R105), the marking guidance, the examiners comments and the exemplar answers into one place for easy reference.

We have also included exemplar candidate answers with commentary for Questions 1b, 2c, 4a, 6a.

The marking guidance and the examiner's comments are taken from the Report to Centre for this question paper.

The Question Paper, Mark Scheme and the Report to Centre are available from:

https://interchange.ocr.org.uk/Modules/PastPapers/Pages/PastPapers.aspx?menuindex=97&menuid=250



OCR
Oxford Cambridge and RSA

Thursday 18 May 2017 – Afternoon

LEVEL 1/2 CAMBRIDGE NATIONAL IN ENGINEERING MANUFACTURE

R109/01 Engineering materials, processes and production

Candidates answer on the Question Paper.
OCR supplied materials: None
Other materials required: None

Duration: 1 hour

Candidate forename | Candidate surname
Centre number | Candidate number

INSTRUCTIONS TO CANDIDATES
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES
- The total number of marks for this paper is **90**.
- The number of marks for each question is given in brackets **[ ]** at the end of each question or part question.
- Dimensions are in millimetres unless stated otherwise.
- Your quality of written communication will be assessed in questions marked with an asterisk (*).
- This document consists of **12** pages. Any blank pages are indicated.

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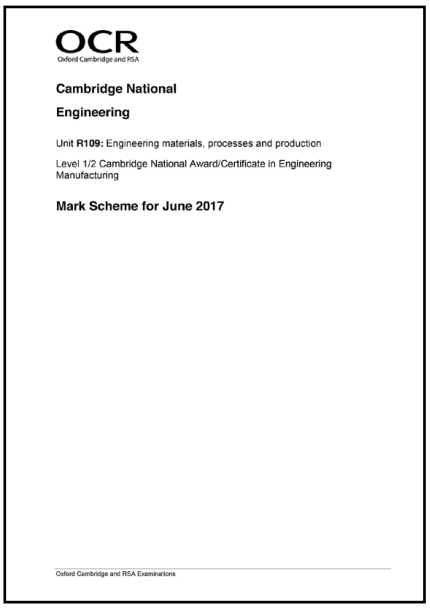
Turn over



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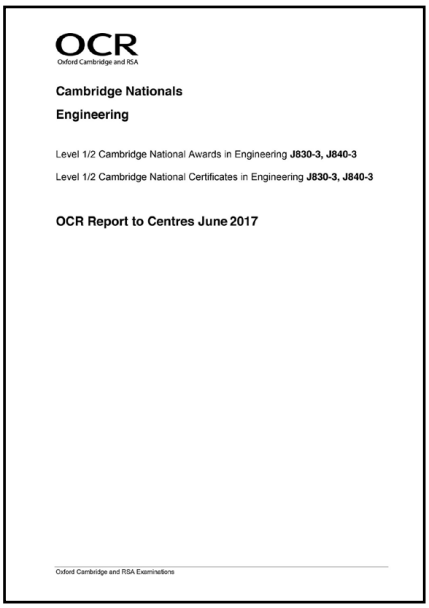
Cambridge National
Engineering

Unit **R109:** Engineering materials, processes and production

Level 1/2 Cambridge National Award/Certificate in Engineering Manufacturing

Mark Scheme for June 2017

Oxford Cambridge and RSA Examinations



OCR
Oxford Cambridge and RSA

Cambridge Nationals
Engineering

Level 1/2 Cambridge National Awards in Engineering **J830-3, J840-3**

Level 1/2 Cambridge National Certificates in Engineering **J830-3, J840-3**

OCR Report to Centres June 2017

Oxford Cambridge and RSA Examinations

GENERAL EXAMINER COMMENTS ON THE PAPER

Most candidates attempted all of the questions on the paper but, in a number of cases, knowledge of some sections of the specification appeared to be quite limited. This was made apparent by an increase in the number of questions to which no response was given.

Responses to questions relating to basic engineering materials and processes were disappointing in the main. Knowledge of digital technologies shows some improvement, but understanding of their application was varied across this cohort of candidates. Specific examples and details of these points are given later in this report.

In a number of cases it was apparent that candidates had not read questions carefully enough before giving their answers, resulting in a loss of marks. In questions where candidates are asked to describe or explain processes or procedures, it should be noted that justified responses need to be presented in order to gain the higher marks available. One-word or overly simplistic answers are not suitable responses to this type of question.

Resources which might help address the examiner comments:

From the link below, you'll find 'The OCR guide to examinations' (along with many other skills guides)
http://www.ocr.org.uk/i-want-to/skills-guides/

Question 1

Answer **all** the questions.

1 A list of engineering materials is given below.

ABS	**Cast iron**	**Polyester resin**
Brass	**GRP**	**Stainless steel**
Bronze	**High Speed Steel**	**Urea-formaldehyde**
Carbon fibre	**HIPS**	**Zinc**

(a) Complete the following statements by adding materials from the list.

(i) Cast iron; high speed steel; stainless steel ..... are ferrous metals. **[2]**

(ii) Carbon fibre; GRP ..... are composite materials. **[2]**

(iii) Polyester resin; urea-formaldehyde ..... is a thermosetting plastic. **[1]**

(iv) Brass; bronze ..... are non-ferrous alloys. **[2]**

(b) Give **three** reasons why a thermoplastic material might be used for a product rather than a metal.

1 .....

2 .....

3 .....

.....

[3]

One mark for each of three valid reasons. Examples:
Thermoplastics are:
- generally easier to form into complex shapes/manufacture
- available in a wide range of colours
- generally more suited to mass production methods self-finishing/don't need surface finishing
- corrosion resistant electrically insulating

Mark Scheme Guidance

Question 1(a):

All materials must be from the list provided.

Question 1(b):

Accept other viable responses.

Three simplistic correct responses 2 marks.

Two simplistic correct responses 1 mark.

NOT easier to recycle/remould/reheat.

Examiner comments

Question 1(a)(i) – Most candidates scored well on this question, but a number showed some confusion and appeared to choose examples from the list at random, and marks from zero to full marks were awarded.

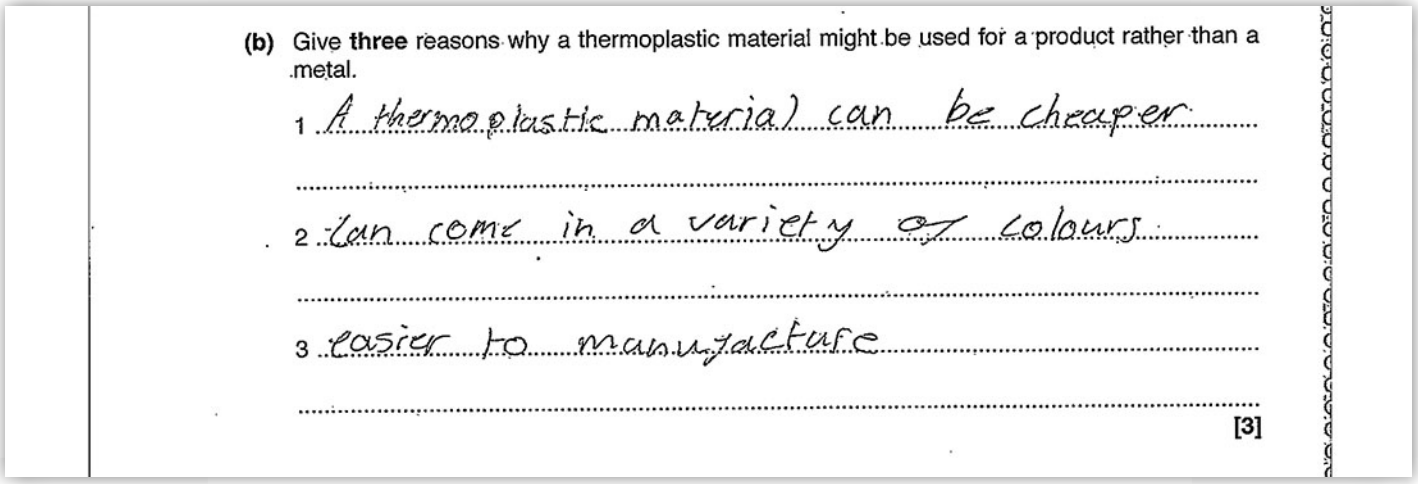
Question 1(a)(ii) – This question was less well answered and most candidates scored only one of the two marks available. Carbon fibre was the most frequently seen correct answer, with GRP a close second, but High Speed Steel and Urea-formaldehyde also appeared in a significant number of cases.

Question 1(a)(iii) – Most candidates correctly gave Urea-formaldehyde or Polyester resin as a thermosetting plastic, but a number seemed to think that any of the plastics materials in the list were appropriate answers, with ABS and HIPS being quite commonly seen.

Question 1(a)(iv) – This question was quite well answered and only a small number of candidates failed to score marks on it. Where incorrect responses were given, it seemed that they had been selected by guesswork, as composites, plastics and also ferrous metals were all seen on a number of occasions.

Question 1(b) – Responses to this question were disappointing and a significant number of candidates failed to score any marks at all. In most cases features of thermoplastic materials were simply stated, with no reference to reasons for using them instead of metals. One-word responses were very common, and the weaker candidates merely suggested that thermoplastics were 'cheap' and 'recyclable'.

Exemplar candidate work
Question 1(b) – Low level answer



(b) Give **three** reasons why a thermoplastic material might be used for a product rather than a metal.

1 A thermoplastic material can be cheaper

2 can come in a variety of colours

3 easier to manufacture

[3]

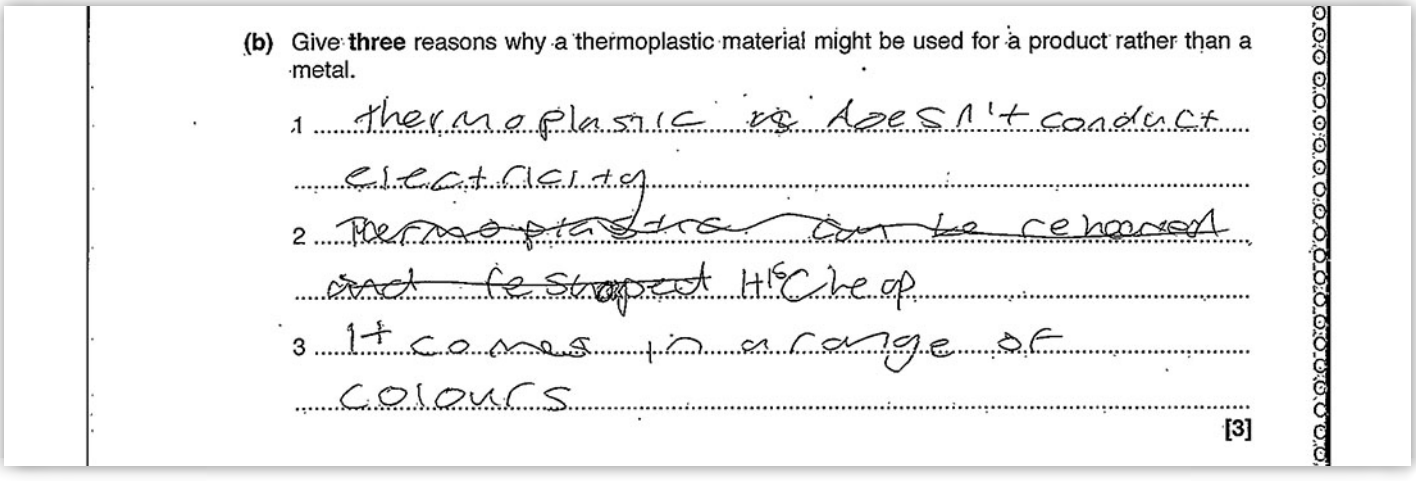
Commentary

This question requires candidates to make comparisons between thermoplastic materials and metals. In most cases, a direct comparison is required and one-word or overly simplistic answers are not acceptable responses. The provision of two lines for each response is an indication that a certain amount of detail is required.

Although two of the responses contained in this low level answer are too vague to qualify for marks, in some cases comparison may be implicit in the wording of a response rather than being specifically stated. An example of this is the reference this candidate has made to the availability of plastics in a variety of colours.

This answer could be made into a medium level answer by justifying one of the other responses. Response three, for example, could be improved by adding reference to the ease of producing complex shapes when the material is softened by heat for moulding.

Question 1(b) – High level answer



(b) Give **three** reasons why a thermoplastic material might be used for a product rather than a metal.

1 thermoplastic ~~is~~ doesn't conduct electricity

2 ~~Thermoplastics can be removed and restored~~ it's cheap

3 It comes in a range of colours

[3]

Commentary

In this case, comparisons between thermoplastic materials and metals are implicit in two of the responses and these are completely acceptable. The statement that 'it is cheap' in response 2, however, is far too simplistic to be credited.

This answer could be made into a full mark high level answer by justifying the reference to the cost of the material. An example of this would be to mention the fact that thermoplastics can be cheaper than some expensive metals such as stainless steels or copper alloys.

Question 2

2 (a) (i) Give **two** properties of copper that make it particularly suitable for the wires in electric cables.

1 Ductile
Conductive
2 Malleable/flexible/easy to bend
Corrosion resistance
Non magnetic
[2]

(ii) Explain why copper is not used in overhead power transmission cables.

Up to three marks for a reasoned explanation.
Examples:
- Copper is quite a heavy metal (1) and this would make the cables sag between the pylons (1) so they may touch the ground and be dangerous (1).
- The cables would sag(1) because copper is heavy (1), so there would have to be more pylons and closer together(1).
- The power lines system would cost more (1) because copper is expensive (1) and also more pylons would need to be made (1).

[3]

(b) Engineering materials are normally supplied in solid form.
Name **two** other forms of supply for engineering materials.

1 Powder
Sheet
2 Granular
Liquid
[2]

(c) Explain, using **one** example, what is meant by the term 'non-destructive testing' (NDT).

One mark for an example, and up to two marks for a suitable explanation.
Example:
Testing where the product is not damaged (1) and can therefore be finished and sold (1), such as using X-rays to detect cracks (1)

[3]

Mark Scheme Guidance

Question 2(a)(ii):

Do not accept reference to heat.

Question 2(b):

Do not accept gas.

Question 2(c):

Justified explanation required for full marks.

Examiner comments

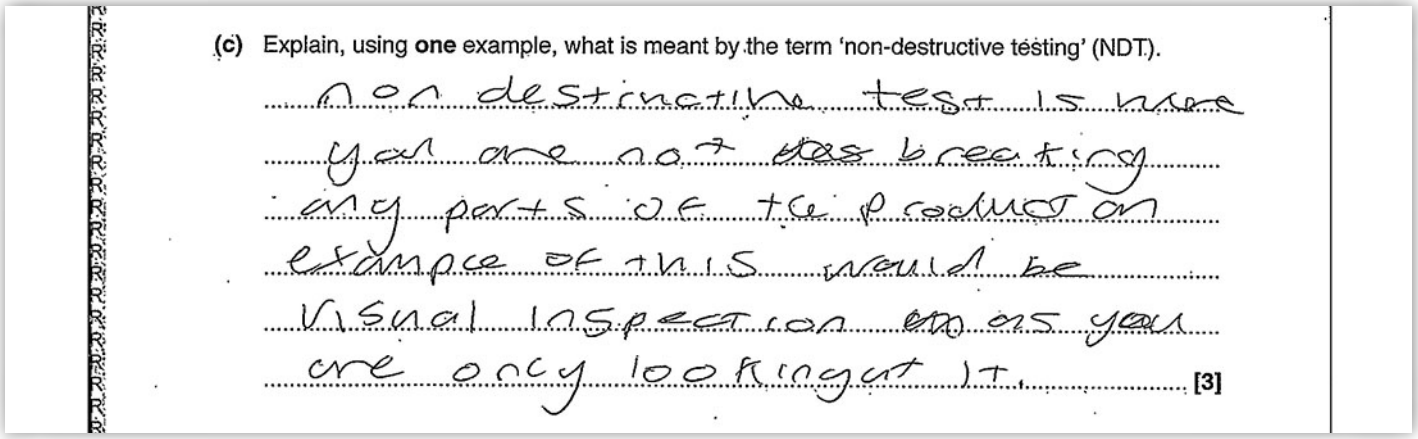
Question 2(a)(i) – The majority of candidates scored full marks on this question. Conductivity and ductility were the most frequently seen properties of copper, although malleability and corrosion resistance were equally acceptable.

Question 2(a)(ii) – This question was generally not well answered and only the more able candidates scored two marks or more on it. In many cases, candidates did not seem to fully appreciate the actual function of the overhead cables, and responses making reference to cables catching fire or being unable to carry the amount of current were seen. The only acceptable response that was given with any frequency was the fact that copper is an expensive material, but the question of weight was rarely mentioned.

Question 2(b) – Most candidates scored at least one of the two marks available for this question, with powder and sheet being the two most commonly seen forms of engineering materials. Liquid was also an acceptable response to the question, but in a number of cases candidates had suggested gas as a material form, this being taken as a consumable, not a material.

Question 2(c) – Knowledge of non-destructive testing was very mixed and a number of candidates did not offer a response to this question. Explanations were generally quite weak with some being little more than an expansion of the question content. Where more detail was given, this was usually in the form of references to X-ray testing for cracks or the use of penetrating dyes. Only a limited number of higher achieving candidates scored the full three marks for the question with a detailed and justified explanation.

Exemplar candidate work
Question 2(c) – Low level answer



(c) Explain, using **one** example, what is meant by the term 'non-destructive testing' (NDT).

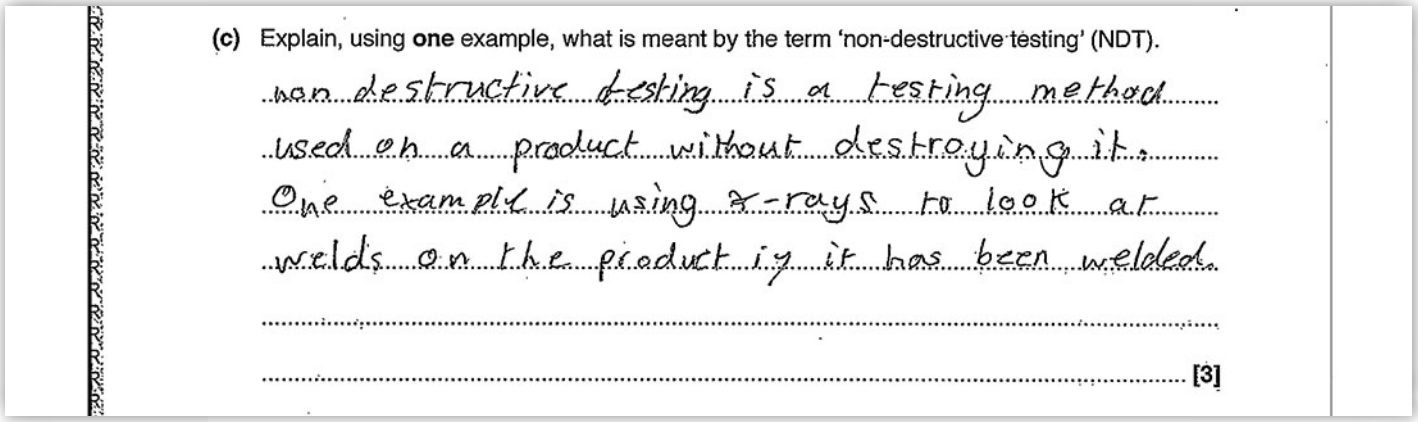
non destinative test is more you are not dos breaking any parts of the product an exampe of this would be visual inspection eg as you are only looking at it. [3]

Commentary

This low level answer clearly indicates that the candidate has little or no understanding of non-destructive testing. The first part of the response is simply an expansion of the question content, and the second part relates to visual inspection. As there is a definite distinction between inspection procedures and testing, this response does not address the focus of the question at all.

Any improvement would need to include some reference to a recognised non-destructive testing procedure, such as X-ray testing for cracks in welds or component parts.

Question 2(c) – High level answer



(c) Explain, using **one** example, what is meant by the term 'non-destructive testing' (NDT).

non destructive testing is a testing method used on a product without destroying it. One example is using x-rays to look at welds on the product if it has been welded.

[3]

Commentary

This is a high level answer as it shows understanding of the term 'non-destructive testing' and includes an example of a relevant testing procedure. The explanation does, however, lack some important detail of the application of X-ray testing.

This answer could be made into a full mark high level answer by adding reference to the examination of the material/product for internal faults, rather than the external viewing suggested in the response. This would demonstrate a clear understanding of the application of non-destructive testing.

Question 3(a)

3 Fig. 1 shows a support bracket made in two parts.
Both parts are made from 3 mm thick mild steel.

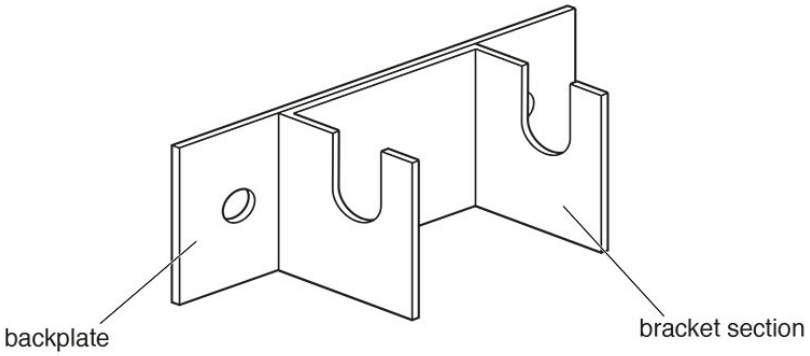


Fig. 1

(a) The bracket section is joined to the backplate by brazing.

Complete the table below by giving the stages needed to braze the two parts together.
The first and last stages have been done for you.

	Process
Stage 1	Clean the surface of both parts where the joint is going to be
Stage 2	Assemble the two parts
Stage 3	Apply flux to the area of the joint
Stage 4	Heat the joint
Stage 5	Melt brazing rod into the joint
Stage 6	Leave to cool
Stage 7	Remove scale and excess braze where necessary and clean finished piece

[5]

Question 3(b)

(b) (i) Give **two** methods of joining the bracket section to the backplate without using heat.

1 Riveting
Use of threaded fasteners
2 Cyanoacrylate/super glue
Epoxy resin adhesive
[2]

(ii) Choose **one** of the methods you have given in part **(i)** and describe how it would be used to join the bracket section to the backplate.

Method
Description

Up to three marks for a clear description of the chosen method.
Examples:

- Riveting – drill correct size holes in the two parts (1) assemble the parts with rivets in place(1) cut rivets to length and hammer to make joint (1)
- Super glue – remove any surface defects and make the joint areas perfectly clean(1) apply small amount of adhesive and avoid touching the joint (1) assemble the parts and clamp lightly (1)

[3]

Mark Scheme Guidance

Question 3(a):

Accept other *workable* solution e.g.:

Accept reference to self-fluxing rods/granular spelter.

Question 3(b)(i):

Not simply 'glue/adhesive'.

Accept high strength double-sided tape.

Question 3(b)(ii):

A clear and viable method required for full marks.

Accept reference to pop riveting.

Ecf if inappropriate method but well described e.g. 'glueing'.

NOTE: method described must not involve heat.

Examiner comments

Question 3(a) – Responses to this question were generally disappointing, with many candidates scoring one mark or less, and a significant number not attempting it. Only the higher achieving candidates referred to the use of flux in the process, and any references to heat were generally very vague. Where marks were scored by the lower achieving candidates, these were commonly as a result of basic references to assembling the joint and then allowing the finished article to cool, albeit from an unspecified temperature.

Question 3(b)(i) – Most candidates were able to give at least one example of a joining process that did not use heat, riveting and the use of nuts and bolts being quite common. Where marks were lost, this was normally due to candidates giving inappropriate responses, such as welding and soldering, or by making simplistic reference to 'glue', which needed to be more specific in this application.

Question 3(b)(ii) This question was quite well answered, with most candidates scoring two marks or more. In some cases descriptions tended to be somewhat disjointed, and stages in the process were either missed out or misplaced. Examples of this were the tapping of holes for using self-tapping screws, and the use of a rivet gun without drilling holes.

Question 4(a)

4 Fig. 2 shows a locating peg made from mild steel.

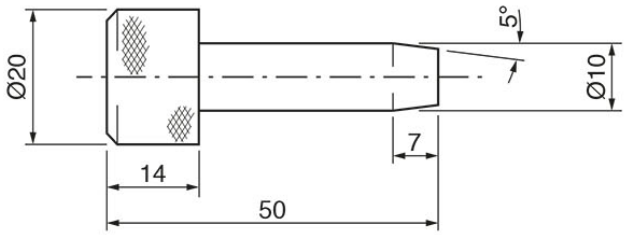
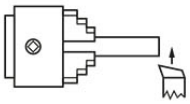
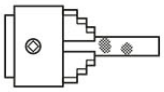
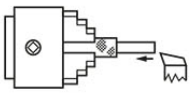
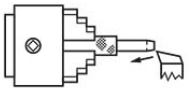
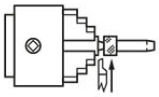


Fig. 2

(a) The table below shows processes used to make the locating peg on a centre lathe.

Complete the table by giving the name of each of the processes shown.

	Process	Description of process	Name of process
Stage 1		**Cutting across the end of the Ø20 mild steel bar**	Facing (off)
Stage 2		**Putting a grip on the outside of the bar**	Knurling
Stage 3		**Reduce the peg to Ø10**	(Plain/parallel) turning (down)
Stage 4		**Putting the angle on the end of the peg**	Taper turning
Stage 5		**Cutting off the finished peg**	Parting (off)

[5]

Question 4(b)

(b) (i) The section of the locating peg with Ø10 diameter is case hardened by heat treatment to reduce wear in use.

Describe how the case hardening process would be carried out.

Up to three marks for an adequate description, which should include reference to:
Carburising – heat to red hot and soak in carburising powder
Heat to red hot
Quench – in oil or water

..... [3]

(ii) Name **two** other heat treatment processes.

1 Hardening
Annealing
2 Tempering
Normalising
Nitriding

[2]

Mark Scheme Guidance

Question 4(a):

Accept tapering/coning.

Question 4(b)(i):

Method described must be viable.

Reference to all three stages required for full marks.

Question 4(b)(ii):

Processes must relate to heat treatment.

Accept any other valid heat treatment process.

Examiner comments

Question 4(a)– Responses to this question were very varied and marks from zero to the full five marks were awarded across the cohort. Only stage one was correctly named 'facing' with any regularity and very few candidates realised that stage four was 'taper turning' and not 'chamfering'. It was disappointing to see so few candidates having detailed knowledge of the processes carried out here.

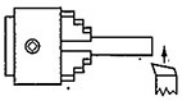
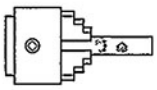
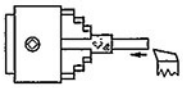
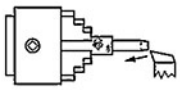
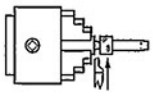
Question 4(b)(i) – Knowledge of heat treatment processes appeared to be quite limited, and many candidates confused case hardening with hardening and tempering. Marks were awarded where candidates had mentioned the required temperature or colour the mild steel needed to be heated to, but in almost all cases the peg was then immediately quenched in oil or water. Very few candidates referred to the use of a carbon rich compound to carburise the surface of the steel, or to the peg being heated in an oven with a carbon rich atmosphere for the same purpose.

Question 4(b)(ii) – As with part (i), it was apparent that knowledge of heat treatment processes was quite limited. Only the more able candidates named two heat treatment processes correctly, whilst the weaker candidates either did not attempt the question, or gave the names of any process that used heat, such as welding, forging and casting.

Exemplar candidate work
Question 4(a) – Low level answer

(a) The table below shows processes used to make the locating peg on a centre lathe.

Complete the table by giving the name of each of the processes shown.

	Process	Description of process	Name of process
Stage 1		Cutting across the end of the Ø20 mild steel bar	facing off
Stage 2		Putting a grip on the outside of the bar	EBS Machining out
Stage 3		Reduce the peg to Ø10	Rounding off
Stage 4		Putting the angle on the end of the peg	Part removed
Stage 5		Cutting off the finished peg	Parting tool

[5]

Commentary

This question requires candidates to identify and name specific processes carried out on a centre lathe. The fact that the word 'processes' appears in both the stem of the question and the question itself is an indication that only the names of the processes shown in the table are acceptable responses.

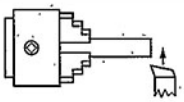
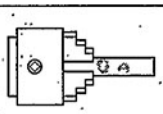
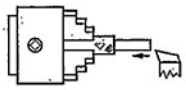
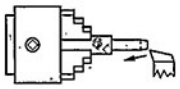
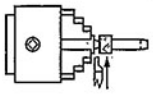
In this low level answer, the candidate would appear to have guessed at the process names by looking at the process diagrams and descriptions given in the table. The fact that Stage 1 process has been correctly named suggests that the candidate does have some knowledge, however limited, of the use of the centre lathe. Some of the responses given do not relate to processes carried out on the lathe, however, and in one case a tool has been named rather than a process.

In order to improve this, and make it a medium level answer, the candidate would need to gain more knowledge of lathework in general, and particularly the basic processes carried out on the machine.

Exemplar candidate work
Question 4(a) – High level answer

(a) The table below shows processes used to make the locating peg on a centre lathe.

Complete the table by giving the name of each of the processes shown.

	Process	Description of process	Name of process
Stage 1		Cutting across the end of the Ø20 mild steel bar	facing
Stage 2		Putting a grip on the outside of the bar	knurling
Stage 3		Reduce the peg to Ø10	turning down
Stage 4		Putting the angle on the end of the peg	taper turning down
Stage 5		Cutting off the finished peg	parting off

[5]

Commentary

This is an example of a high level answer as it indicates that the candidate has a good understanding of the basic processes carried out on the centre lathe. One incorrectly named process does suggest, however, that the candidate has perhaps not had sufficient experience of some of the less commonly used processes.

The candidate could make this into a full mark high level answer by gaining more experience of lathework, thereby being able to correctly name the process shown in Stage 4 as Taper Turning.

Question 5

5 (a) Give **two** benefits to a manufacturer of using CNC machining centres rather than CNC lathes and milling machines.

1 .....

.....

.....

2 .....

Up to two marks for each of two benefits.
Examples:
- The machines are more versatile (1) and can carry out many different operations (1)
- Production time can be reduced (1) as parts do not need to be changed from one machine to another (1)
- The machines would take up less space (1) than a number of different machines (1)

.....

.....

[4]

(b) Give **two** applications of lasers in engineering production.

1 .....

2 .....

[2]

Cutting
Welding
Engraving
Measurement
Alignment
Sintering

(c) Explain how 3D printing could be used to produce a prototype of a new product.

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.....

.....

[4]

Up to four marks for a detailed explanation
Example:
- The product is designed using CAD software (1) and a 3D image is produced (1)
- Computer software 'slices' 3D image into thin layers (1) the 3D printer then builds up the solid model/prototype (1)

Mark Scheme Guidance

Question 5(a):

Accept other relevant/feasible responses.

Justified response needed for full marks.

Do not accept references to workforce.

Question 5(b):

Accept specific reference to use in quality control.

Question 5(c):

Detailed explanation required for full marks.

Reference to slicing/layers required for full marks.

Examiner comments

Question 5(a) – Responses to this question were again very varied, with the whole range of marks being awarded. Good responses related to machining centres effectively doing the job of CNC lathes and CNC milling machines in one unit, this often being justified by the fact that products do not have to be moved between machines. Where marks were lost, this was normally as a result of candidates giving benefits of CNC machines compared with conventional machines, although some candidates thought that a CNC machining centre was a place where CNC machines were stored and/or sold.

Question 5(b) – This question was generally well answered, with most candidates being able to give at least one application of lasers in engineering production. The most popular examples were laser cutting and laser sintering, although the uses in engraving, alignment and measurement were also quite commonly seen.

Question 5(c) – Very few candidates gave sufficiently detailed explanations to score more than two marks on this question. Most responses included reference to the use of appropriate computer software to produce a 3D image of the product, but detail of the actual printing process was rather more limited. Only the more able candidates included reference to the slicing of the 3D image into layers which were then built up into a 3D prototype on the 3D printer.

Question 6

6 (a) Describe **two** ways that digital communications might be used in research and development.

1 .....

.....

.....

2 .....

.....

.....

[4]

One mark for the technology used and a further mark for its use.
Examples:
- Use of email/video conferencing to share ideas.
- The Internet (1) can be used to search for existing examples of products or materials to use (1).
- CAD software (1) can be used to produce design drawings and 3D images (1).

(b)* Discuss the business benefits of 'global manufacturing'.

.....

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Up to six marks for a discussion or detailed explanation of the business benefits of global manufacturing.

Responses may include reference to:
- Financial incentives from governments of countries to set-up manufacturing facilities.
- Lower manufacturing costs from cheaper labour.
- Closeness to raw materials.
- Ease of manufacturing remotely using digital communication. Potential of benefits from varying exchange rates.
- Ease of international travel/communication.
- Closeness to developing markets. International standardisation of processes.

Mark Scheme Guidance

Question 6(a):

Simplistic responses e.g. Using CAD/the Internet – 1 mark only.

Question 6(b):

Levels of response

Level 3 (5–6 marks)

Detailed discussion showing a clear understanding of the business benefits of global manufacturing.

Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar.

Level 2 (3–4 marks)

Adequate discussion showing an understanding of the business benefits of global manufacturing.

There will be some use of specialist terms, although these may not always be used appropriately. The information will be presented for the most part in a structured format. There may be occasional errors in spelling, punctuation and grammar.

Level 1 (1–2 marks)

Basic discussion showing limited understanding of the business benefits of global manufacturing.

There will be little or no use of specialist terms. Answers may be ambiguous or disorganised. Errors of spelling, punctuation and grammar may be intrusive.

0 = a response that is irrelevant and/or not worthy of a mark.

Annotate with 'Seen' at end of response.

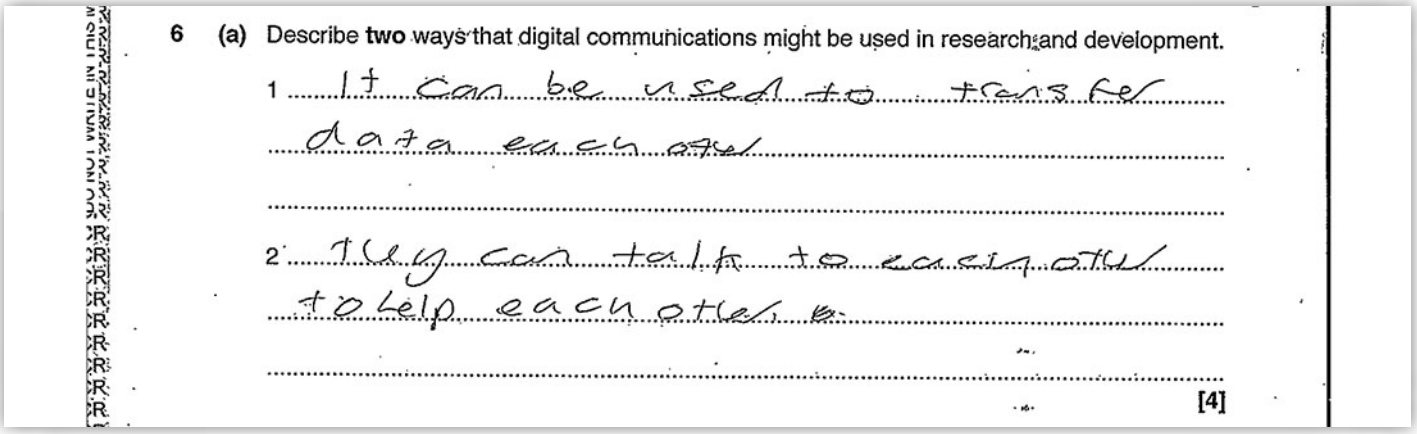
Examiner comments

Question 6(a) – Most candidates that attempted this question showed a reasonable awareness of digital communications, but were rarely able to give clear descriptions of their application. In many cases examples of the technologies used were not given, whereas in other cases the technologies were named without describing their use. The most frequently seen technologies were the Internet and emails, and some candidates also made reference to video conferencing, but descriptions of use were generally weak, and two marks out of the four available for the question was the norm.

Question 6(b) – This extended response question was attempted by most candidates, largely with reasonable success, and marks across the full range were seen. The most frequently discussed business issues relating to global manufacturing were those of cheaper labour and availability of resources in other countries. Some higher achieving candidates showed a broader understanding of the business benefits by also making reference to currency issues and proximity of markets.

The candidate's Quality of Written Communication (QWC) was assessed in this question, and marks were awarded for well written answers, despite technical content sometimes being somewhat limited.

Exemplar candidate work
Question 6(a) – Low level answer



6 (a) Describe **two** ways that digital communications might be used in research and development.

1 It can be used to transfer data each other

2 They can talk to each other to help each other.

[4]

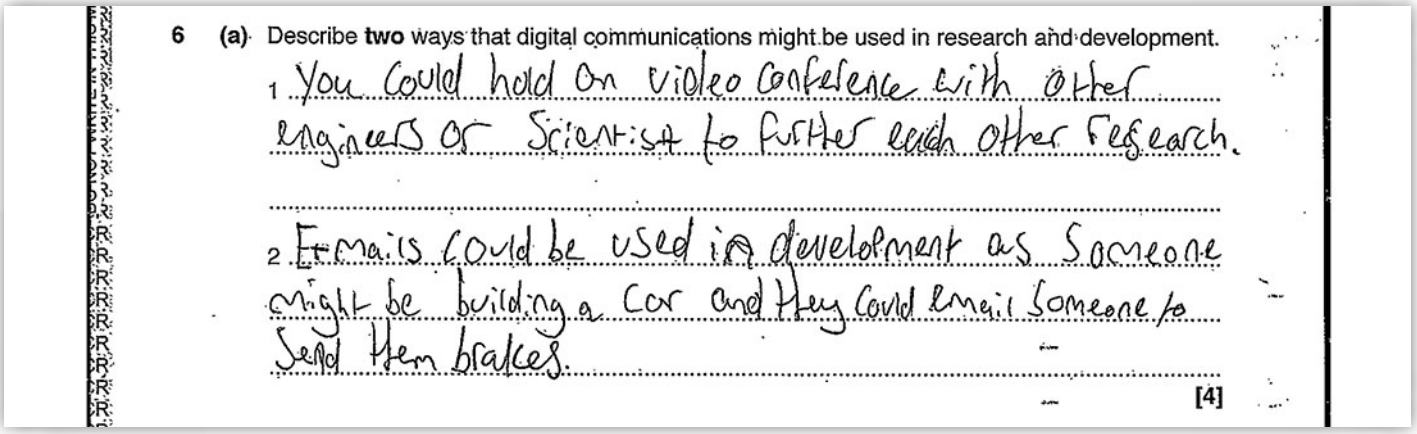
Commentary

In this question, candidates are required to consider the application of digital communications in research and development.

This low level answer does not address the focus of the question and contains only one vaguely relevant reference to 'data', with no mention of digital communications at all. It would appear that the candidate may have limited understanding of examples of digital communications, and is unable, therefore, to describe how they might be used.

This answer could be improved to a medium level by making relatively simple references to the use of the Internet and/or emails, these being used in a number of ways in research and development.

Question 6(a) – High level answer



6 (a) Describe **two** ways that digital communications might be used in research and development.

1 You could hold on video conference with other engineers or Scientist to further each other research.

2 Emails could be used in development as Someone might be building a car and they could email Someone to send them brakes.

[4]

Commentary

This is a good example of a high level answer as the candidate has made clear reference to specific examples of digital communications and, in one case at least, has described their use in research and development.

The example of use given in response 2 is not really relevant to development, however, and the candidate could improve this to a high level full mark answer by giving a more appropriate use of emails. One particularly good example of this would be the emailing of CAD generated designs to clients/colleagues. This would also indicate detailed knowledge of digital communications and their uses.

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